ACCOUNTABILITY TOWARDS ENABLING COMMERCIALISATION OF RESEARCH IN PUBLIC TERTIARY EDUCATION INSTITUTIONS

Anil K. Narayan

A thesis submitted to

Auckland University of Technology

in fulfilment of the requirements for the

Degree of Doctor of Philosophy (PhD)

2010

School of Business

Supervisors:

Professor Keith Hooper

Professor Gael McDonald

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

RELATED RESEARCH OUTPUTS

The following peer reviewed research outputs relate to this study:

Conference Presentations

Narayan, A. (2010). *Managing Accounting Expectations in an Uncertain Context: A New Institutional Perspective.* Paper presented at the Sixth Asia Pacific Interdisciplinary Research in Accounting Conference (APIRA), 11-13 July, 2010; University of Sydney, Australia.

Narayan, A. (2010). *Framing Public Sector Accountability in Uncertain Contexts: A New Institutional Explanation.* Paper presented at the AFAANZ Conference, 4-6 July, 2010, Christchurch, New Zealand.

Narayan, A., & Hooper, K. (2010). *The Role of Government towards Encouraging the Development of Academic Research Commercialisation in New Zealand Universities: A Historical Overview of Policy Directions.* Paper presented at the Sixth Accounting History International Conference, "Accounting and the State", 18-20 August, 2010, Wellington, New Zealand.

Narayan, A. (2009). *Managing Accountability Expectations Using Structural and Communicative Mechanisms: A New Institutional Perspective.* Paper presented at the AFAANZ Conference, 5-7 July, 2009, Adelaide, Australia.

Received the Best Paper Award in the Public Sector Stream.

Narayan, A. (2008). *Research Commercialisation in New Zealand Universities: Public Sector Accountability and Reporting Challenges.* Paper presented at the AFAANZ Conference, 6-8 July, 2008, Sydney, Australia.

Narayan, A. (2007). *Window Dressing for Legitimacy? A Selected Review of Annual Reports of New Zealand Tertiary Education Institutions.* Paper presented at the AFAANZ Conference, 1-3 July, 2007, Gold Coast, Australia.

ATTESTATION OF AUTHORSHIP

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

ACKNOWLEDGEMENTS

I would like to formally acknowledge and thank a number of people who encouraged, supported and assisted me through the demanding and challenging years of my PhD study.

First, I would like to thank my two supervisors, Professor Keith Hooper and Professor Gael McDonald. Keith guided me in the selection of my topic and provided me with timely assistance and feedback. Keith, your confidence in me encouraged me to achieve what I believed I could. Gael has inspired me and nurtured my research endeavours. I am greatly indebted to you Gael for your consistent support, enthusiastic encouragement and valuable feedback throughout the dissertation process.

I would also like to thank the interview participants, many of whom gave up their valuable time to accommodate my needs. Lynn Spray was great with her data transcription and proof-reading skills.

To my mum, a special thank you for instilling in me the true value of education from an early age. This gave me the much needed drive and determination to be successful in my endeavours.

Finally, this dissertation was only made possible by the unwavering support, affection, and limitless patience of my wife Reshmi and two children, Vikash and Divya. Words are not enough to describe how lucky I feel to have you all in my life. Reshmi, your patience, sincerity and understanding encouraged me at every step of the journey. It means so much to me that you are always proud of my achievements.

ABSTRACT

Commercialisation of research has increasingly become a desirable activity for many tertiary education institutions (TEIs) across the globe. There is now widespread recognition by all sectors of society that TEIs engagement with research commercialisation will help drive a nation's innovation system and contribute to the needs of the economy and society. However, in recent times, the growing accountability agenda for research commercialisation has raised important challenges for TEIs. There are increasing concerns that TEIs have failed to achieve the desired results of research commercialisation (for e.g. Dahlstrand, 2008; Goldfarb & Henrekson, 2003; Salmi, 2009) as has been anticipated by both public and private entities. Predictably, a broad range of stakeholders are increasingly asking TEIs to justify the use of public resources and to provide a more thorough account of their research outcomes (Fielen, 2007; Gauthier, 2004). There also remains considerable uncertainty amongst TEIs as to the mechanisms by which they are able to leverage the intellectual abilities of their research staff, particularly, given the complex and long-term nature of the commercialisation process.

This study draws on the theoretical perspectives of new institutional theory (NIT) and uses three New Zealand TEIs as case studies to explore how public TEIs identify and render accountability in the process of enabling commercialisation of research. Data was collected using a mixed method approach of interviews and a broad range of secondary documents and archival records that covered the period 2002-2010. The constructive-interpretive research strategy permitted the simultaneous selection, inductive analysis, and interpretation of contextual data in order to construct emergent themes arising from the real-life context of commercialisation.

The study highlights a number of important findings. First, TEIs are embedded in a complex network of institutionalised relationships with normative and cultural-cognitive obligations towards enabling commercialisation of research. These relationships require careful management to help shape TEIs responses to select and use appropriate accountability mechanisms to enable and enhance commercialisation. Second, while research commercialisation has become legitimised in terms of nation building activities, the commercialisation agenda has been potentially undermined by a strong performance

based research funding (PBRF) culture. As a consequence, commercialisation remains a marginal activity as TEIs strongly view accountability for research in terms of funding levels. In the main, TEIs do not consider returning value in terms of commercialisation as an obligatory part of accepting funding to support basic research. Finally, new public management (NPM) accountability with a focus on bureaucratic compliance fails to recognise the uncertain, complex, and long-term nature of the research commercialisation process. To avoid NPM tensions, TEIs have 'decoupled' from the technical requirements to render accountability for commercialisation performance. Consequently, this is causing legitimating behaviour in TEIs and in fact, accountability for research commercialisation seems to have become a 'representational faithfulness' to the rhetoric in the TEIs strategic documents.

This research makes important contribution to theory, policy and practice. In regards to theory, the current research contributes through the application of new institutional theory (NIT) to two demanding fields of research and this is the first time NIT has been applied to examine public sector accountability within the context of enabling academic research commercialisation. A conceptual model of accountability has been developed identifying accountability obligations, management of accountability expectations, and discharge of accountability obligations. While most studies are *ex post*, this framework provides a three stage model to help examine *ex ante and ex post* accountability.

In relation to practice, this study identifies the gap between rhetoric and reality of accountability that seems to have become a characteristic of the accountability environment within which public TEIs operate. While the rhetoric in strategic documents helps legitimise research commercialisation, the accountability practices of commercialisation are not thoroughly embedded, widely accepted, and effective as the rhetoric suggests. The study provides a model for enabling commercialisation of research that helps inform practice from early stage development of a research culture, to setting clear research targets in terms of PBRF goals, to finally establishing commercialisation initiatives.

In relation to policy, this study identifies notable tensions between academic research and commercialisation. As a consequence, government needs to become more explicit in articulating its policy on research commercialisation so that TEIs move beyond identifying accountability simply in terms of PBRF goals. The study demonstrates that government policy needs to provide incentives to ensure that academic research and research commercialisation become two important roles of TEIs that complement and reinforce each other. The PBRF policy needs to be redeveloped to recognise research in terms of economic contributions and value adding activities leading to commercial outcomes. There is an urgent need for both government and TEIs to frame policy that encourages the development of a research culture within TEIs that remains sufficiently focussed on successful research commercialisation.

Keywords: accountability, commercialisation, new public management (NPM), new institutional theory (NIT), performance based research funding (PBRF), research

ABBREVIATIONS

AUTEC	Auckland University of Technology Ethics Committee
CEO	Chief Executive Officer
COM	Commission of the European Communities
CoRE	Centre of Research Excellence
DEST	Department of Education, Science and Training
DVC	Deputy Vice-Chancellor
ETA	Economic Transformation Agenda
EU	European Union
FRST	Foundation for Research, Science and Technology
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GIAB	Growth and Innovation Advisory Board
GIF	Growth and Innovation Framework
GIPI	Growth and Innovation Pilot Initiatives
HRC	Health Research Council
IP	Intellectual Property
KPIs	Key Performance Indicators
MED	Ministry for Economic Development
MoRST	Ministry of Research, Science and Technology
NINS	National Innovation System
NIT	New Institutional Theory
NPM	New Public Management
NZ	New Zealand
NZTE	New Zealand Trade and Enterprise
NZVIF	New Zealand Venture Investment Fund
OECD	Organisation for Economic Co-operation and Development
PBRF	Performance-Based Research Fund
PfX	Partnership for Excellence
PVC	Pro Vice-Chancellor
R&D	Research & Development
SIAC	Science and Innovation Advisory Council
STEPS	Statement of Tertiary Education Priorities
TEAC	Tertiary Education Advisory Committee
TEC	Tertiary Education Commission
TEI	Tertiary Education Institutions
TES	Tertiary Education Strategy
UCONZ	University Commercialisation Offices of New Zealand
VC	Vice-Chancellor
WTO	World Trade Organisation

CHAPTER 1:   INTRODUCTION

Traditionally, public tertiary education institutions including universities (hereafter TEIs)[1] have operated on two stable missions of teaching and research. However, in recent times, with the growing impact of globalisation and the rise of the knowledge economy society's expectations have changed. Government policy changes and funding restructuring as drivers are compelling TEIs to take on a much broader role that contributes towards the social and economic development goals of the nation. With changing roles and expectations, there has been a gradual shift from the traditional state controlled institutions towards greater autonomy and market-driven entrepreneurship in most OECD countries (Etzkowitz, Webster, Gebhardt, & Terra, 2000; Marginson & Considine, 2000; OECD, 2003; Vincent-Lancrin, 2006). TEIs now have the freedom to pursue commercial objectives with research commercialisation high on the national agenda of innovation strategies of many countries. Research commercialisation relates to the process of transforming research outcomes into marketable products, processes, or services (Laperche, 2002) and is seen increasingly as a major factor contributing to high innovation performance and economic growth. It is now becoming widely accepted as the "third mission" generating "third stream" income in many TEIs across the globe (Markman, Siegel, & Wright, 2008). Although a contested concept (Rinne & Koivula, 2005; Shattock, 2005), commercialisation is now receiving increasing attention in literature and many policy debates surrounding tertiary education development.

This introductory chapter provides a background to the research topic, explains the need for and justification of the research, describes the research questions and research objectives, and gives an outline of the thesis structure.

---

[1] Tertiary education and Tertiary Education Institutions (TEIs) are new terms recently adopted by OECD countries (2008, p. 13) to reflect the growing diversity of institutions and programmes. TEIs include universities, polytechnics, university colleges, and institutes of technology. Tertiary education has replaced the previous term, higher education, which only reflected what happened in universities.

1.1 *Background*

There is an ever-growing public interest in the role public TEIs occupy in the performance of the national innovation system at both the national policy level across countries, as well as among institutional actors associated with academic research commercialisation (Drabenstott, 2008; Gauthier, 2004; Goldfarb & Henrekson, 2003; Gulbrandsen & Smeby, 2005; Jones, McCarney, & Skolnik, 2005; Keeling, 2006; Shattock, 2005). TEIs are often viewed as rich reservoirs of unexploited commercialisable intellectual property with huge potential to stimulate innovation and economic growth (Mowery, Nelson, Sampat, & Ziedonis, 2001; Rosenberg & Nelson, 1994). These views, combined with pressures from the institutional environment, have put TEIs at centre stage in the creation and diffusion of new knowledge which is considered essential in driving the national innovation and economic development plans of many nations (e.g. OECD, 2008; Rasmussen, Moen, & Gulbrandsen, 2006). In the US, Congress passed the Bayh-Dole Act in 1980 to ensure USA's competitiveness in the world economy and TEIs were given a central role in commercialisation of research to help drive the nation's innovation and productivity. Since then, initiatives have been taken in many countries, especially in the UK (e.g. HM Treasury, 2004), across Europe (e.g. Commission of the European Communities [COM], 2003), Canada (AUCC, 2001), and Australia (DEST, 2002), to recognise and enhance TEIs' engagement in commercialisation of academic research. TEIs are now increasingly expected to take a leading role in encouraging innovation and fostering commercialisation and some countries, for example Canada, have gone even further than most and set an ambitious target to double research by 2010 and triple the rate of commercialisation (AUCC, 2001).

New Zealand, too, has set out on an ambitious commercialisation and innovation path to keep pace with other developed nations. For the past decade, the government has recognised that research commercialisation and innovation are essential ingredients to the success of the nation's economic development plans. However, despite various government initiatives to improve the nation's innovative capabilities, New Zealand continues to lag behind in terms of GDP per capita (OECD, 2007), and ranks towards the bottom end of the Organisation for Economic Co-operation and Development's (OECD's) productivity league (OECD, 2009). The performance of the nation's

innovation system has come under various reviews in recent years. The World Economic Forum Report in 2000 concluded that New Zealand was underperforming and emphasised that TEIs must play an important role in improving the nation's innovation and entrepreneurship (World Economic Forum, 2000). In 2001, the national innovation report card compiled by the government-appointed Science and Innovation Advisory Council noted that New Zealand, as a nation, has great potential and can do better (Science and Innovation Advisory Council, 2001). It recognised that while the basic conditions for entrepreneurship and innovation were good, the low rate of commercialisation of research was not sufficient to keep pace with other nations. The report again emphasised that TEIs had a central role in knowledge creation and transfer through commercialisation of research.

Given the widespread recognition of TEIs as major drivers of innovation and global competitiveness in a knowledge-driven economy, tertiary education policy has become extremely important on the national agenda. The New Zealand government has responded in various ways, for example, by formulating the Growth and Innovation Framework (GIF) as the national strategy for returning New Zealand's income per capita to the top half of the OECD. To give effect to the government's vision, Tertiary Education Strategy 2002-2007 (strategy six) was implemented to strengthen research, knowledge creation and commercialisation (Ministry of Education, 2003). The most recent OECD Economic Survey report on New Zealand recognises that performance on productivity has been impacted by many natural and unavoidable causes, such as the economy's small size and geographical remoteness (OECD, 2009). Despite these barriers, raising productivity growth remains the greatest challenge for the government which has pledged to catch up with Australian living standards by 2025. To achieve this ambitious goal will require raising average annual per capita income growth to 3.3% (from 2.1% over the past decade), which, in turn, would require a much higher rate of productivity growth (OECD, 2009). For its part, TEIs must optimise the results of their research findings (OECD, 2007).

The centrality of TEIs to the success of the nation's innovation plan has placed growing expectations on TEIs by all sectors of society. Public agendas have become more

complex and demanding as TEIs are increasingly expected to satisfy the needs of the economy and society by improving their ability to create and transfer knowledge so that full social and economic benefits could be realised. Public pressure on TEIs across nations seems to be even greater given that there is a dominant belief that previous policies have failed to achieve desired results in the form of economic growth, knowledge transfer to industry and commercialisation of research results (for e.g. Dahlstrand, 2008; Goldfarb & Henrekson, 2003). These developments provide a number of important accountability challenges to TEIs. Not only do TEIs have to cope with a growing commercialisation agenda, but accountability has become a major concern in most parts of the world (Salmi, 2009). A broad range of stakeholders are increasingly asking TEIs to justify the use of public resources and more thoroughly account for their research results (Dahlstrand, 2008; Fielen, 2007; Gauthier, 2004). In New Zealand, in return for public investment in research in TEIs, the government is seeking enhanced commercialisation and rapid diffusion of new ideas and technologies into all sectors of the economy (MoRST, 2006, p. 8). Given these major challenges, this study seeks to examine how public TEIs in New Zealand are meeting their accountability obligations towards enabling commercialisation from research.

1.2   *The Need For and Justification of this Research*

Research commercialisation is a fairly recent phenomenon in many TEIs across the globe (Ambos, Makela, Birkinshaw, & D'Este, 2008; Colyvas & Powell, 2006) and is fraught with difficulties (Laperche, 2002). TEIs are now expected to demonstrate tangible returns for the public research funding they receive, but the process of transferring innovative ideas from basic research to industry to create commercial products is not so evident (Wessner, 2003, p. 51). There is also accumulating evidence that many OECD countries are lagging behind in terms of knowledge and technology transfer activities. The majority of invention disclosures do not result in a licence (Mowery, Nelson, Sampat, & Ziedonis, 2004) and there is a great deal of concern over the poor propensity to spin-off firms from academia (Goldfarb & Henrekson, 2003). In New Zealand, although TEIs produce significant amounts of research, there is a strikingly low rate of transfer to business (Ministry of Education, 2003). There remains considerable uncertainty amongst TEIs about how to leverage the intellectual abilities of their research staff (Laperche, 2002;

Pilbeam, 2006). The uncertainty arises from the complex, multi-faceted, and time-consuming nature of the commercialisation process, including the inherent risk involved in transforming academic research into commercial products and services. Despite receiving widespread attention in the literature in recent years (Agrawal, 2001; Djokovic & Souitaris, 2008)[2], the 'who, where, what, how, and why' of university research and technology commercialization are still evolving' (Markman et al., 2008, p. 1411). Thus, research aimed at investigating these evolving concepts is extremely important and deserves greater attention.

Surprisingly few studies empirically examine these very early stages of research commercialisation within TEIs, despite the growing interest in increasing academic commercialisation as a source of innovation and income generation. As such, our knowledge of the antecedents that enable research commercialisation is still limited. It takes many years to create successful products out of TEI research (Dahlstrand, 2008) and success improves over time (Powers & McDougall, 2005). Most studies are on technology transfer relating to spin-offs, licensing and patents that are ex post the decision to commercialise and do not explain the processes leading up to the creation of the technologies for commercialisation (Hindle & Yencken, 2004; Vohora, Wright, & Lockett, 2004). Therefore, the impact of academic research development on commercialisation is not well understood. To fill the early stage commercialisation knowledge gap, this study will specifically explore the dynamics of enabling commercialisation of research and naturally the accountability processes leading up to and following the developments in commercialisation at TEIs.

The much heightened expectations of TEIs' involvement towards commercialisation of research have also created conflicts and tensions at organisational and individual levels within TEIs. There are concerns that commercialisation will jeopardise the central mission and basic role of TEIs (Lee, 1996; Mazzoleni & Nelson, 1998), will alter the institutions' rules and conventions of research (Dasgupta & David, 1994) and will largely be ineffective in contributing to the nation's economic performance (Dahlstrand, 2008;

---

[2] Agrawal (2001) provides a comprehensive review of literature on university-to-industry knowledge transfer, and Djokovic and Souitaris (2008) provide a literature review on spinouts from academic institutions.

Lindelof & Lofsten, 2003; Lofsten & Lindelof, 2002). Commercialisation of research has created profound normative change in science (Etzkowitz, 1998) and this development has led to notable tensions between academia and the commercial sector (Lockett, Wright, & Franklin, 2003; West, 2008). Some academics hold a strong intrinsic belief that academic research and commercial activities represent fundamentally different and potentially contradictory goals and that deviating from the social norm of research in pursuit of commercial gains could be highly risky (D'Este & Patel, 2007; Dasgupta & David, 1994; Owen-Smith, 2003). They argue that commercialisation of research has negative consequences and promotes secretive behaviours among researchers, creates conflicts and tensions between advancing knowledge and the generation of revenues, and even threatens academic freedom (Gulbrandsen & Smeby, 2005; Lee, 1996; Louis, Jones, Anderson, Blumenthal, & Campbell, 2001; Powell & Owen-Smith, 1998). These issues cannot be ignored by TEIs when pursuing commercialisation goals. In New Zealand, the TEI culture is insufficiently focussed on successful research commercialisation (MoRST, April 2008) and appears to be inhibiting the commercialisation process (Science and Innovation Advisory Council, 2002). Therefore, a study of how TEIs manage the tensions between academic research and commercialisation activities at both the organisational and individual levels is extremely important as it will provide valuable insights in order to better guide policy development and management of research commercialisation activities (Markman et al., 2008).

Prior research has mainly examined academic research commercialisation in US, Canada, UK and some European countries. Yet, there are considerable differences in levels of complexity and results obtained in commercialisation of research in these countries and across TEI systems (Goldfarb & Henrekson, 2003; Laperche, 2002; Siegel, Waldman, & Link, 2003). Despite the burgeoning literature, there remains insufficient theoretical and empirical evidence on the underlying processes relating to the commercialisation of research across institution types (Markman et al., 2008, p. 1402). It is far from clear whether these differences are due to TEIs being embedded in different cultural, economic, or institutional contexts and little is known about what impact these contexts are having on the TEI systems. Given that there are no recent studies in the local New Zealand context, a promising avenue of research emerges in order to generate new

insights pertaining to how TEIs in New Zealand actually manage the commercialisation processes to enhance outcomes.

An OECD review of innovation policy in New Zealand notes shortcomings in the process of technology diffusion and adoption (OECD, 2007) and raises a number of issues worth investigating. While some TEIs may be undertaking industry-relevant applied research, there are concerns relating to the mismatch between supply and demand, a fragmented system of government support to R&D and innovation, inadequate incentives, and a lack of coherence across a full range of innovation-related policies (OECD, 2007). As noted by Wessner (2003, p. 51), the problems with policy context for public programs arise where policy-makers assume a linear model of innovation by believing that government support for basic R&D will transfer seamlessly to the economy at large. In New Zealand, while there is some government encouragement for commercialisation of TEI research, there is no government requirement for TEIs to make follow-on investments in research outcomes that have commercial potential. Despite these major drawbacks and obstacles, TEIs are still required to cope with systemic failures that prevent them from optimising the results from research. As raised in the Science and Innovation Advisory Council report (Science and Innovation Advisory Council, 2002, p. 32), how can TEIs take far greater responsibility for more actively supporting the commercialisation of research and identify and eliminate impediments to the efficient commercialisation of research?

The much heightened government and public expectations, contradictory demands and resulting tensions of commercialisation of academic research also raise important accountability challenges to TEIs. For example, what are the approved policies and priorities, adequate structures, resources and incentives to guide behaviour (Ambos et al., 2008)? A new dimension to TEI research management practices has been added which is in conflict and is causing tensions with the New Public Management[3] (NPM) model of accountability. Research management within TEIs is largely dictated by a culture of managerialism and performativity originating from the NPM literature (Anderson, 2006; Codd, 2005; Coy & Pratt, 1998; Gray, Guthrie, & Parker, 2002; Lapsley & Miller, 2004;

---

[3] New Public Management (NPM) refers to the conception of public accountability characterised by the adoption of private sector management techniques and competitive attitudes with a greater emphasis on measurable outputs (Hood, 1995).

Modell, 2003, 2005; Neumann & Guthrie, 2002; Parker, Guthrie, & Gray, 1998; Willmott, 1995). The NPM accountability places high value on what is produced, observed, and measured and for knowledge, experience, and innovation to be valued and recognised, it needs to be reduced to measurable performance outcomes under NPM (Codd, 2005). NPM accountability is also largely audit driven (bureaucratic accountability) and at odds with research professional groupings who prefer greater autonomy, flexibility, and a culture of trust to produce successful outcomes (Codd, 2005; O'Neill, 2002). The tension between academic innovation and NPM accountability has been recognised in literature (Findlow, 2008) and seems counterproductive to research commercialisation. Therefore, what are the appropriate models of accountability that will shape the TEIs' responses to select and use mechanisms to enable and enhance commercialisation?

Research on organisational response to accountability and performance mechanisms introduced under NPM shows that conflicting pressures on the organisation lead to the adoption of a range of responses, from transformation, acquiescence, defiance, and manipulation (Brignall & Modell, 2000). Noteworthy evidence from empirical studies regarding research management within the private sector suggests that formal and programmed management control mechanisms are largely ineffective in managing the ambiguous nature of research (Abernethy & Brownell, 1997; Bisbe & Otley, 2004; Davilla, 2000; Ditillo, 2004). A natural question that arises is what are the alternative accountability mechanisms to successfully manage research performance outcomes? What is the interactive and complementary nature of different control mechanisms (Abernethy & Chua, 1996; Alvesson & Karreman, 2004; Macintosh & Daft, 1987; Simons, 1995)?

There has been previous research on the university sector using institutional frameworks attributing organisational change to wider political, social and economic pressures (Coy & Pratt, 1998; Deem, 2004; Gray et al., 2002; Lapsley & Miller, 2004; Modell, 2003, 2005; Neumann & Guthrie, 2002; Parker et al., 1998; Willmott, 1995). However, the focus of many of these studies has been on the NPM transformation of the university sector at the macro-level (Juniper, 2002; Modell, 2003, 2005). These studies do not

provide insights into specific use of accountability mechanisms at the specific organisational or micro-level. This is needed and provided in the current study being undertaken.

1.3 *Research Questions and Objectives*

The central role TEIs occupy in the nation's innovation framework has placed greater expectations on TEIs to enhance commercialisation of research results. The growing government and public agenda has become more complex and demanding as TEIs are increasingly expected to fulfill much broader societal and economic needs. These enhanced expectancies provide important challenges for TEIs in countries pursuing the commercialisation agenda. In order to optimise the benefits arising from commercialisation of research, there is an urgent need for TEIs to identify and address a number of concerns in regard to commercialisation and specifically in regard to accountability. This study, therefore, provides a unique opportunity to meet this challenge.

The central research question that this study aims to address is:

> How do public TEIs in New Zealand identify and render accountability towards enabling commercialisation of research?

To gain comprehensive insights into the accountability practices of public TEIs in the context of enabling commercialisation of research, four specific research questions were posed in this study, as follows:

1. What primary rationales underlie the accountability obligations of public TEIs in New Zealand towards enabling commercialisation of research?
2. How do public TEIs in New Zealand manage the accountability expectations of enhanced commercialisation of research?
3. How do public TEIs in New Zealand measure and report the performance of their commercialisation activities?
4. What are the scope, purpose and modus operandi of voluntary reporting strategies within the TEI setting?

These research questions are further explained by the four inter-related objectives of this research. The first objective is to determine the internal and external drivers of commercialisation confronting public TEIs in New Zealand. Commercialisation cuts across different activities and a clear understanding of the endogenous and exogenous pressures will help elucidate the much wider roles expected of TEIs in their growing societal and commercial obligations. The aim is to develop a detailed understanding of the TEIs' accountability obligations towards research commercialisation. The second objective of the study is to explore the organisational adaptations and arrangements that have taken place in TEIs to help determine how they manage research commercialisation expectations. The findings of this investigation will help determine what accountability arrangements are needed and whether they are robust enough to encourage a commercial environment. Commercialisation involves giving management greater accountability and, at the same time, making them more accountable for performance. As commercialisation becomes firmly embedded into the TEI's mission, the major challenge for TEIs is to set goals, measure performance, and make visible the full extent of the results of their commercial activities (Einar, Oystein, & Magnus, 2006). As a consequence, the third objective of this study is to determine how TEIs measure commercialisation performance. The nature and extent of organisational reporting is largely influenced by performance achievements and good performance reporting should demonstrate clearly the progress made by TEIs in meeting their accountability obligations. Hence, the fourth objective of this study is to examine organisational specific reporting to determine TEIs' reporting strategies and factors that influence reporting of research commercialisation initiatives.

To help answer the research questions and achieve the research objectives, the study utilises a theoretical framework built upon new institutional theory. Multiple case studies have been used as the research strategy to help uncover rich, detailed and in-depth information arising from real-life context. The theoretical framework and the research methodology have been described in detail in Chapters 3 and 4, respectively.

1.4   *Structure of this Thesis*

The remainder of the thesis is organised into eight chapters. Chapter 2 reviews the literature on research commercialisation. It provides the background information, discusses the macro environmental forces of commercialisation, notes the importance of innovation and entrepreneurship and discusses the performance of the New Zealand innovation system. It also discusses the role of government, industry and TEIs in research commercialisation and reviews literature on accountability and performance. Chapter 3 describes the theoretical framework of the study. It provides the conceptual dimensions of the study, outlines the key theoretical elements of new institutional theory and discusses relevant theory and accountability issues that inform the study. Chapter 4 describes the research methodology and methods used for data collection and analysis. It justifies the selection of case studies as the appropriate research design strategy. The chapter also outlines the standards of quality and ethical principles guiding the study. Chapters 5, 6 and 7 are the most substantive chapters of the thesis. These chapters present the findings of each of the three case studies undertaken in the study. The findings of each case study are presented in a similar format that roughly corresponds to the four research questions posed in the study. Chapter 8 presents the results of the cross-case analysis by identifying common themes and differences resonating among the multiple cases. Major findings of the cross-case analysis are integrated to the theoretical concepts and the resulting theoretical interpretations provide a richer basis for research conclusions to be drawn. Chapter 9 presents the study's conclusions of the overall research problem and research questions, and provides the implications and contributions of the study. Finally, the limitations of the research are identified and further research opportunities presented.

CHAPTER 2: LITERATURE REVIEW

2.1   *Introduction*

This chapter reviews relevant literature on research commercialisation in the context of the study. The first section provides a background to research commercialisation. It traces the origins of the public sector commercialisation strategy in New Zealand and clarifies the definition of research commercialisation used in this study. The second section reviews the macro environment of research commercialisation. This includes the effects of globalisation, the rise of the knowledge economy, and the influences of the NPM reforms. The third section discusses the importance of innovation and entrepreneurship as key elements of research commercialisation. The fourth section reviews the relevant literature on the role of government, industry and TEIs, and how they interact in their role in research commercialisation. The literature on accountability and performance management in the context of research commercialisation is critiqued in the fifth section. The final section provides a commentary on the performance of the New Zealand innovation system and identifies the key accountability concerns that have emerged over the years.

2.2   *Background*

2.2.1   **Origins of the Public Sector Commercialisation Strategy**

The tertiary education environment in most Western countries has changed dramatically since the early 1980s. Some of these changes relate to the much wider social, political and economic reforms of the public sector in general. Pressure for world-wide reforms also came from the impact of globalisation, international competition, and the rise of the knowledge economy. With rapid globalisation, many Western governments have increasingly relied on the logic of market forces to transform government activity (McKenna, 2000). This transformation has been categorised as commercialisation, corporatisation, and privatisation (Spicer, Emanuel, & Powell, 1996). Commercialisation in the context of public sector transformation has been described by Bozec et al. (2004, p. 79) as the reorientation of objectives more towards profitability targets. Spicer et al.

(1996) describe commercialisation as an economic reform to introduce greater efficiency in government commercial activities.

In New Zealand, the origins of the commercialisation strategy can be traced back to the more general reforms of the public sector. In the early 1980s, successive governments used economic liberalisation policy to open markets to competition as a means of regulating the economy[4]. The overall trend of the government's major macro policies and the socio-economic reform agenda had economic rationalism and market liberalisation as their key features. The reform programmes resulted in the corporatisation and privatisation of many state-owned enterprises (SOEs). Easton (1997) points out the duplicity that, while the official reason for corporatisation and privatisation presented by government was a means of reducing government debt, in reality, it was part of a much wider commercialisation strategy.

The state sector reforms had also set a precedent for the radical reforms of the tertiary education sector. Throughout the 1980s and 1990s, a series of reports recommended market driven approaches to improving efficiency and accountability of the TEI sector. The Hawke Report on Post-Compulsory Education and Training (PCET) in New Zealand became a significant starting point of debate in the commercialisation process of tertiary education (Hawke, 1988). The report recommended that universities become more commercial with the ability to generate private funds. Most of the Hawke Report recommendations were incorporated as intended government policies in the Learning for Life documents (Ministry of Education, 1989a, 1989b). These documents maintained a commercial approach that provided the initial onslaught of neo-liberal market policies that substantially changed the tertiary education system in New Zealand.

The New Zealand government, by introducing New Public Management (NPM) reforms in the tertiary education sector, granted institutional autonomy to TEIs, each with their own governing council operating on a devolved contractual model of governance through charters, mission statements, and performance objectives (Ministry of Education, 1989a,

---

[4] See Easton (1977, pp. 13-43), for a full description of the commercialisation strategy. Examples of reforms are given on pages 82-83.

pp. 12-14). TEIs had the freedom to generate new sources of revenue through increasing reliance on market-like competition policies for external funding, research grants, contracts, university-industry partnerships, and other profit-seeking activities that Slaughter and Leslie (1997) referred to as 'academic capitalism'. Across nations, governments promoted academic capitalism as a means to stimulate economic growth. The effects of globalisation were pressurising industry to innovate, causing businesses to turn to TEIs for assistance, and TEIs were more willing to engage in capitalist activities as an important source of income to supplement declining government funding (Hessels & Lente, 2008). Research commercialisation accelerated after the passing of the 1980 Bayh-Dole Act in the United States and became part of the innovation and economic transformation agenda of many OECD nations.

2.2.2 **Defining Research Commercialisation**

Research commercialisation has been defined in a number of ways. Bok (2003) defines research commercialisation in terms of efforts made throughout the university to profit from research. It includes adoption of revenue generation and profit-seeking strategies through technological innovation and research, and university-business co-operation (Bok, 2003). Dilanchian (2006, p. 1) refers to it as a *"realisation of an opportunity"* and *"a process of development which converts or adds market value to intellectual assets to derive benefits"*. Laperche (2002) defines research commercialisation as the transformation of basic knowledge into marketable new products and services. Bok (2003) warns that the word commercialisation can be misused or used for rhetorical purposes to capitalise on any opposition to emerging business practices in academia. He goes on to warn that given *"the several meanings of commercialisation and the motives with which the term is often used, it is especially important to be clear about one's own definition at the outset"* (Bok, 2003, p. 3).

This thesis embraces the key elements of the definition proposed by DEST (2005) and Laperche (2002) and broadly defines research commercialisation as the means of advancing intellectual property, ideas, know-how and research-based skills in terms of developing marketable new products, services and processes that have useful economic, social, and environmental outcomes. Howard (2005) lists the output indicators of the

14

most common modes of research commercialisation as patenting and licensing, spin-off company formation, university-industry joint ventures, contract research, and consulting. These activities are consistent with the research commercialisation activities of many TEIs in New Zealand.

2.3 *The Macro Environmental Context of Research Commercialisation*

Research commercialisation does not happen in a static environment and, therefore, a comprehensive understanding of the environmental context is important. The macro environmental forces of research commercialisation can be best attributed to the effects of globalisation, the rise of the knowledge economy, and the influence of NPM ideologies. Over the past two decades the growing impact of globalisation and the rise of the knowledge-based economy have driven many nations to reform and reinvent their tertiary education sector. A recent review of tertiary education by the OECD (OECD, 2008) found that globalisation and development of knowledge-based economies have transformed the tertiary education landscape. The notions of "corporate universities", "marketisation of higher education", "the global business of education", "academic capitalism" and "entrepreneurial universities" are becoming common themes in tertiary education development (Bok, 2003; Considine & Marginson, 2001; Deem, 2001; Etzkowitz, 1998; Parker, 2002; Slaughter & Rhoades, 2004). Many governments have placed strategic importance on research commercialisation as a vital activity to the success of the national innovation goals. Research commercialisation has also put new accountability demands and pressures on TEIs to satisfy the needs of the economy and society.

2.3.1 The Effects of Globalisation

Globalisation is normally considered as a starting point for transformation in a modern society (Rinne & Koivula, 2005) and, in recent years, it has become a major force in the commercialisation of TEIs. According to a recent OECD report, globalisation has placed a new premium on innovation to fuel economic development (OECD, 2008). The process of globalisation is making TEI research more important than ever before by exerting new pressures to promote economic growth (Bloom, 2003, 2005, p. 22). Through global

15

integration, TEIs have now become part of the global economy with cross-border mobility of researchers. Globalisation has transformed TEIs into global networks of research universities that have intensified research commercialisation (Mohamedbhai, 2003). The new breed of global research institutions with global vision and strategies are necessary to accept the challenges of globalisation (Currie, 2003). Most governments recognise the potential economic benefits of globalisation and want TEIs to serve their national interests in the global marketplace. Increasingly, TEIs are also subject to the supranational global influences of the World Trade Organisation (WTO), the OECD, the European Union (EU), and the World Bank, which see them as positive vehicles for economic progress (Shattock, 2005). Globalisation not only poses challenges related to the research mission of TEIs, it requires changes in organisational forms, policies, and strategies.

2.3.2 **The Rise of the Knowledge-based Economy**

Similar to globalisation effects, the rise of the knowledge-based economy provides TEIs with clear opportunity for exploiting their intellectual assets (Webster & Etzkowitz, 1998). With the advent of the knowledge-based economy, commercialisation has taken root in tertiary education development in many Western countries (Bok, 2003) where governments are intent on economic growth and global competitiveness. For example, the EU set itself a key strategic goal of becoming *"...the most competitive and dynamic knowledge-driven economy in the world, capable of sustained economic growth..."* (Commission of the European Communities [COM], 2000, p. 2). The emergence of the new global economy has led to the creation of a knowledge society which represents a shift from the traditional material goods production to science-based production, continuous technological innovation and advanced information processing activities (Castells, 1996; Naidoo, 2000). While Rinne and Koivula (2005) define the knowledge society simply as a society in which the significance of knowledge has increased, Fuller (2003) provides a more comprehensive analysis and regards knowledge as social capital and positional goods with increased value attached to it. Slaughter and Rhoades (2004) acknowledge that the rise of the knowledge society has altered the relationship between TEIs and society leading to the development of the "theory of academic capitalism". According to this theory, TEIs are using state resources to create new circuits of

16

knowledge that provide a linkage to the new economy. In this new knowledge economy, there is an ever-increasing demand on tertiary education to adopt market behaviours to exploit the commercial potential of research. Recognising that, Slaughter and Rhoades (2004) have acknowledged that knowledge development and dissemination extends well beyond the academy. It is now widely accepted that knowledge has become an important determinant of the wealth of nations and its creation and dissemination has become a major source of competitive advantage (Bloom, 2003, p. 140). According to Bok (2003), in order to prosper in an increasingly complex society, there is a need to acquire new knowledge and skills. A new breed of knowledgeable workers with multiple and transferable skills is required to engage in complex tasks and technologies vital for the knowledge economy (Leadbeater, 2000). Within this context, there is an expectation that tertiary education research will make a valuable contribution to enhancing the nation's competitive edge in the global marketplace (Gibbons et al., 1994; Naidoo, 2000).

The relationship between tertiary education and its contribution to the knowledge economy has led many governments to develop their national skills and knowledge base, which are regarded as critical factors in determining the nation's ability to compete in the global market (Naidoo, 2000; Yerbury, 1997). In the USA, Congress passed the Bayh-Dole Act in 1980, to ensure the USA's competitiveness in the world economy by making it easier for universities to own and licence patents on discoveries made through research paid for with public funds (Bok, 2003). Rose (1999) and Naidoo (2000) contend that tertiary education was previously "insulated" from the influences of market forces, but policies of marketisation are now actively created and adopted as a basis for successful economy and nation building. After the passing of the Bayh-Dole Act, commercialisation became more prevalent in American universities. As stated by Bok (2003), this provided TEIs with the rapid growth of opportunities to commercialise education and scientific knowledge in exchange for handsome sums of money.

2.3.3 The Influence of New Public Management (NPM) Reforms

New public management (NPM), broadly referred to as the application and use of private sector management techniques and practices to transform public sector organisations, has significantly affected the re-orientation of tertiary education towards commercialisation

in many countries. NPM ideologies have now become fairly well-established in transforming tertiary education in global contexts resulting in the growth of knowledge-based industries (Clark, 1998; Deem, 2001; Slaughter & Leslie, 1997). The ideologies have become increasingly popular in countries such as New Zealand, Britain, Australia, Canada and the United States through their emphasis on a strong social demand for better public management (Boston, 1991; Boston, Martin, Pallot, & Walsh, 1996; Deem & Brehony, 2005; Ferlie, Pettigrew, Ashburner, & Fitzgerald, 1996). The NPM strategies are based on market principles of economic efficiency and effectiveness, accountability, transparency, autonomy, contestability, choice and market competition. These strategies have largely influenced the development of education policy decisions leading to commercialisation of TEIs in many Western countries.

The shift from traditional state-controlled institutions towards greater autonomy and market-driven entrepreneurship is a common trend in tertiary education management in most OECD countries (Etzkowitz et al., 2000; Marginson & Considine, 2000; OECD, 2003; Vincent-Lancrin, 2006). Slaughter and Leslie's (1997) study found that research universities in the United States, Australia, and the United Kingdom were closely engaged in "academic capitalism" leading to an increasing involvement with the profit motive and market-like behaviours. Marginson and Considine (2000) refer to TEIs that are largely driven by a commercial and entrepreneurial spirit and dominated by a profit-seeking objective as the "Enterprise University". In New Zealand, the tertiary education system experienced a radical transformation from government controlled, highly centralised institutions to a more liberal market-based system (Gordon, 1992; Olssen, 2002). These reforms emerged out of the state sector reforms of the public enterprises. In the USA, commercialisation of education using market-based principles also became increasingly popular (Bok, 2003). In Australia, the Dawkins Report (1988) set the policy agenda for exposing universities to commercialisation using market forces, and the Nelson Report (2003) outlined the policy framework which made universities autonomous and economically efficient "businesses" competing in a "free market" (Pick, 2006) and contributing towards "modern nation building" (Considine & Marginson, 2001; Marginson, 2000).

2.4 *Innovation and Entrepreneurship: Key Elements of Commercialisation*

2.4.1 **Innovation**

Innovation, described as the dynamic process of invention, creation and commercial exploitation of new products, ideas and processes, is an important component of the national economy[5]. TEIs are central to many nations' innovation systems (Wessner, 2003). Innovation has also been described as the critical fuel to economic development and progress of nations and is often influenced by a wide range of government policy decisions (OECD, 2008). The opportunities offered by increasing globalisation and the rise of the knowledge-based economy have led many developed nations to configure a national innovation system (NINS) to exploit developments in research, science and technology (OECD, 2007). For example, Canada's national innovation strategy is "*to be one of the most innovative countries in the world and among the five most research intensive nations of the world*" (AUCC, 2002, p. 1). The European Commission has been actively encouraging closer co-operation between universities and industry geared more effectively towards innovation, new business start-ups, technology transfer and dissemination of knowledge to drive both national and global economies (Commission of the European Communities [COM], 2003). In the UK, the government aims to make the nation the best place in the world to run an innovative business (DIUS, 2008). The Australian government has a vision for a national innovation system in 2020 in which universities and research organisations attract the best and brightest minds to conduct world-class research, fuelling the innovation system to address national and global challenges (DIISR, 2009).

The New Zealand government has recognised the importance of innovation to economic growth and put innovation at the centre of its economic policy in 2000[6]. In 2000 the government appointed the Science and Innovation Advisory Council (SIAC) to

---

[5] The ministry of Economic Development' website
http://www.med.govt.nz/templates/Page____38199.aspx#innovation provides a more comprehensive definition of innovation.
[6] "Prior to 2000, NZ government did not have a strong focus on innovation as part of its economic policy" (OECD, 2007, p. 156).

comprehensively assess and advise on the New Zealand innovation system. Following various reviews and reports on innovation, in February 2002 the government set out its approach to economic development in the document, *Growing an Innovative New Zealand,* commonly referred to as the Growth and Innovation Framework (GIF) (New Zealand Government, 2002). GIF had a major focus on returning New Zealand's per capita income to the top half of the OECD rankings by growing innovation. The government established the Growth and Innovation Advisory Board (GIAB) in May 2002 to provide it with high level, independent strategic advice on growth and innovation issues. In March 2006, Cabinet agreed on an Economic Transformation Agenda (ETA)[7] to build on the directions set by the GIF for lifting New Zealand's innovation and economic performance and improving income per capita. Since 2000, the New Zealand government has also set the focus of the tertiary education system to produce knowledge, skills and innovation that will transform the economy, promote social and cultural development, and contribute effectively to its development as a knowledge nation (TEAC, 2001, p. 1). The government continues to develop its Tertiary Education Strategy (TES) and a number of sector-based strategies in which science and innovation feed into the GIF/ETA.

2.4.2 **Entrepreneurship**

Successful innovation is dependent on a strong entrepreneurial environment. An entrepreneurial environment is the key to knowledge-based growth, with TEIs having an extremely important enabling role in innovation and research commercialisation (Wessner, 2003). Increased competition from globalisation has become a major driving force for innovation and entrepreneurship (Moja, 2003), which, in turn, seems to have intensified the process of commercialising TEI knowledge. Schumpeter (1961), also cited in Fuller (2005), first defined entrepreneurship in terms of creativity or innovation that characterises market reconfiguration. Clark (1998) in his book, *Creating the Entrepreneurial University*, views entrepreneurship as an innovative academic behaviour which reinforces academic performance. Rothaermel, Agung, and Jiang (2007) place entrepreneurship at the heart of the overall TEI innovation system, and identify its many

---

[7] Refer to MED website http://www.med.govt.nz/templates/ContentTopicSummary____23387.aspx for more details.

components, which remain fragmented, to include technology transfer, licensing, spin-offs, science parks, incubators, and technology transfer offices. Shattock (2005) views the role of entrepreneurship in TEIs as an economic concept and argues that it can strengthen institutional autonomy and be an enabling process which stimulates research and innovation and, hence, makes a valuable contribution to the knowledge society. Fuller (2005, p. 32) argues that TEI entrepreneurship is the systematic translation of social capital into public goods. Here TEI research is regarded as a creator of social capital and the knowledge they produce provides them with a competitive market advantage.

Many governments now actively encourage TEIs to become innovative and entrepreneurial in generating revenues from the commercial exploitation of their intellectual assets. The EU has adopted the goal of becoming the most dynamic knowledge-based economy in the world and has stated that the goal can only be achieved through innovation and entrepreneurship (Commission of the European Communities [COM], 2000, 2003). Etzkowitz (1998, 2003) believes that universities are currently undergoing a "second revolution" which involves a more radical transformation into an entrepreneurial university driven by business ideology and commercial ethos. The commercialisation of knowledge represents a profound normative change which opens up possibilities to academic researchers to meet two goals simultaneously - the pursuit of truth and profit-making (Einar et al., 2006). The modern TEI now has multiple roles of teaching and research as well as economic entrepreneurialism. In the words of Clark (1998), they have become "entrepreneurial universities", or what Marginson and Considine (2000) refer to as the "enterprise university" driven by a commercial and entrepreneurial ethos and profit-seeking objectives.

The TEIs' new role is to create new and innovative products and bring them to the market and this entrepreneurial role is generally regarded as a natural evolution of the TEI system that emphasises economic development (Rothaermel et al., 2007). Although the economic view of entrepreneurialism in universities is a contested concept (Rinne & Koivula, 2005; Shattock, 2005), it is now widely accepted that the entrepreneurial features should be combined with traditional academic values in such a manner that the academic mission remains strong (Marginson, 2000). This has given rise to the term

"academic entrepreneurship" which refers to the different approaches academics employ in commercialising the knowledge they produce (Slaughter & Leslie, 1997). Clark (1998) describes an entrepreneurial university as adapting to new challenges imposed by restrictions on state funding, through external collaboration with industry and commerce, to generate extra resources to cross-subsidise academic activities as well as stimulate further entrepreneurial activity. Going further in the description, Slaughter and Rhoades (2004) recognise the efforts to generate new revenue streams in the realm of education as "educational entrepreneurialism" in response to the pull of various market opportunities beyond those in technology transfer. These opportunities provide a distinctive strategic orientation that includes a wide range of activities such as research consultancy services, research contracts, research projects and custom-made programmes designed purely as money-making initiatives that have become the TEIs' cash cows. Hence, according to Naidoo (2005), the notion of research innovation as a process of knowledge creation ceases to be an end in itself and what is seen as perhaps more important is its commercial value and the capacity to generate income.

2.5   *The Triple-Helix of Research Commercialisation*

Effective commercialisation of research requires co-operation between three principal actors - TEIs, industry, and government. This partnership is more commonly referred to as the triple-helix of research commercialisation (Etzkowitz & Leydesdorff, 1997; 2000). The triple-helix concept recognises the enhanced role of TEIs towards enabling commercialisation of research. Previous approaches had either placed the firm in the leading role or given the government the privileged position in the national innovation system (Henry Etzkowitz & Leydesdorff, 2000). However, the triple-helix of research commercialisation has reshaped the institutional arrangements by providing a network of relationships among TEIs, industry, and government, with each having a vital role of equal importance[8].

---

[8] Etzkowitz and Leydesdorff (2000) also refer to triple-helix I, II and III as three different types of configurations of the triple-helix.

2.5.1 **Role of Government**

The government has an important role in the national innovation system (NINS) to ensure that it fully contributes to the economic prosperity and social well-being of the nation. The major role of government in enabling commercialisation of research in TEIs is to set the national agenda that provides the policy and legislative framework, funding, and institutional support mechanisms. In the USA, two important pieces of government legislation introduced in the 1980s accelerated the commercialisation of public research. The Stevenson Act introduced commercialisation as a new mission of public research, and the Bayh-Dole Act gave universities the intellectual property rights over their discoveries which provided them with the incentives for commercialisation (Laperche, 2002). The Federal legislation authorising university technology transfer has been proclaimed *"as possibly the most inspired piece of legislation to be enacted in America over the past half century"* (Economist, 2002, p. 3). However, according to some researchers, legislation is not the driving force but more an authorisation (Colyvas & Powell, 2006; Mowery et al., 2004). Some writers (e.g. Bozec et al., 2004) believe that the greater role of government in commercialisation comes from governments facing drastic social and economic changes including the effects of globalisation and technological innovations.

The passage of the Bayh-Dole Act was seen as a major development in the role of government in enabling commercialisation in TEIs. Since then, there has been a broad acceptance by governments around the world of the importance of research commercialisation (Nordfors, Sandred, & Wessner, 2003), and changes in government policy and legislation have received increasing attention (see for example Bozeman, 2000; Goldfarb & Henrekson, 2003; Mowery et al., 2001; Rothwell & Dodgson, 1992)[9]. Whereas, previously, research commercialisation was not a priority, a key government policy focus in many developed nations over recent years has been on enhancing the capacity of TEIs to engage in commercialisation (OECD, 2008). Examples of some of the major policy foci are clarifying intellectual property ownership, patenting and licensing,

---

[9] Bozeman (2000) provides a review of policy models in the USA, and Rothwell and Dodgson (1992) provide a description of European technology policy models. Goldfarb and Henrekson (2003) link Sweden's poor record on spin-out creation with the country's policies.

23

and promoting co-operative research. Besides major policy changes, governments have developed financial support mechanisms in the form of grants and public funding to enable commercialisation of university research (Meyer, 2003; Phan & Siegel, 2006).

In New Zealand, the government is a significant player in the nation's research, science and technology system. It finances about half of the country's investment in research, science and technology, owns research infrastructure, notably, Crown Research Institutes (CRIs), and is committed to supporting innovation and commercialisation of research activities (MoRST, 2006). According to a recent OECD *Thematic Review of Tertiary Education*, investment in R&D is an important indicator of the effort government is putting into achieving scientific and technological progress (OECD, 2008). The report highlights that, in GDP terms, tertiary education R&D expenditure has risen steadily from 0.36% to 0.40% across the OECD nations in the period 2000 to 2005, although, in New Zealand's case, it had declined [10]. The New Zealand government-financed R&D expenditure is also much lower than the OECD average but is expected to improve as the government has agreed to lift its public investment to the OECD average by 2010 (MoRST, 2006).

The New Zealand government also provides the policy frameworks for economic growth and innovation. Since 2000, it has established various science and innovation-related frameworks and advisory boards (e.g., SIAC, GIF, GIAB, ETA) aimed at strengthening the innovative efforts of the nation. The New Zealand government sees commercialisation of intellectual property (IP) from public research as an important way to create benefits for New Zealand and has issued guidelines on IP ownership and use, including guidelines on licensing[11]. Three key ministries, the Ministry for Research, Science and Technology (MoRST), the Ministry for Economic Development (MED), and the Ministry of Education have a pivotal role with significant influence on setting research directions and policy and funding administration. A number of other government policy agencies also have important roles, such as the Ministry of Health which is

---

[10] Statistics New Zealand (2009) provides the latest R&D funding figures.
[11] See http://www.morst.govt.nz/publications/govt-policy-statements/public-service-research-ip-guidelines/

involved in formulating health research policy, and the Tertiary Education Commission (TEC) which has a strategic role in the development of tertiary education policy.

Government funding for research in the tertiary education sector is mainly obtained from the following sources:

- TEC - provides the Performance-based Research Fund (PBRF) that supports research excellence in TEIs with funding allocated on the basis of research performance. This is the major research funding source for TEIs.
- The Royal Society of New Zealand – provides basic research funding to TEIs, primarily through the Marsden Fund.
- The Health Research Council – provides funding for medical research.
- The Foundation for Research, Science and Technology (FRST) provides funding to TEIs for strategic research.

MoRST funds the Foundation for Research, Science and Technology (FRST), the Royal Society, and the Health Research Council. FRST is a statutory authority with an independent board reporting to the Minister of Research, Science and Technology. It is contracted by MoRST to manage the bulk of its actual funding of research and innovation projects. The Royal Society is an independent national academy of sciences, and the Health Research Council reports to the Minister of Health and co-ordinates health research.

The New Zealand government has also established the following programmes and support mechanisms and provides funding for research initiatives:

- Centres of Research Excellence (CoREs) – seven CoREs were established in 2002-03 by the government to assist the tertiary education sector to reward research excellence and enable the development of a critical mass of inter-institutional and world-class research networks, aligned with the national goals, to help improve knowledge uptake and commercialisation of research. Each CoRE is hosted by a university and comprises a number of partner organisations including TEIs.
- Partnerships for Excellence (PfX) and Techlinks Fund– are innovation-related TEC initiatives to improve links between TEIs, industry and business

organisations to help develop research capability, transfer knowledge and expertise to industry, and encourage private sector investment.

- New Zealand Venture Investment Fund Ltd (NZVIF) – was established by the government in 2002 to address the shortage of venture capital to help facilitate commercialisation of innovation.

- Pre-Seed Accelerator Fund – to support commercialisation of research.

Although the government's role has been recognised through the establishment of various support programmes and funding mechanisms, there is to some extent a lack of clarity between the roles of government ministries and those of their funding agencies (OECD, 2007). However, *Science for New Zealand*, a MoRST document (MoRST, 2006), provides the overarching vision and national policy regarding science, technology and innovation.

The New Zealand government recognises the importance of tertiary education research and commercialisation as key drivers of modern economies and thriving societies. In 2003, it established the Tertiary Education Commission (TEC) to help provide strategic direction and formulate research priorities for TEIs. To give effect to the government's vision on research and innovation, two key strategy documents have been released by TEC since 2002. The first, Tertiary Education Strategy (TES) 2002-2007 contained a key strategy (strategy six) that was implemented to strengthen research, knowledge creation and uptake for New Zealand's knowledge society (Ministry of Education, 2003). Specific objectives relating to this strategy were to:

- Encourage and reward excellent research performance (Objective 29)
- Have stronger accountability and enhanced performance reporting for tertiary education research (Objective 30)
- Increase global connectedness and mobility (Objective 31)
- Have more focussed tertiary research investment through world-class clusters and networks of specialisation (Objective 32)
- Ensure greater alignment of tertiary education research with national goals (Objective 33)

- Improve knowledge uptake through stronger links with those that apply new knowledge or commercialisation of knowledge products (Objective 34)

- Increase breadth of support for research students and emerging researchers, with particular focus on the development of Maori researchers (Objective 35)

Within this strategic framework, the Statement of Tertiary Education Priorities (STEP), which is a statutory document under the Education Act 1989, was formulated and released by the Minister of Education. STEPs then form the basis of negotiation by TEC of individual TEIs' *Charters and Profiles* and funding allocations. Charters and Profiles are high level accountability documents prepared by TEIs in consultation with their stakeholders. The Charter provides the TEI mission and its strategic contribution to the tertiary education system. The Profile is an ex ante document of accountability, setting out objectives and targets against which the TEI subsequently reports in its annual reports. The Profile provides the basis for monitoring the TEI's performance, accountability for the use of public funds, and meeting of other statutory accountability requirements.

Following amendments to the Education Act in 2007, *The Investment Plan* replaced Charters and Profiles, and the Tertiary Education Strategy (TES) replaced the Statement of Tertiary Education Priorities (STEP). One of the key purposes of the amendments to the Education Act is to streamline the strategic, funding, and administrative frameworks for tertiary education, and encourage TEIs to take greater responsibility for their own accountability for the use of public funds. Investing in a Plan aims to provide "*a more integrated, effective and efficient tertiary sector*" with a "*move to a high trust, high accountability, and low compliance cost environment*" (TEC, 2007, p. 2).

The second Tertiary Education Strategy document (TES 2008-2012) highlights concerns that although TEIs produce significant amounts of research, there is a low rate of transfer to business (Ministry of Education, 2006, p. 38). The OECD's 2005 Annual Review of New Zealand report also highlights the strikingly low rate of collaboration and ideas flowing from universities and research institutions to businesses (OECD, 2005). The government, therefore, recognises in the TES that it is essential to improve the transfer of

TEI knowledge to enhance economic opportunities and create wealth for the nation. The TES document 2008-2012 contains key strategies for TEIs that continue to support the government's overall vision of innovation and commercialisation. The government's goals for tertiary education as part of the Economic Transformation Agenda (ETA) are to create and apply knowledge to drive innovation, improving transfer and application of knowledge, supply research and knowledge to create commercial opportunities for NZ firms, connect effectively with businesses to realise these opportunities, and build global awareness and lift productivity and innovation (Ministry of Education, 2006).

2.5.2 **Role of Industry**

There is much greater recognition that the extent and intensity of research conducted by TEIs in collaboration with industry is a major factor contributing to high innovation performance (Cohen, Nelson, & Walsh, 2002; D'Este & Patel, 2007; Lam, 2005; Mansfield, 1998; OECD, 2002). Industry now recognises TEIs as key sources of innovation (Gulbrandsen & Smeby, 2005). Industry's growing demand for technological innovation in recent years has led to an increase in commercialisation activities in TEIs (Rothaermel et al., 2007). Both can leverage their respective comparative advantages, with TEIs better at basic research, and industry better at developing and commercialising technology (Rosenberg & Nelson, 1994). Bell (1993) identified that by maintaining links with TEIs, industry can maintain comparative advantage in core technologies by accessing complementary research, save R&D time and cost, and also build an image of affiliation with academic partners. Lee (2000) found that the most significant benefit realised by firms through collaboration with TEIs was increased access to new research and discoveries, and the most significant benefits for TEI researchers was complementing their own research by securing funding for graduate students, lab equipment, and seeking insights into their own research including entrepreneurial opportunities for them. Collaboration and linkages of industry with TEIs enhance the firm's absorptive capacity (Cohen & Levinthal, 1989), capability, and innovation potential which benefits not just the firm but the wider community.

Many nations have placed major importance on the role of industry in research commercialisation efforts of TEIs. For example, in the UK (e.g. HM Treasury, 2004), and

in Europe (e.g. Commission of the European Communities [COM], 2003), TEIs have been strongly encouraged to engage in commercialisation activities and to establish close links with industry to facilitate transfer of technology as a means to drive the development of both the local and national economies. New Zealand's geographical isolation and the small size of most of its businesses provide much greater challenges in maintaining the global connectivity essential to innovation and economic growth (OECD, 2007). Smaller firms generally lack in-house capability to develop and adapt technology and, hence, are more reliant on external sources of technology creating important opportunities for collaboration with TEIs and research institutes. Many of New Zealand's larger firms are in natural resource-based sectors, mainly agriculture, forestry and fishing, which also offer considerable scope for high technology/high value-added innovation opportunities for research collaboration with TEIs and other research institutes (OECD, 2007). In New Zealand, 7% of businesses reported co-operative arrangements with TEIs between 2004 and 2005 (Statistics New Zealand, 2005), indicating good potential to further build relationships. Across the globe, the importance of industry and TEI partnership has long been recognised in a number of major new inventions and scientific breakthroughs leading to product and process developments. TEIs are accountable for efficiently sharing new knowledge in such a way that industry can transform it into new products and services.

2.5.3 Role of TEIs

TEIs are embedded in larger environmental contexts including global networks of research and innovation systems. With the rise of the knowledge economy and globalisation, TEIs have an important role in commercialising their intellectual assets to fuel economic development and success (Drabenstott, 2008; Webster & Etzkowitz, 1998). In addition, a large proportion of R&D expenditure flows to TEIs placing them at the centre of a number of government research and innovation policies aimed at achieving key social and economic goals (OECD, 2004, 2008). For example, in the UK, the government views tertiary education as the key driver of "economic prosperity", "social inclusion", and "good citizenship" (OECD, 2004a, pp. 20-21)[12]. TEIs have a

---

[12] See UK government's White paper "*The future of higher education*" published in January 2003 for full details of the government's aims and priorities.

unique role to capitalise on the trends in globalisation, innovation and research commercialisation (Lambert, 2003). In Canada, the government's ambitious target to triple the rate of commercialisation requires TEIs to occupy a leading role in fostering commercialisation of research (AUCC, 2001). The EU sees TEIs as having a profound influence and holding the key to the realisation of its commercialisation goals (Commission of the European Communities [COM], 2000, 2003). In Germany, TEIs have a central role in developing the political, social, economic, cultural, and environmental needs of the modern knowledge society (OECD, 2004b). In Australia, the Nelson Report (2003, p. 8) identified tertiary education as "vital to Australia's economic, cultural and social development" (cited in Pick, 2006, p. 229). Sweden has the highest ratio of higher education R&D to GDP in the OECD, at 0.76%, with tertiary education seen as the major driving force for the modernisation, prosperity, growth, and renewal of society (OECD, 2008)[13]. The government encourages commercialisation and exploitation of university research as an economic development tool - the so called "third task" - of TEIs (Dahlstrand, 2008). In New Zealand, the government (TEAC, 2001, p. 1) has set the focus of the tertiary education system to produce knowledge, skills and innovation that will transform the economy, promote social and cultural development, and contribute effectively to its development as a knowledge nation. This focus provides legitimate opportunities to TEIs and places them in a central role to enable commercialisation of research.

A number of previous studies have examined the TEIs' role in the performance of the national innovation system at both the national policy level across countries as well as among institutional actors associated with research and innovation (Drabenstott, 2008; Gauthier, 2004; Goldfarb & Henrekson, 2003; Gulbrandsen & Smeby, 2005; Jones et al., 2005; Keeling, 2006; Shattock, 2005). TEIs are expected to show tangible returns for the public research funding they receive (Wessner, 2003, p. 51) with research commercialisation being a key objective. In recent years, there has been much greater recognition, enthusiasm, and heightened expectation of the role of TEIs towards commercialisation of their research (Dahlstrand, 2008). One stream of research has

---

[13] Also refer to the government bill 'The Open University', Sweden 2001.

examined the role of TEIs in transfer of knowledge through a variety of channels such as patents and licences (Chapple, Lockett, Siegel, & Wright, 2005; Henderson, Jaffee, & Trajtenberg, 1998; Mowery et al., 2001; Siegel et al., 2003; Thursby & Thursby, 2002), formation of spin-out and spin-off companies (Clarysse, Wright, Lockett, Mustar, & Knockaert, 2007; Dahlstrand, 2008; Di Gregorio & Shane, 2003; Johansson, Jacob, & Hellstrom, 2005; Klepper & Sleeper, 2005; Wright, Lockett, Clarysse, & Binks, 2006), and various other means of technology transfer such as incubators, joint ventures, strategic alliances, and science parks (Becerra, Lunnan, & Huemer, 2008; Markman, Gianiodis, Phan, & Balkin, 2005; Markman et al., 2008; Mian, 1997; Powers & McDougall, 2005; Wright, Vohora, & Lockett, 2004).

TEIs also occupy a central role in undertaking research that meets the needs of industry in supporting innovation generally. They add to the stock of IP upon which the firms draw to address needs of customers and design new products and processes. TEIs are also expected to collaborate with industry to facilitate transfer of technology as a means to drive the development of both local and national economies (Cohen et al., 2002; D'Este & Patel, 2007; Lam, 2005; Mansfield, 1998; OECD, 2002).

2.6   *Managing the Accountability and Performance*

The much heightened expectations for academic research commercialisation are posing new challenges to the accountability relationships and performance management of public TEIs. Pressure for research commercialisation is also adding a new dimension to public sector accountability by reshaping the accountability relationships between TEIs, government, industry, and society. Calls for greater accountability from TEIs are being made, given the increasing recognition and importance placed on the central role TEIs occupy towards enabling commercialisation of academic research (Dahlstrand, 2008; Gauthier, 2004; Goldfarb & Henrekson, 2003; Gulbrandsen & Smeby, 2005; Wessner, 2003). Accountability in the context of research commercialisation is much broader than mere compliance with technical and procedural accounting requirements. It fulfils a broader societal and economic need. To say that TEIs should be accountable for research commercialisation is to hold certain expectations about what TEIs should be able, and obliged, to take responsibility for, justify, deliver, and explain (Cooper & Owen, 2007;

31

Messner, 2009). Accountability for research commercialisation presents major challenges to TEIs in terms of setting clear policies and priorities, structures, resources, and incentives to guide behaviour (Ambos et al., 2008). Accountability is also the major force for improving performance (Aucoin & Heintzman, 2000). Hence, recognising accountability obligations and managing accountability expectations are crucial challenges facing TEIs involved in transforming academic research into commercial outputs.

The following sub-sections provide a review of relevant literature on public sector accountability. Public sector accountability is recognised as a complex and multi-dimensional concept. Next, a review of relevant literature on accountability concerns relating to commercialisation within the TEI context is presented, followed by a discussion of the major accountability challenges confronting TEIs, including issues relating to managing accountability expectations. In New Zealand, since the late 1980's, the public sector accountability requirements of TEIs have undergone dramatic shifts with the introduction of NPM reforms. The final sub-section presents a discussion of the conflicts and tensions arising from utilising the NPM model of accountability.

2.6.1 **Public Sector Accountability**

Numerous definitions of accountability have emerged in literature ranging from broad to narrow concepts and each trying to convey different meanings. In the public sector Kearns, (1994, p. 7) refers to accountability as an "untidy construct" with "competing assumptions" which is "ill-structured". Sinclair (1995, p. 221) believes that accountability is a complex and chameleon-like term and "the more definitive we attempt to render the concept, the more murky it becomes". The notion of accountability could be constructed in terms of "setting goals, providing and reporting on results and the visible consequences for getting things right or wrong, including rewards or sanctions as appropriate" (Funnell & Cooper, 1998, p. 30). Perhaps a more concise definition that captures a number of essential elements is the definition proposed by Bovens (2007). He defines accountability as "a relationship between an actor and a forum, in which the actor has an obligation to explain and to justify his or her conduct, the forum can pose questions and pass judgment, and the actor may face consequences" (Bovens, 2007, p.

450). The actor could be an individual, an organisation, or a public institution. The accountability forum could be a specific person, government agency, parliament, or the general public. The forums are not necessarily principals of the actors as seen in many political, legal, and professional accountability relationships.

In the public sector, a range of accountability relationships suggest a complex system of demands and requirements involving a wider set of stakeholders (Brignall & Modell, 2000). Corbett (1992) extended the traditional upward Westminster model of Ministerial Accountability by adding inward, outward, and downward accountability. Accountability inwards relates to personal morals and codes of ethics, outwards to clients and external stakeholders, and downwards to staff. Romzek and Dubnick (1987) viewed public accountability as a strategy for managing diverse expectations within and outside the organisation and provide three levels of organisational responsibility and control – technical, managerial, and institutional. At the technical level, organisations focus on the effective performance of specialised and detailed functions. At the managerial level, the focus is on technical components and functionaries, and those customers and suppliers in the task environment. At the institutional environment level, the organisation deals with the need to be part of the wider social system which is the source of meaning, legitimation, or higher-level support which makes implementation of the organisational goals possible (Romzek & Dubnick, 1987).

Within the typology of accountability there are four perspectives - *bureaucratic/hierarchical, legal, professional and political accountability* (Johnston & Romzek, 1999; Romzek & Dubnick, 1987; Romzek & Ingraham, 2000). Each of these four perspectives is based on two critical factors – whether the ability to define and control expectations is held by an internal or external agency; and whether the agency has a high or low degree of autonomy over defining those expectations. Bureaucratic accountability systems are based on managing expectations through standard operating procedures and rules, following orders without questioning, and legitimising priorities of those on the top of the bureaucratic hierarchy. Legal accountability is similar to bureaucratic accountability but involves an outside party who makes the laws and policy mandates and can impose legal sanctions. Professional accountability places

33

organisational activities in the hands of employees with expertise or special skills to get the job done. Political accountability requires responsiveness to the general public or constituents.

Public institutions are often faced with important questions relating to accountability approaches, such as *who* should render account, to *whom*, for *what* purpose, and *why*? These questions are far more complicated to answer when compared to private sector accountability requirements (Bovens, 2007). Researchers tend to agree that public sector accountability is far more complex than private sector accountability because of the greater diversity in types of information that need to be disseminated (Coy, Fischer, & Gordon, 2001; Glynn & Murphy, 1996; Parker & Gould, 1999; Sinclair, 1995). Bovens (2007) provides a multi-dimensional concept of public accountability based on the nature of the forum, nature of the actor, nature of the conduct and nature of obligation. This conceptualisation allows each accountability relation to be classified on each of the four dimensions separately, which may help provide answers to the various accountability questions, as follows:

To *whom* account is to be rendered is based on the nature of the forum comprising at least five different kinds of accountability and, hence, five different types of forum. Boven refers to this as "the problem of many eyes" (2007, p. 455) because public institutions are accountable to demands of different forums with different information requests, each applying a different set of criteria. The five types of forums identified by Boven are the *political accountability* forum based on parliamentary systems with ministerial accountability; the *legal accountability* forum based on legal systems and standards; the *administrative accountability* forum comprising quasi-legal forums such as auditors and public agencies exercising independent and external administration and financial controls and supervision based on statutes and prescribed norms; the *professional accountability* forum comprising professional peers with membership to professional bodies laying down codes and standards for acceptable practice; and the *social accountability* forum comprised of interest groups, clients, and the general public.

Who and *to what degree* an actor can be brought to account is referred to as the "problem of many hands" because policies pass through many hands before they are actually put into effect. Boven (2007) identifies four accountability strategies or forums to overcome the problem of many hands in public organisations. They are *corporate accountability* where the organisation is held to account for the collective outcome; *hierarchical accountability* based on chain of command; *collective accountability* where every member could be held accountable; and *individual accountability* where each member is held responsible based on individual performance.

What the account is to be rendered for is based on the nature of the conduct, which could be financial, procedural, or product accountability.

Why an actor should render account is dependent on the nature of the obligation, which could range from *vertical accountability* based on a forum formally wielding power mainly from the hierarchy; *horizontal or mutual accountability* based on a voluntary or moral basis with members on an equal footing; and *diagonal accountability* where there are no hierarchical relationships and few formal powers for compliance, but informal powers may be derived on the basis of reports to a Minister or to parliament.

2.6.2 Measuring Accountability - The Three Perspectives

The above accountability questions help provide important guidance towards overcoming the complexities of public sector accountability. However, a more thorough understanding of the various accountability arrangements and regimes also require assessment of their adequacy. According to Aucoin and Heintzman (2000), accountability is the cornerstone of public governance and management meant to serve three overlapping fundamental purposes – control, assurance, and promote learning in pursuit of continuous improvement. Bovens, Schillemans and Hart (2008) developed further these three fundamental purposes into three perspectives, providing an assessment tool to help determine the adequacy of accountability arrangements. The three perspectives are the democratic perspective, the constitutional perspective, and the learning perspective.

The democratic perspective is based on the central concept that accountability controls legitimise government actions by linking them to a democratic chain of delegation.

Public accountability is viewed as an essential precondition for the democratic process to work since it provides citizens with information to help monitor and control the conduct of those holding public office. The constitutional perspective is based on the central idea that accountability is essential to withstand tendencies towards power concentration, corruption and abuse of power. Accountability arrangements are designed to keep the executives honest and prevent, or at least uncover and redress, abuse of public authority and resources. The learning perspective views accountability as a tool to make and keep governments, agencies, and individuals effective in delivering on their promises. It is based on the central idea that the purpose of public accountability is to induce individuals to learn by reflecting on successes and failures aimed at enhancing their effectiveness. Here, accountability is not about keeping people honest but about keeping people smart and sharp (Bovens et al., 2008).

It must be recognised that while each of the three evaluative perspectives provides guidance on the adequacy of accountability arrangements, what constitutes a suitable accountability arrangement may still be debatable. Inadequacies in accountability arrangements may arise in the form of accountability deficits or accountability excesses. Accountability deficits refer to the lack of accountability arrangements, and accountability excesses or overloads refer to a dysfunctional accumulation of a range of accountability mechanisms (Bovens, 2007; Bovens et al., 2008).

2.6.3 **Accountability in the TEI Setting**

Accountability in TEIs "is the most advocated and least analyzed word" according to Burke (2005, p. 1). He argues that accountability in a TEI setting has many faces that are creating confusion and conflict, thus eroding the general consensus that tertiary education is a public good. Not only do TEIs have to cope with the growing accountability agenda, accountability for research commercialisation has become a global concern in many developed nations (Salmi, 2009). In the past decade, a number of government policy statements from many countries, for example, the USA and Britain (HMSO, 1993; NCIHE, 1997; USHSC, 1998, all cited in Demeritt, 2000), Canada (Gauthier, 2004), Sweden (Dahlstrand, 2008), and Australia (DEST, 2002), have all emphasised the need for greater accountability from publicly-funded research. These governments have relied

on a mixture of regulation, public-private partnerships, and market discipline to make academic research more accountable and relevant (Demeritt, 2000). The general themes of accountability that have been stressed by these reports include the need for greater research relevance and higher productivity, success, efficiency and economic returns, and greater responsiveness to public needs and wealth creation.

In New Zealand, the government is placing increased emphasis on TEI accountability in terms of research excellence and is seeking commercial value from publicly-funded research and the rapid diffusion of new ideas and technologies into all sectors of the economy (MoRST, 2006, p. 8). In Canada and Sweden, TEIs have a heightened expectation for accountability given that research and innovation have become more central and significant spending categories in the government budget (Dahlstrand, 2008; Gauthier, 2004). In Sweden, the government has made TEIs accountable by stipulating a so called "third task" of universities to transfer the results of research to business and industry (Dahlstrand, 2008). Despite this firm commitment, there is a dominant belief that the science policy has failed to achieve results in the form of economic growth, knowledge transfer to industry and commercialisation of research (Dahlstrand, 2008; Goldfarb & Henrekson, 2003). Similarly, accountability concerns of research commercialisation in TEIs in the UK are highlighted by lack of emphasis on intellectual assets as a means of generating alternative sources of income, as well as considerable uncertainty amongst TEIs about how to leverage the intellectual abilities of their academic research staff (Pilbeam, 2006).

Within TEIs, the underlying intent of accountability suffers from many or often conflicting expectations. Over time, the accountability purpose seems to have shifted from systems efficiency, to academic quality, to TEI productivity, and to external responsiveness to public priorities or market demands (Burke, 2005, p. 4). New purposes appear to be incrementally added over time. More recently, the pressures of falling government funding have been identified as the cause for shifting the focus of TEI accountability from governments to markets and private entities. According to the OECD, fiscal constraints and increased market pressures have fostered the growing focus on accountability in TEIs (OECD, 2008).

There is also a perception that TEIs are more interested in autonomy than accountability (Burke, 2005). However, greater autonomy places even greater demands on accountability as TEIs must demonstrate proper use of powers and be effective and efficient. They must demonstrate that they have worked to achieve their mission and priorities and report on their performance. Research commercialisation requires the co-operation of multiple and often competing stakeholders. Given the complexity and wider set of accountability demands, TEIs may need to exercise a degree of strategic choice to define their stakeholders and prioritise accountability to them.

2.6.4 **Accountability Challenges**

Increasing public interest, contradictory demands and resulting tensions of commercialisation of academic research raise important accountability challenges for TEIs (Ambos et al., 2008). As Markman et al. (2008, p. 1411) state, the 'who, where, what, how, and why' of TEI research commercialisation are still evolving and it is far less clear how TEIs actually manage commercialisation processes and outcomes. There remains insufficient theoretical and empirical evidence on the underlying processes relating to the commercialisation of research across institution types (Markman et al., 2008, p. 1402). To provide important evidence for policy-makers and managers, a study of how TEIs manage tensions between academic and commercialisation activities at both organisational and individual levels is necessary (Markman et al., 2008).

The external pressures of research commercialisation combined with internal perceptions of the opportunities it presents are reshaping the accountability relationship between TEIs, government and the private sector. In a web of multiple accountability relationships, TEIs need to carefully select and align with different types of accountability strategies. As noted by Romzek (2000, p. 35), often calls for "more" accountability are calls for a "different kind" of accountability, with different expectations for performance rather than just "more of the same". The desire for engagement in research commercialisation represents a major change in TEIs' operations and research expectations of staff. According to Romzek (2000), it is essential to make a corresponding shift in accountability relationships to ensure that the behavioural expectations are appropriately aligned with managerial strategy. Here, the

appropriateness of accountability relationships is a function of the organisation's institutional environment, managerial strategy, and agency or individual task (Romzek & Dubnick, 1987).

Research and development are significant spending categories in government budgets, hence, TEIs are subject to greater public scrutiny due to concerns of public accountability (Gauthier, 2004). A new social contract is emerging where autonomous TEIs can no longer be left entirely to their own devices, as economic pressures from globalisation and the rise of high-tech knowledge economies have fuelled demands to make academic research more economically productive and publicly accountable (Demeritt, 2000). With the growing number of voices demanding that publicly-funded research be made more accountable and to prove its value for money, government funding agencies are moving away from institutional autonomy and demanding *"bang for the buck"*, even from the blue-skies research undertaken without any application in mind (Demeritt, 2000, pp. 311-312). TEIs are under increasing pressure to reach out and justify their claim on public resources by demonstrating how and why the research is relevant in solving public problems.

2.6.5 A Question of Mission

There are concerns that commercialisation will jeopardise the central mission and basic role of the university (Lee, 1996; Mazzoleni & Nelson, 1998), and will alter the institution's rules and conventions of research (Dasgupta & David, 1994). Critics also argue that it is largely ineffective in contributing to the nation's economic performance (Dahlstrand, 2008; Lindelof & Lofsten, 2003; Lofsten & Lindelof, 2002). TEIs are expected to show tangible returns for the public research funding they receive, however, the process of transferring fresh and new ideas from basic research to industry to create commercial products is not so evident (Wessner, 2003, p. 51). The majority of invention disclosures do not result in a licence (Mowery et al., 2004) and there is a great deal of concern over the poor propensity to spin-off firms from academia (Goldfarb & Henrekson, 2003).

As noted by Etzkowitz (1998), commercialisation of research is a profound normative change in science and these developments have led to notable tensions between academia

and the commercial sector (Lockett et al., 2003; West, 2008). Some academics hold a strong intrinsic belief that academic research and commercial activities represent fundamentally different and potentially contradictory goals, and that deviating from the social norm of research in pursuit of commercial gains could be highly risky (D'Este & Patel, 2007; Dasgupta & David, 1994; Owen-Smith, 2003). They argue that commercialisation of research has negative consequences and promotes secretive behaviours among researchers, creates conflicts and tensions between advancing knowledge and generating revenues, and even threatens academic freedom (Gulbrandsen & Smeby, 2005; Lee, 1996; Louis et al., 2001; Powell & Owen-Smith, 1998). While acquiring resources and financial incentives are necessary components of commercialisation development, they are not considered to be a primary factor (Colyvas & Powell, 2006), and most university commercialisation offices barely break even (Mowery et al., 2004). According to Powell and Owen-Smith (1998), large-scale undertakings by universities aimed at generating income are more an effort to signal legitimacy rather than demonstrate commercial acumen.

2.6.6 Conflicts with NPM Accountability

In recent times, many Western nations have undertaken NPM reforms to strengthen their public sector accountability arrangements [14]. NPM accountability accompanied by mission statements and strategic plans places high value on what is produced, observed, and measured and is largely audit-driven (Codd, 2005; Hood, 1991). For knowledge, experience and innovation to be valued and recognised under NPM, it needs to be reduced to measurable performance objectives and outcomes (Codd, 2005). This bureaucratic form of accountability is at odds with academic researchers, scientists, and professional groupings within TEIs who prefer greater autonomy, flexibility, and a culture of trust to produce successful research outcomes (Codd, 2005; O'Neill, 2002).

---

[14] NPM advocates the use of private sector management practices based on an objective search aimed at improving accountability, effectiveness and efficiency of public service provision (Aucoin, 1990; Ball, Dale, William, & Sacco, 1999; Barzelay, 2001; Boston et al., 1996; Considine & Painter, 1997; Deem, 2001; Hood, 1991; Painter, 1997; Pallot, 1991). The rationale for the NPM reforms in New Zealand is comprehensively documented in a report entitled *Government Management,* prepared by Treasury (1987) as a briefing for the incoming Labour Government. New Zealand was not alone in its pursuit of reinventing public sector accountability using NPM. Many other OECD countries, such as Australia, Canada, and Britain, also embarked on similar reform programmes.

NPM also assumes a stable environment with conditions of certainty about expected results. However, the realities of research commercialisation at TEIs are characterised by uncertainty, complexity, interdependence, diversity, and instability and, under such conditions, NPM accountability seems weak (Zapico-Goni, 2007). This causes conflict and tension that is counterproductive to research commercialisation (Findlow, 2008). Successful commercialisation of research requires linkages and collaboration between TEIs and other actors in the research and innovation system. TEIs need to be flexible and responsive in terms of collaborative arrangements (OECD, 2008) and it may take many years before research commercialisation outcomes are fully recognised. Therefore, accountability relationships need careful management as they will shape the TEIs' responses in selecting and using appropriate mechanisms to enhance commercialisation

Under NPM, TEIs as autonomous institutions have the freedom to pursue self-determined institutional objectives. At the same time, as with public funded institutions, TEIs are under increasing public pressure to utilise the outcomes of their research for the benefit of the society. TEIs are moving to corporate citizenship and strategic philanthropic engagement to enhance the institutional contexts within which they operate (Gardberg & Fombrun, 2006). Long-term advantages can be produced by creating strategic intangible assets such as reputational capital and legitimacy to help enhance long-term performance and accountability (Gardberg & Fombrun, 2006; Godfrey, 2005). According to the OECD, the tension between the pursuit of self-determined institutional objectives and the broader research commercialisation objectives of the nation needs to be recognised and reconciled with an increased focus on accountability and performance (OECD, 2008, p. 15).

2.7 *Performance of the New Zealand Innovation System*

2.7.1 **Critical Concerns from Earlier Reviews**

The performance of the New Zealand innovation system has been relatively weak since the late 1990's, with relatively low investment in R&D and little evidence of technology diffusion (Engelbrecht & Darroch, 1999). In 2000, The World Economic Forum report (World Economic Forum, 2000) concluded that New Zealand was underperforming and needed to improve innovation and entrepreneurship. Following this, the government-

appointed Science and Innovation Advisory Council (SIAC) carried out a comprehensive assessment of the New Zealand innovation system, and compiled *New Zealand's Innovation Report Card* (Science and Innovation Advisory Council, 2001). Key points of interest were as follows:

- New Zealand has a lot of potential, and can do better
- New Zealand must recognise the role of innovation and knowledge creation
- The present rate of progress in transforming ideas into real and tangible benefits is not sufficient to keep pace with other nations
- There is relatively good government R&D investment, but less private sector investment in R&D which lags behind other developed countries
- Most R&D is done by government providers, CRIs, and universities from government funding for research
- There is a low rate of commercialising innovation, suggesting the need for more and better collaboration and networking between business, researchers, and educators, both locally and globally
- There is a need to have measures and indicators to support innovators and entrepreneurs

On generating wealth from ideas, the report noted that commercialising innovation is one of the most challenging problems facing society. Despite this, there is a need to recognise the importance of commercialising innovation with the ability to take calculated risks, create new products and services, and sell them to new and bigger markets (Science and Innovation Advisory Council, 2001).

2.7.2 **Recent OECD Review**

The performance of New Zealand's national innovation system has recently been reviewed by the OECD[15]. The OECD report confirms earlier findings that despite the past two decades of economic reforms, expectations concerning New Zealand's economic development have not been fully met. New Zealand is lagging behind other OECD countries in terms of GDP per capita despite government initiatives to improve the nation's innovative capabilities (OECD, 2007). This report makes a useful contribution to

---

[15] Refer to the OECD Review of Innovation Policy: New Zealand (OECD, 2007)

the debate about the importance of innovation and the role of the government to ensure that innovation makes a useful contribution to the nation's prosperity and social well-being. However, while this reports looks at broader innovation challenges, no comprehensive studies on research commercialisation and the role of TEIs in enabling research commercialisation have been carried out.

The OECD report notes that the basic conditions for entrepreneurship and innovation in New Zealand are good and, over time, universities and research institutes have developed world-class competencies in many areas of research. However, the report also notes that there are shortcomings in the process of technology diffusion. While TEIs may be undertaking industry-relevant applied research, there are concerns relating to a mismatch between the supply and demand for complementary technical services and research to help small and medium sized enterprises (SMEs) to articulate and satisfy their needs. TEIs also need to cope with systemic failures that prevent them from optimising the results of their research findings.

To build on the strengths and overcome the weaknesses, the OECD report recommends, among other initiatives, greater exploitation of value-adding innovation, improvements in international connectivity and access to global networks. Adoption of a comprehensive innovation strategy to remove obstacles is recommended to increase commercialisation and entrepreneurship. Collaboration with industry could increase the impact on business innovation and help TEIs exploit their potential to carry out high-quality and economically-relevant research leading to commercialisation success (OECD, 2007).

2.7.3 **Accountability Issues**

Relatively little systematic analysis has been carried out on the commercialisation of research by TEIs in New Zealand (TEC, 2003) and several reports commissioned by the government on innovation and entrepreneurship have raised similar accountability concerns relating to commercialisation of research by TEIs. For example, the *Final Report from the Science and Innovation Advisory Council,* released in 2002, highlighted the need for TEIs to become more accountable towards enabling commercialisation of research. More specifically, the report highlighted that *"... universities need to take responsibility for more actively supporting the commercialisation of such research:*

reinvesting profits from successful ventures back into further research" (Science and Innovation Advisory Council, 2002, p. 32). The report further highlighted that TEIs need to identify and eliminate impediments to the efficient commercialisation of research, and encourage collaboration with industry.

The report of the *Entrepreneurial Sub-group on Collaborating for Efficiency* project, commissioned by TEC (TEC, 2003), noted a number of myths[16] about commercialisation of IP that needed exploration. The group's key accountability concern was whether commercialisation opportunities were being appropriately enhanced and exploited. The report recommended the development of robust information on performance of TEIs relating to commercialisation. The report also acknowledges that there are impediments and that improvements need to be made in the internal and external environments that would facilitate commercialisation of research and IP. Improvements include setting realistic expectations, and introduction of support mechanisms that include providing appropriate funding, autonomy to TEIs, and incentives to researchers. The New Zealand Venture Capital report shares similar accountability concerns and, as a high priority initiative, refers to identifying ways to improve flow of innovation from TEIs to the market place (Lerner, Moore, & Shepherd, 2005, p. 119). To enable this to happen, the report recommends reviewing and strengthening incentives to overcome the impediments TEIs face in commercialisation of research.

Commentators have also raised concerns that government funding for research is not providing sufficient return. The chief science advisor to government, has raised concerns that there is an urgent need for compelling explanations of what the government is getting for its investment in science funding and that the quality of reporting to community stakeholders is poor (Education Review, 24 July 2009). Among his other key accountability concerns are the varying expectations of different interest groups and the inter-institutional gaming and positioning over funding bids that can get in the way of collaboration. He goes on to explain that conflicting expectations are causing tensions between business, TEIs, government, and research scientists in terms of placing emphasis

---

[16] The report concluded that four myths policy-makers and would-be 'commercialisers' need to be aware of are: TEIs are vast, untapped sources of IP; TEI IP is under-sold; TEIs are behind their overseas counterparts in commercialising research; and researchers are anti-commercialisation.

on basic or applied research, with research scientists more concerned about the future of their profession, and the science system more effectively focussed on incentivising and protecting institutional health rather than achieving knowledge gains. At the same time, government officials are questioning whether science is an indulgence or is at the core of the country's future development (Education Review, 24 July 2009). It is worth noting that the TEC report of the steering group on the collaborating for efficiency project (TEC, 2003, p. 1) had warned much earlier that TEIs faced a wide range of behavioural changes and expectations in the new tertiary environment following the passing of the Education (Tertiary Reform) Amendment Act 2002. This now seems to have become a reality, given the above accountability concerns relating to commercialisation of research.

During the past decade, the scope and importance of TEIs in enabling commercialisation of research has been widely recognised. At the same time, the growing focus on accountability has raised important questions relating to the role of TEIs. Although these accountability concerns are similar in nature, they have emerged from a variety of sources, thus confirming their importance. Also, the fact that these accountability concerns have been raised consistently over the past decade indicates the complex nature of the accountability problems confronting TEIs thus contributing to little or no action being taken so far to resolve them. To enable TEIs to become successful in their research commercialisation efforts, there is an urgent need to address the identified accountability concerns. Currently, there are no known studies that have specifically examined these issues in a systematic manner within TEIs in New Zealand. This study aims to fill this gap by providing some useful insights into how public TEIs in New Zealand identify and render accountability towards enabling commercialisation of research.

2.8   *Chapter Summary*

The review of literature provided a background to research commercialisation, helped clarify the definition, and traced the origins of the commercialisation strategy to the NPM reforms of the public sector. A comprehensive understanding was provided of the macro environmental forces of research commercialisation that can be best attributed to the effects of globalisation, the rise of the knowledge economy, and the influence of NPM ideologies. The literature review also highlighted the importance of innovation and

entrepreneurship as key elements of research commercialisation. Research commercialisation is a complex phenomenon that has placed TEIs at the centre of many government policy decisions over the past decade. The literature review helped clarify the role of government, TEIs, and industry, and considered the triple-helix of research commercialisation. External forces combined with perceptions of opportunities and conflicting expectations presented by research commercialisation were indicated as reshaping the accountability relationships of TEIs.

A review of literature has identified a number of important gaps that can be linked back to the research questions and objectives. While a new social contract is emerging with demands to make academic research more economically productive and publicly accountable, it remains unclear how TEIs are expected to recognise their accountability obligations and make suitable accountability arrangements in order to manage these expectations. What are the corresponding shifts in accountability relationships to ensure that behavioural expectations of researchers are appropriately aligned with the managerial strategy on commercialisation? Given the complexities of research commercialisation, the literature review has identified gaps in terms of the appropriateness of the NPM accountability model. Is NPM robust enough to cope with the complexities of research commercialisation? In rendering accountability, how do TEIs select and align with different types of accountability mechanisms and strategies? Are there different models of accountability that are specific to different expectations of performance? Commercialisation of research has been portrayed as an institutionalised global practice, yet there are claims in literature that it has contradictory goals that will jeopardise the central mission of TEIs. Little is known about what is causing tensions between academic research and commercialisation and how these are managed at organisational and individual levels. Are commercialisation opportunities appropriately enhanced and exploited? What are the impediments to the efficient commercialisation of research?

The next chapter presents a theoretical framework, within which the conceptual dimensions and key theoretical elements are identified as suitable to inform the study.

CHAPTER 3: THEORETICAL FRAMEWORK

3.1 Introduction

This chapter provides a theoretical framework constructed by identifying the conceptual dimensions and key theoretical elements considered appropriate in answering the research questions (refer to Figure 3.1 and Table 3.1). The identification and discussion of theory most relevant in informing the study is then undertaken.

In this chapter, three broad dimensions of accountability have been used to provide the conceptual basis for the study. The first conceptual dimension recognises that the institutional dynamics of research commercialisation impose accountability obligations on TEIs. It provides a macro perspective of research commercialisation and identifies the key theoretical elements as the macro actors as well as the endogenous and exogenous forces present in the institutional environment. The accountability obligation arises as a result of coherence among the environmental forces and the powerful actors made up of government and professional industry groups. A wide variety of sometimes conflicting interests and objectives is also present. These accountability obligations and expectations need to be managed within an appropriate accountability framework.

Therefore, the second conceptual dimension of the study recognises that the macro-level forces will influence the micro-level dynamics and practices within TEIs, requiring suitable accountability arrangements to be implemented. A shift in strategic focus and rearrangement of structural mechanisms will be required. Teasing out the accountability mechanisms of the process of commercialisation will also encourage an in-depth understanding of the micro processes of institutionalisation of research commercialisation.

The third conceptual dimension of the study recognises that the success of TEIs' efforts towards enabling research commercialisation is based on an appropriate accountability discharge. Appropriate accountability discharge is dependent upon the approaches taken to measure and report performance of commercialisation results. Setting performance indicators for evaluating and measuring outcomes and making visible the results of

research commercialisation is a crucial step in determining whether the commercialisation goals are being achieved. These three dimensions are expected to provide a greater integration of the macro and micro explanations of the accountability process of enabling research commercialisation at tertiary institutions.

The theoretical foundation of the study is built upon the new institutional theory (NIT)[17], also referred to as the neo-institutional sociology. This is by no means the only available and potentially relevant theory as other theories such as actor-network theory and resource dependency theory could have provided some useful insights. However, NIT was chosen and used as it offers a rich framework for examining the influence of the wider environment on the conceptualisation, adoption and implementation of research commercialisation practices at tertiary institutions. TEIs are among the oldest and most complex of structured organisations and are highly institutionalised. Given this situation, resistance to change becomes an assumption for theoretical constructs (Zucker, 1987). NIT offers the key theoretical concepts that help explain TEIs' responses to the growing public agenda on research commercialisation. According to Forgarty (1996, p. 250), "the essence of institutional theory lies in the demonstration that what an organisation actually accomplishes and what its structure suggest it should accomplish, are often quite distinct". The use of NIT is justified on the basis that it provides the theoretical lens to view and seek explanations on how TEIs respond to changes, or create an appearance of change, while avoiding real change from the impacts of commercialisation. NIT also helps understand the institutional dynamics and isomorphic behaviour patterns arising from the initiation, development, and impact or response to change in TEIs. Morphew and Huisman (2002) have recognised the importance of NIT, and have issued calls for additional research in TEIs using the NIT framework. They emphasise that future research efforts to understand institutional diversity should be driven by more in-depth and complex questions aimed at examining the broad isomorphic patterns in the behaviour of TEIs (Morphew & Huisman, 2002, p. 504). This study seeks to respond to their call.

---

[17] In this thesis, NIT refers to the new institutional theory.

3.2 Structure

This chapter is organised as follows. The first section describes the NIT that informs the study. The second section discusses the institutional dynamics and the key theoretical elements of the macro forces of commercialisation. Following on, it considers the applicability of the NIT theory base. The third section discusses the key theoretical elements of the micro-level processes of commercialisation of research followed by a discussion of the NIT perspective. The fourth section discusses the research perspectives employed to discharge public accountability including external reporting of the results of research commercialisation. This is followed by a discussion of the NIT. The final section provides a summary of the key elements of the theoretical framework.

Figure 3.1 presents a conceptual model of accountability that identifies the three conceptual dimensions of accountability and the NIT elements.

Figure 3.1: Conceptual Model of Accountability and Institutional Elements
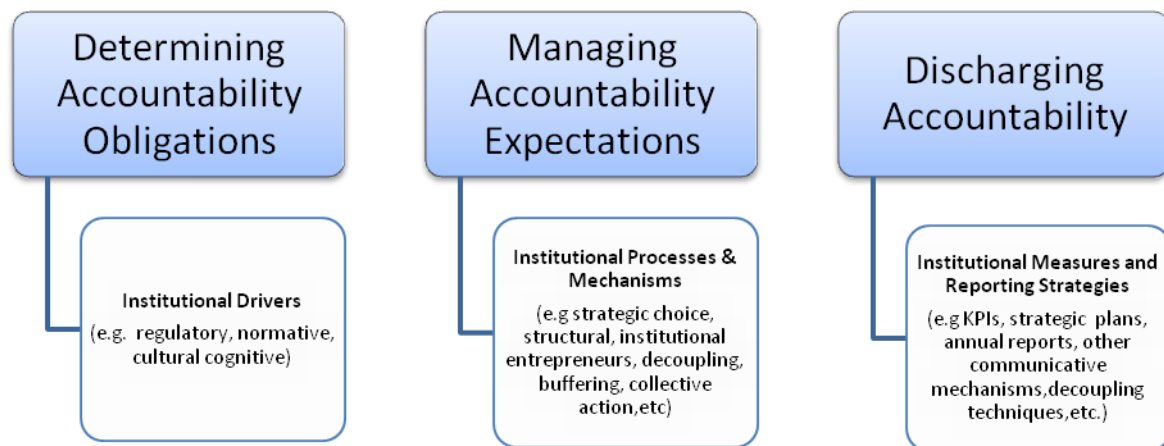
(Source: Developed by the Author)

Table 3.1 serves as a guide to each of the conceptual dimensions and key theoretical elements relating to the emerging research questions.

49

Conceptual Dimensions	Key Theoretical Elements	Emerging Research Questions
Institutional Pressures (accountability obligations)	• Macro actors • External environment • Internal Pressures • Government (regulatory, normative, cultural-cognitive)	What primary rationales underlie the accountability obligations of TEIs towards enabling commercialisation of research?
Micro-level processes and mechanisms (manage accountability expectations)	• Strategic choice • Structural configurations • Decoupling • Bridging • Collective action • Institutional entrepreneurs • Institutionalisation	How do TEIs manage accountability expectations of commercialisation of research?
Accountability Discharge	• Accountability perspectives • Legitimacy • Political economy • Image management • Marketing	How do TEIs measure and report the performance of their commercialisation activities? What are the scope, purpose and modus operandi of voluntary reporting strategies within the TEI setting?

(Source: Developed by the Author)

3.3   New Institutional Theory (NIT)

NIT is a dominant theory that offers renewed interest in organisational analysis and understanding of organisational behaviour (Dillard, Rigsby, & Goodman, 2004; Mizruchi & Fein, 1999). It provides unique perspectives that have become established as key theoretical foundations of modern organisational institutionalism (Lounsbury, 2008). It has its origins both in the much earlier, old institutional theory, especially the works of Selznick (1949, 1957), Gouldner (1954) and Parsons (1956), as well as the social constructionist literature in sociology (Berger & Luckmann, 1967). Drawing on the contributions from these earlier works, NIT gained prominence during the mid-1970s. The foundation of the theory stems from a series of articles written by Meyer and Rowan (1977), Zucker (1977), and DiMaggio and Powell (1983), that provides the underpinnings

for the new institutional perspective in organisation studies. Meyer and Rowan (1977) studied how organisations gained institutional status and concluded that it is not only organisations that undergo institutionalisation but also the environment in which they operate. Institutionalisation, according to (Meyer & Rowan, 1977, p. 341), "involves the processes by which social processes, obligations, or actualities come to take on a rule-like status in social thought and action" and organisations' relations with their environment became a major focus of research during this period. Scott (2003b, p. 136) defined institutionalisation as the process of constructing social reality "by which actions are repeated and given similar meaning by self and others". It is "viewed as the social process by which individuals come to accept a shared definition of social reality" (Scott, 1987, p. 496). The institutional environment is "characterized by the elaboration of rules and requirements to which individual organizations must conform if they are to receive support and legitimacy" (Scott & Meyer, 1991, p. 123). Meyer and Rowan (1977) emphasising the importance of cultural rules in wider institutional environments observed that modern societies contain many complexities of institutionalised rules and patterns to which an organisation must conform to gain legitimacy. They explain that the prevalence of organisational forms can be attributed to the existence of "rationalized myths" or shared belief systems and these institutional belief systems powerfully shape organisational forms (Meyer & Rowan, 1977, p. 343).

Organisations that "succeed in becoming isomorphic with these environments" conform to these beliefs and contemporary norms and receive public support and confidence (Meyer & Rowan, 1977, p. 352). These organisations are regarded as legitimate players and gain resources needed to survive even if there are no specific technical advantages. Zucker (1977, p. 742) found that a higher degree of institutionalisation leads to greater uniformity of cultural understandings. Consistent with Meyer and Rowan's (1977) views, DiMaggio and Powell (1983) have recognised that similarity in organisations has arisen not because of competition or an objective requirement for efficiency, but as a result of organisations striving for greater legitimacy within their larger environments. They postulate that organisations have become increasingly similar to one another because the state and professions require such homogenisation. Therefore, over time, in response to

institutional pressures, organisations increasingly resemble one another within the same organisational field. Providing a useful tool for understanding organisations' competition for political power, institutional legitimacy, and competition for resources and customers, DiMaggio and Powell (1983, p. 150) offer the concept of "institutional isomorphism". They proposed three drivers of institutional change: coercive, mimetic, and normative.

Coercive isomorphism results from formal and informal pressures exerted on organisations to comply with requirements of other dominant organisations upon which they are dependent. This includes the cultural expectations of the society within which the organisation operates. The pressure for organisation change may be in the form of force, persuasion, or an invitation to join in collusion. It could also be the result of government mandate, or political and legal pressure to increase legitimacy.

Mimetic isomorphism occurs when "organizations tend to model themselves after similar organizations in their field that they perceive to be more legitimate or successful" (DiMaggio & Powell, 1983, p. 152). Modeling or imitation can be intentional or unintentional. It happens when organisational technologies are misunderstood, when goals are ambiguous, or as a response to environmental uncertainty. Organisations may model or adopt technologies or innovations from similar successful organisations to enhance their own legitimacy.

Normative isomorphism occurs via professionalization, mainly arising from two important sources. First, through formal education and legitimation by university specialists; and secondly, through the growth of professional networks that helps to channel organisation behaviours and procedures in appropriate, expected, and legitimate directions.

With substantial overlap in themes, Scott (2001) provided a more systematic approach to tease out the various meanings of institutionalism. His conception of institutions is that they "are composed of cultural-cognitive, normative, and regulative elements that, together with associated activities and resources, provide stability and meaning to social life" (Scott, 2001, p. 48).

The *regulative element* views institutions as constraining, regularising, and influencing behaviour through a system of rules and governance mechanisms. Compliance is achieved through monitoring, enforcement, and sanctioning activities. The nation or state is the major source of regulatory rules and enforcement mechanisms, although other formal and informal regulatory structures may exist (Scott, 2003b). Regulatory compliance is mainly effected by coercion, rewards, fear, and punishment. Legitimacy is achieved through compliance to existing rules and legislation.

The *normative element* views institutions as "normative rules that introduce a prescriptive, evaluative, and obligatory dimension into social life" (Scott, 2001, p. 54). The potential of values and norms was recognized as providing a moral framework promoting and constraining social behavior. Norms were conceptualised as both goals and objectives and appropriate ways of pursuing them. Norms and values provide stability and distinctive culture to organisations. According to Scott (2003b, p. 136), "unlike externally enforced rules and laws, norms are internalized by participants; behavior is guided by a sense of what is appropriate, by one's obligations to others, by a commitment to common values".

The *cultural-cognitive element* emphasises that "internal interpretative processes are shaped by external cultural frameworks" (Scott, 2001, p. 58). There is a shared conception and taken-for-granted assumptions and beliefs of how things are done. Usually, compliance with expectations happened because of the common frameworks of meanings, and it was inconceivable for organisations or individuals to behave in a manner inconsistent with shared understandings.

In recent times, several new perspectives have emerged in the new institutionalism. More recent NIT places new emphasis on rationality, thus broadening the scope and richness of its core concepts, assumptions and arguments. Included is the adoption of a more strategic approach to rationality (Oliver, 1991), new perceptions of organisational heterogeneity and practice variation (Lounsbury, 2001), and greater emphasis on a collective or institutional notion of rationality (Lounsbury, 2007). The research focus has shifted to examining the effects of individual and organisational action on institutions

(Jepperson & Meyer, 1991). There is also a more intent focus on the concept of institutional entrepreneurship that offers fresh insights in understanding how new institutions arise by introducing actors and human agency roles (DiMaggio, 1988; Fligstein, 1991; Hardy & Maguire, 2008; Leblebici, Salancik, Copay, & King, 1991). By putting human agency back into institutional analysis of organisations, NIT helps "move beyond the constraining effects of institutions" (Hardy & Maguire, 2008, p. 213). In the following sections, the applicability of NIT will be further considered in the context of each of the conceptual dimensions and emerging research questions.

3.4   *Determining Accountability Obligations*

Determining accountability obligations involves examining the institutional dynamics of research commercialisation. The advent of research commercialisation is forcing fundamental changes to the organisational form and mission of TEIs in New Zealand. The literature on organisation change suggests that organisations change for numerous reasons. For example, the dynamics that precipitate change may arise from exogenous sources, such as "destabilising jolts" in the form of social and political upheaval, technology change, competitive market pressures, or regulatory change (Fox-Wolfgramm, Boal, & Hunt, 1998; Greenwood & Hinings, 2006; Lounsbury, 1999; Meyer, 1982; Meyer, Brooks, & Goes, 1990). Organisation change can also arise from internal pressures or endogenous sources relating to changing values, conflicting internal interests, and increasing social fragmentation (Covaleski & Dirsmith, 1988a; Greenwood & Hinings, 1996; Oliver, 1992). Alternatively, change could also result from the actions of actors who have the power to alter the organisational goals by encouraging local entrepreneurship and changing the intellectual climate by introducing new ideas (Colomy, 1998; Davis, 1991; DiMaggio, 1988; Fligstein, 1991; Leblebici et al., 1991; Seo & Creed, 2002).

An understanding of institutional drivers of research commercialisation at tertiary institutions will provide an important basis for the study. It will help identify the accountability obligations of TEIs towards enabling commercialisation of research. The following sub-sections provide a discussion of the institutional dynamics that can

precipitate organisational change through commercialisation and provide a link to the appropriate theoretical base and the emerging research questions.

3.4.1 Macro Actors

Actors play an important role in influencing commercialisation decisions at tertiary institutions. The term actor is preferred over the term stakeholder because it represents a much broader conceptualisation of commercialisation by including both human and non-human elements. From the outset, recognition of the conception of actors in a social system is important – be they individuals, organisations, governments, or nations - and their ability to drive changes in an organisation. As Scott (2003b, p. 21) succinctly puts it, "it's their energy, their ideas, their conformity and non-conformity that constitutes and shapes the structure of the organisation and carries on its functions. Without the ongoing participation of specific individual actors, there is no social structure, no organisation." (Fligstein, 1991, p. 313) found that change in organisations occurs when "either a new set of actors gains power or it is in the interest of those in power to alter the organisation's goals". Powerful actors have been conceptualised here as "macro" actors. Macro actors could be formal organisations, markets, or social and political institutions having a strong voice (Czarniawska & Hernes, 2005). They are seen as the "vehicles of power" having interests that can be invoked to influence actions taken in the interest of institutions, organisations, the nation, society, and the economy. They have the ability to alter the rules, distribution of resources or exercise "agency" to influence or alter the environment and structural constraints (Jaffee, 2001; Scott, 2003b). Through their actions, they are able to create an environment to which others must acknowledge and respond (Greenwood & Hinings, 1996). Gradually, this becomes an institutionalised environment. In this thesis, macro actors are recognised as residing both inside and outside the organisational environment. Macro actors inside the organisation will generate internal pressures for change, whereas those residing in the external environment will become the external agents of change. Using the NIT concepts of isomorphism and decoupling, TEIs' responses to both internal and external pressures for change can be examined.

In a much broader context, key influential macro actors that share a common goal of commercialisation include the knowledge society, economy, markets, government,

business, industry, international agencies (e.g., the OECD), and institutional entrepreneurs. These macro actors (both human and non-human) form alliances and share common beliefs on the benefits of commercialisation. The recognition of macro actors provides a useful basis for examining further the internal and external environmental pressures for commercialisation. Combined with the NIT concept of isomorphism that employs three types of strategies - coercive, mimetic, and normative - this will help further explain the TEIs' response to the public agenda on research commercialisation.

3.4.2 External Environment

The environment is a construction of the macro actors and it has a major effect on every organisational actor and the organisation itself (Scott, 2003b, p. 23). The environment can be conceived in terms of the social, political, cultural, economic, and technological forces to which every organisation must adapt (Scott, 2003b). Traditional models of organisations have placed greater emphasis on technology shaping organisational forms and structure. NIT places greater recognition on the organisation-environment linkages in shaping and supporting organisational forms (Meyer & Rowan, 1977). NIT calls to attention "the neglected facet of environments: institutionalized beliefs, rules, and roles - symbolic elements capable of affecting organizational forms independent of resource flows and technical requirements" (Scott, 1991, p. 165). It places greater emphasis on the importance of institutional environmental pressures in influencing the structure, strategy, behaviour and survival chances of organisations than Scott (2003b).

The institutional environment is "characterized by the elaboration of rules and requirements to which individual organizations must conform if they are to receive support and legitimacy" (Scott & Meyer, 1991, p. 123). Organisations will be subject to both technical and institutional pressures which should be treated as dimensions along which environments vary, rather than as dichotomous states with one set precluding the other (Scott & Meyer, 1991, p. 168). To elaborate on this point, it must be recognised that organisations are not purely technical systems but also have cultural-cognitive and normative elements emphasising the symbolic aspect of these organisations. Similarly, just like their technical environments, organisations need to exercise their strategic choice

relating to their location in the institutional environment to secure legitimacy, obtain essential resources and funding, or vary the regulatory pressures.

The environment is shaped by many factors, some within the control of TEIs and some beyond their control. To become successful, organisations need to be constantly adjusting to shifting environmental factors (Nadler & Tushman, 1997) and it is the changing environment that leads to innovation and commercialisation. Adapting to the changing environment may lead to changes in operational practices, methods, or outputs (Greve & Taylor, 2000) and, within the context of enabling research commercialisation, may mean changes in TEI structure and strategies. Morphew and Huisman (2002), in their study of academic drift at colleges and universities, found that institutions whose environment is marked by interaction with other institutions are more likely to engage in isomorphic behaviour. They assert that isomorphic behaviour is promoted by a strong level of inter-organisational interaction, with organisations likely to mimic organisations they believe to be successful. However, they are more likely to mimic those organisations they trust (Morphew & Huisman, 2002). TEIs constantly monitor the activities of other TEIs through networks of research collaborations and partnerships. Through these connections to the larger organisation field, they are likely to mimic the behavior of other TEIs to which they have established network ties via boundary spanning personnel, as well as organisations they trust (Morphew & Huisman, 2002).

3.4.3 Internal Pressures
Internal pressure for change in organisations emanates from the beliefs, actions and influences of those who have the power to define directions and interests. The changing values, conflicting internal interests, and increasing social fragmentation will have a major influence on shaping the purpose, structure, and evaluation of actions of the organisation (Greenwood & Hinings, 1996). This may arise from appointment of new managers from different functional backgrounds attempting to shift values, power dependencies, and expectations, through to changes in organisation structure (Clark, 1972; Fligstein, 1991; Greenwood & Hinings, 1996). Alternatively, internal pressure for change could arise from employee dissatisfaction. Organisations are viewed as "arenas in which coalitions with different interests and capacities for influence vie for dominance"

57

(Palmer, Jennings, & Zhou, 1993, p. 103). The extent to which groups are dissatisfied and how their interests are accommodated within an organisation will determine whether dissatisfaction becomes a pressure for change. A high level of dissatisfaction may become a pressure for change (Covaleski & Dirsmith, 1988a; Walsh, Hinings, Greenwood, & Ranson, 1981) but does not necessarily provide direction for change (Greenwood & Hinings, 1996).

Another possible form of internal pressure for change could be increasing representation of ideas and views within the organisation which causes "normative fragmentation" (Oliver, 1992, p. 575). According to Greenwood and Hinings (1996), normative fragmentation would arise from changes in the composition of the workforce (e.g., hiring of researchers, research professors), changes in portfolio of activities (e.g., entrepreneurial and research-oriented programs), and changes in specialisations within organisations (e.g., applied research focus as opposed to teaching and research). Fligstein (1991, p. 313) found that change in organisations occurs when "either a new set of actors gains power or it is in the interest of those in power to alter the organisation's goals".

DiMaggio (1988) recognised the *institutional entrepreneur* as an important element in the dynamics of institutional change. Institutional entrepreneurs are individuals and groups who have an interest in transforming the normative, cognitive, and regulative aspects of institutions. They organise their activities around a "project" that requires alternative arrangements and strategy within the context of existing institutional constraints. The project challenges existing goals, assumptions, habits, and routines while simultaneously framing criticisms within an acceptable "vocabulary of motives". "Entrepreneurs frequently rely on established cultural systems for standards to critically evaluate institutionalized practices" (Colomy, 1998, p. 276). Therefore, institutional norms and culture both shape and are used as resources by actors to challenge and transform the organisation. Jaffee (2001) suggests that institutional entrepreneurs conduct their own institutional analysis by identifying rationalised myths and inefficient and ineffective methods and procedures, and seek to discredit existing arrangements while glorifying the proposed techniques. Colomy (1998) refers to this as "micro corrective" to institutional

theory organised around the concepts of institutional entrepreneurs and institutional projects.

3.4.4 Role of Government

Organisation theorists suggest that government and professional groups are the two major actors who generate institutional rules influencing the cultural-cognitive, normative and regulatory elements of organisations (DiMaggio & Powell, 1983; Scott, 2003b, p. 213). Governments can play a vital role in encouraging TEIs to take on the commercialisation challenge and, hence, accept a much broader role in making a contribution towards the social and economic development aims of the nation. The government, through the influence of and interaction with other powerful actors, such as other OECD countries, shares a common belief that commercialisation is good for nation building (Etzkowitz et al., 2000; Marginson & Considine, 2000; OECD, 2003; Vincent-Lancrin, 2006). It promotes its commercialisation strategy as important for the knowledge economy, and for developing "social cohesion" and global competitiveness (Larner & Le Heron, 2005).

In this global environment of research commercialisation, a government may, therefore, position itself and align its vision and strategy with other internal and external drivers of commercialisation impacting on TEIs. In so doing, it may exercise its power and influence over TEIs who, in turn, have interests and obligations to commercialise. The government is also in a position to control TEIs behaviour so that what they do is aligned with the government's national goals. They can do this through mobilising non-human actors in the form of legislation, funding mechanisms, and policies that set tertiary strategic priorities with directions and limits. This controlling of behaviour is important to make actions predictable as well as help achieve national development goals.

Given the importance of the role of government in shaping commercialisation, some studies view the nation or state as the most important level of analysis in the study of organisation fields. This is because as macro actors, the government has the power to define, enforce and encourage perception of practices as part of government action which could gain acceptance and legitimacy as the "natural order of things" (Campbell & Lindberg, 1990; Dobbin & Sutton, 1998). Other studies have tended to focus on the world society as the most important level for the adoption of organisational practices,

such as natural environmental protection schemes because of the rise of world environmental regimes (Meyer, Boli, Ramirez, & Ramirez, 1997; Schofer & Hironaka, 2005). Commercialisation has become a worldwide phenomenon as a result of the rise of the knowledge society, with key influential players such as the OECD taking a leading role.

3.4.5 A NIT Perspective

NIT provides a useful theoretical lens to inform a TEI's decision to pursue the commercialisation agenda. It allows us to look beyond the economic forces to understand comprehensively the evolution of commercialisation and the role of macro actors and their enabling and constraining influences through internal and external pressures on TEIs. It has become clear from the above discussions that TEIs operate within an institutional environment. The institutional environment requires conformity and convergence among TEIs so they can achieve homogeneity and legitimacy thus providing inertia and stability and dispel forces of change. The pressure for conformity and homogenisation leads to coercive, normative, and mimetic behaviour patterns in TEIs. NIT recognises the importance of the organisation-environment linkages. It characterises the TEIs' institutional environment as the elaboration of institutionalised beliefs, rules, myths, norms, and procedures to which they must conform if they are to receive the support, acquire the needed resources, and gain legitimacy. This aspect presumably has much greater relevance for TEIs as they are often heavily influenced and constrained by external environmental pressures for greater representation, accountability, and responsiveness from multiple constituencies. NIT views intra-organisational changes as largely shaped by environmental factors rather than by rational choice decisions. It also recognises that TEIs play an active role in constructing rationalised myths and shaping their institutional environment to gain legitimacy (Carruthers, 1995; DiMaggio, 1991, p. 287). Therefore, rationalisation rather than making rational decisions is an interesting feature of this theory. Even though adaptation to institutional environmental pressures may not be the most efficient action, it may be necessary for ongoing funding, support and legitimacy (Jaffee, 2001).

The institutional features of the environment also encompass the cultural-cognitive, normative, and regulatory factors to which TEIs will need to conform. To help understand the conception of the institutional environment, NIT introduces the concept of "organisational fields" (DiMaggio & Powell, 1983). According to the theory, organisations are embedded in their organisational fields. These organisational fields are composed of all organisations in a population that collectively create an institutional environment within which interactions of relevant actors can be examined in totality. Fields are "structured systems of social positions within which struggles or manoeuvres take place over resources, stakes and access" (Oakes, Townley, & Cooper, 1998, p. 260). In the context of an institutionalised environment, it is important to recognise the actions of other organisations in the field that will affect the environment of the analysed organisation. Either it can legitimate current actions or else constitute reasons for change. Taking this viewpoint, it could be argued that TEIs cannot exist in isolation from their institutional environment as they have to be seen as embedded in their organisation field comprising the broader societal environments with which they need to interact. Therefore, it could be conceptualised that TEIs operate in a strong institutional environment and decisions on commercialisation need to be explained in the context of their interaction with the institutional environment.

NIT also provides a new focus by introducing the concept of multiple institutional environments. Multiple institutional environments are comprised of macro actors such as the state, professional associations, industry, and other organisations that play an influential role in defining the ends and shaping the means by which interests are determined and pursued (DiMaggio & Powell, 1991; Scott, 1987). Hence, NIT could be used to explain the role of macro actors such as government, professional research organisations, and other local and international organisations connected to the tertiary institutions' commercialisation initiatives.

To help explain internal pressures of change, the new institutional perspective of the environment can, again, be utilised since environments are the constructions of organisations and their macro actors (Scott, 2003b, p. 313). Within the organisation, the institutional entrepreneur becomes an important element to help explain the dynamics of

61

institutional change (DiMaggio, 1988). Either as individuals or groups, they could organise their activities around the project and become powerful macro actors having interests in transforming the normative, cognitive, and regulatory aspects of institutions. Using their legitimate subject positions within a field, institutional entrepreneurs can dislodge existing practices, introduce new ones, and ensure that they become widely adopted in the field. They do this through the mobilisation of resources, the construction of rationales for institutional change and discursive intervention, and through forging inter-actor relations to bring about collective action (Hardy & Maguire, 2008; Hardy, Maguire, & Lawrence, 2004).

3.5 *Managing Accountability Expectations*

Managing accountability expectations involves the institutional processes and mechanisms of commercialisation. The second conceptual dimension of the study recognises that the macro-level forces of commercialisation will influence the micro-level dynamics and practices of TEIs. These internal dynamics often require a shift in strategic focus, change in organisation structure, policies and process. Organisation change is a continuous process and can be understood as a sequence of events occurring over an extended time frame. It is perhaps best understood and explained as components in a larger system of relations shifting the emphasis from an organisation as an entity to organising as a process (Scott, 2003b).

The process of commercialisation begins with the determination of an appropriate response by tertiary institutions to the exogenous and endogenous forces including the pressures exerted by the macro actors. It has been recognised that TEIs may respond strategically to change and, hence, reorganise their organisational configurations to accommodate the change. The reorganisation may lead to selection or adaptation of appropriate models of commercialisation. The selection or adaptation of appropriate organisational configurations could be based on established models in the organisation population. Whatever model is selected or adapted, it will be subject to translation or conditioning to the various routines and competencies of the organisation, including appropriate risk management policies. Through a process of translation or redefinition and reconstruction, it is expected that, at the final stage of the process, a stabilised or

institutionalised model of commercialisation will emerge. The theoretical underpinnings of these elements are discussed below.

3.5.1 Tertiary Institutions' Response

Organisations are expected to exercise strategic choice in relation to the environmental and internal pressures for change (Oliver, 1991). External pressures may prescribe templates or archetypes for organising, and powerful actors within the organisation will interpret the pressures for change and mobilise power sources to conform or resist them. Environmental pressures for change could arise from the state, society, and cultural obligations as opposed to market forces and resource dependency. Depending on the nature and extent of these pressures, organisations will display varying degrees of choice, awareness, pro-activeness, influence, and self-interest in response to the environmental pressures for change (Oliver, 1991). However, there may also be a non-choice behaviour especially when norms, beliefs, values, and practices are so externally validated and ingrained within an organisation that they are invisible to the actors they influence (DiMaggio, 1988; Oliver, 1991), or when action becomes a "social fact", making it the only conceivable, obvious, or natural choice (Berger & Luckmann, 1967; Oliver, 1991; Zucker, 1977; 1987). For example, acting responsibly and ethically may not require an organisational response in anticipation of positive gains or outcomes, but merely because it is an acceptable behaviour driven by institutional values and practices (DiMaggio, 1988; Oliver, 1991). Non-choice behaviour can occur and persist through the exercise of habit, convention, convenience, or social obligation without serving the organisation's interest or contributing to organisational efficiency and control (Tolbert, 1985; Tolbert & Zucker, 1983). An organisation's response to change is a function of internal organisational dynamics and the response will vary depending on the perceived value commitments and rates of success in the marketplace (Greenwood & Hinings, 1996). Some organisational theorists have argued that peripheral organisations which are not fully embedded in an organisational field will show less commitment to prevailing practices and, hence, be more willing to develop new practices (Leblebici et al., 1991).

Organisations vary in their response to pressures for change. Oliver (1991, p. 151) suggests that "organisational responses will vary from conforming to resistant, from

passive to active, from preconscious to controlling, from impotent to influential, and from habitual to opportunistic, depending on the institutional pressures toward conformity that are exerted on organizations". In order to understand these variations, a number of important considerations need to be understood, such as the organisational capability to shape or influence the nature of institutional expectations, the variations in the resource environment, structural considerations, and their relationship with state and society including their coercive powers (Brignall & Modell, 2000; Powell & DiMaggio, 1991; Scott, 2001).

3.5.2 Strategic choice

Organisations can employ a broad range of strategies to deal with pressures for change. Oliver (1991) has proposed five strategic responses to institutional pressures: acquiescence, compromise, avoidance, defiance, and manipulation.

Acquiescence refers to conformity to institutional pressures from habit, imitation, and compliance. Habit is the unconscious or blind adherence to taken-for-granted norms or values accepted as a social fact. Imitation refers to conscious or unconscious mimicry of institutional models considered successful. Compliance is the conscious obedience to values, norms, or institutional requirements (Oliver, 1991).

Compromise happens when conflicts arise between external pressures for institutional expectations and internal pressures for organisational efficiency or autonomy. When organisations compromise, they use tactics to balance, pacify, or bargain with the external actors. Balancing tactics help accommodate multiple stakeholder demands and internal interests. Pacifying tactics help to conform to at least the minimum standards, and bargaining involves negotiation to gain some concessions from the external constituents (Oliver, 1991).

The third type of strategic response is *avoidance* which is achieved through concealment, buffering, or escape tactics. Concealment involves disguising non-conformity behind a façade of acquiescence to gain legitimacy. For example, organisations may establish elaborate rational plans and procedures (e.g., mission statements, statement of goals and objectives, budgets) in response to institutional requirements in order to disguise their

64

non-implementation. They can disguise their operations using formal structures and mechanisms such as inspection and evaluations to account for and legitimise their activities to external stakeholders, even though internal operations may not always reflect those accounts (Meyer, 1977). They may engage in "window dressing"; rituals and ceremonies; or demonstrate symbolic acceptance of institutional norms, rules, or requirements (Meyer & Rowan, 1977; Oliver, 1991). They project an appearance that is different from reality, because appearance rather than fact of conformity is often presumed as sufficient to gain legitimacy (Oliver, 1991).

Buffering, on the other hand, refers to organisations' attempts to reduce external pressures by partially detaching or decoupling their activities from external contact (Oliver, 1991; Scott, 2003b). By doing this, the organisation is able to separate public perception from internal behaviours. Decoupling internal operations from formal structures and external assessments sometimes becomes necessary as a means of maintaining the faith and legitimacy of the organisation (Meyer & Rowan, 1977). Several studies support the notion of buffering tactics as a means of protecting the organisation's interests, especially in terms of maintaining autonomy and maximising efficiency without having to depend on external intervention or open up to public scrutiny (Covaleski & Dirsmith, 1988a, 1988b). It serves a symbolic or ritual role and becomes an ineffectual exercise to serve hollow legitimation (Friedland & Alford, 1991).

The fourth type of strategic response to external pressure is *defiance*, a more active and purposive action that uses the tactics of dismissal, challenge, and attack (Oliver, 1991). Organisations dismiss or ignore institutional pressures when they are perceived to be low, or when they are inconsistent or conflict with internal objectives. Organisations challenge or contest institutional pressures when they believe the expected changes are not rational and are considered less significant to their own values and vision. Attack is the most extreme form of defiance, involving much greater intensity and aggression. It happens when an organisation believes its rights, privileges, or autonomy is in serious jeopardy or being discredited (Oliver, 1991).

The fifth type of strategic response, according to Oliver (1991), is *manipulation*, which is a purposeful and opportunistic attempt to co-opt, influence, or control institutional pressures. It is the most active response intended to change or exert power over the sources that seek to enforce them. Co-opting tactics include persuading those external actors exerting pressure to join the organisation in order to neutralise opposition and enhance legitimacy. Influence tactics include manipulation of belief systems such as lobbying government to change regulations, increase funding and support, or influence standards of evaluation. When institutional expectations are weakly promoted, controlling tactics are used to dominate, or exert control over the source, allocation, or expression of social approval and legitimation (Oliver, 1991).

3.5.3 Structural configurations

In addition to exercising strategic choice, organisations develop appropriate structures to respond to their environment. Hargrave and Van De Ven (2006) have identified four models of structural configurations to respond to institutional change: institutional design, institutional adaptation, institutional diffusion, and collective action models.

The *institutional design model* focusses on the intentional or purposeful actions of individual actors to create or change organisational arrangements to achieve their goals. Change is a purposeful strategic action of individual actors, and institutional arrangements reflect the conscious decisions and actions that society judges to be prudent and reasonable (Hargrave & Van De Ven, 2006).

The *institutional adaptation model* views institutional environmental pressures as the mechanisms that shape the structure and actions of organisational actors. Organisations look similar because they have to conform to norms, beliefs, and rules in the institutional environment in order to achieve legitimacy and acquire resources (DiMaggio & Powell, 1983; Scott, 2001). DiMaggio and Powell (1983) have argued that the homogenising pressures from the state and professions lead to coercive, normative, and mimetic processes that cause organisations to adopt similar structural characteristics. Recent studies suggest that an organisation's response to change is also a function of internal dynamics (Greenwood & Hinings, 1996) and that change is influenced by strategic and organisational conditions (Greenwood, Suddaby, & Hinings, 2002).

The *institutional diffusion model* examines how and why specific institutions are adopted (selected) and diffused (retained) among institutional actors in a population or organisational field. Scott (2001) categorised diffusion as coercive, normative, and mimetic mechanisms. Recent studies have focussed on the spread of organisational forms resulting from the quest for organisational legitimacy (Carroll & Hannan, 1989). Research has also viewed diffusion as an interplay between environment pressures and strategic choice at the organisation level (Van De Ven & Hargrave, 2004). For example, Tolbert and Zucker (1983) use the variation, selection and retention model of the evolutionary process to explain the institutionalisation and de-institutionalisation of organisational arrangement.

The *collective action model* of institutional change focusses on the interplay of social and political processes through which institutions emerge or are altered. Institutional change is produced through collective efforts, and no single actor has the power or authority to produce the change by itself (Hargrave & Van De Ven, 2006).

3.5.4 Decoupling and Bridging Mechanisms

Organisations do not choose new structures at random (Meyer & Rowan, 1977). Organisation studies indicate a number of factors influencing this decision – size, strategy, pressures for conformity with institutionalised norms, values, beliefs, and technical lore institutionalised in society. In a study of educational organisations, Rowan (1982) found that education organisations add structures due to pressure of conformity and, therefore, get the support and endorsement of key agencies in the institutional environment. Two mechanisms of organisational change that have received widespread attention in the literature are the buffering or decoupling and bridging mechanisms.

Buffering refers to organisations' attempts to reduce external pressures by partially detaching or decoupling their activities from external contact (Oliver, 1991; Scott, 2003b). Meyer and Rowan (1977) call this "sagacious conformity", in which new technologies and techniques appear to be in use, but may not be acted upon. Decoupling sometimes becomes necessary as a means of maintaining the faith and legitimacy of the organisation (Meyer & Rowan, 1977). Recent developments in decoupling literature have broadened its scope. According to Boxenbaum and Jonsson (2008), decoupling could be

a result of heterogeneous organisational fields with multiple and often contradictory pressures on the organisation, or it could be a strategic response. Organisations decoupling as a strategic response may do so for proactive reasons rather than defensive reasons (Boxenbaum & Jonsson, 2008). Several studies support the notion of buffering tactics as a means of protecting the organisation's interests, especially in terms of maintaining autonomy and maximising efficiency without having to depend on external intervention or open up to public scrutiny (Covaleski & Dirsmith, 1988a, 1988b).

Bridging techniques include bargaining, contracting, forming joint ventures, mergers, associations, and government links to secure legitimacy and support from the institutional environment while, at the same time, protecting their technical environment. For complex and mature organisations, adaptive changes cannot be easily made, as structures, core missions, norms, values, beliefs, and power distributions are firmly entrenched in the cognitive frames of organisational members and in the organisational routines and processes (Greenwood & Hinings, 2006). Therefore, breaking down this inertia can be a long-term conditioning process often requiring legitimating and de-legitimating of strategies and changes (Greenwood & Hinings, 2006; Hannan & Freeman, 1977, 1984; Pettigrew, 1987; Scott, 2003b). For adaptive change to happen, organisational members will need to be convinced that adapting to the change will benefit the organisation by providing massive enabling opportunity or "competence-enhancing" opportunities arising from the external environment (Tushman & Anderson, 1986). At the same time, reassurance may be required that the proposed changes will still allow for continuity with past values and norms.

3.5.5 Institutionalisation

Institutionalisation, according to Meyer and Rowan (1977, p. 341), "involves the processes by which social processes, obligations, or actualities come to take on a rule-like status in social thought and action". Institutionalisation is necessary to be viewed as a legitimate member of the organisation field. Scott (2003b, p. 136) defines institutionalisation as the process of constructing social reality "by which actions are repeated and given similar meaning by self and others". Within this context it could be argued that adoption of commercialisation practices will become institutionalised when it

becomes standard operating procedure, values, and premises that regularise patterns of behaviour and enhance legitimacy. Institutionalisation is necessary to facilitate persistence, endurance, and stability (Jaffee, 2001). The degree to which commercialisation becomes institutionalised is dependent on the extent to which these practices are accepted by organisational actors. Acceptance will be dependent upon continued commitment and reinforcement in the behaviours of organisational managers and the extent of adaptation to the environmental conditions (Waddell, Cummings, & Worley, 2007). If the institutionalised patterns of organisational behavior and the values and belief systems of the new archetypes are no longer supported or reinforced, they may lead to deinstitutionalisation. The institutional phase is important because it provides the inertia and stability required to examine the outcomes of change and make comparisons with the system before the change was implemented (Dawson, 2003).

3.5.6 A NIT Perspective

New institutional theory provides key insights into the organisational response to change. It asserts that institutional pressures prescribe templates or archetypes for organising to which an organisation must conform to gain legitimacy (DiMaggio & Powell, 1983; Greenwood & Hinings, 1993; 1996). The environmental actors impose strict structural requirements on organisations as conditions for acceptance and support, and organisations are rewarded for establishing correct structures and processes, not for the quantity and quality of their outputs (Scott, 1991, 2003b).

According to the NIT, the prevalence of organisational forms can be attributed to the existence of "rationalised myths" or shared belief systems and the institutional belief systems powerfully shape organisational forms (Meyer & Rowan, 1977). Organisations that "succeed in becoming isomorphic with these environments" conform to these beliefs and contemporary norms and receive public support and confidence (Meyer & Rowan, 1977, p. 352). They are regarded as legitimate players and gain resources needed to survive, even if there are no specific technical advantages. DiMaggio and Powell (1983), consistent with Meyer and Rowan's views, argued that similarity in organisations has arisen not because of competition or an objective requirement for efficiency, but as a result of organisations striving for greater legitimacy within their larger environments.

69

They argue that organisations have become increasingly similar (isomorphic) to one another because the state and professions required such homogenisation. Therefore, over time, in response to institutional pressures, organisations increasingly resemble one another through coercive, normative, and mimetic processes within the same organisational field. Organisation fields and institution logics prescribe appropriate behavior and provide the archetypes (Greenwood & Hinings, 1993) or templates for organising (Powell & DiMaggio, 1991). Hence, following the above discussion, it appears that accountability mechanisms may have a symbolic and legitimacy role in TEIs.

Extending the NIT, Oliver (1991) proposed that organisations display a range of strategic responses to institutional pressures, from compliance to compromise, avoidance, defiance, and manipulation. This theory base is applicable in the sense that TEIs may refuse to comply with the coercive pressures to conform to the external environment. Instead, they may employ a range of avoidance tactics such as concealment and buffering mechanisms to gain symbolic acceptance and legitimacy. Through concealment tactics they could establish goals, objectives, budgets, and policies but disguise their non-implementation. On the other hand, they could decouple activities from formal structures to gain organisational legitimacy. Thus, NIT offers a potentially valuable window into accountability processes, agendas and interactions amongst TEIs and their stakeholders.

3.6   *Discharging Accountability*

Discharging accountability relates to institutional measures and reporting strategies used by organisations. The third conceptual dimension of the study recognises that the success of TEIs' efforts towards enabling research commercialisation is based on an appropriate accountability discharge. Appropriate accountability discharge can be based on approaches taken to measure and report performance of commercialisation results. Setting performance indicators for evaluating and measuring outcomes and making visible the results of research commercialisation is a crucial step in determining whether the commercialisation goals are being achieved. Successful adoption of commercialisation practices depends on what emerges as evidence of commercialisation and how this is measured and reported. What is measured and reported should also

70

provide evidence of the nature and extent of commercialisation of TEIs. Different theoretical research perspectives have been adopted by researchers in examining the role of public institutions in discharging public accountability. Stanton and Stanton (2002) provide a comprehensive review of literature on corporate annual reporting perspectives that could be used to inform this study. These perspectives are outlined below.

3.6.1 The Accountability Perspective

The accountability perspective involves the monitoring, evaluation and control of organisational agents to ensure that they behave in the interests of shareholders and other stakeholders (Keasey & Wright, 1993). The external economic and political climates are forcing fundamental changes in accountability relationship between TEIs and government and serious attempts are being made to organise information about performance and resource use in TEIs (Wellman, 2001). Accountability depends on adequate performance measurement, reporting, and auditing and when combined with rewards and sanctions, the requirement to report should lead in turn to improvements in efficiency and effectiveness (Pallot, 1991). Annual reports are commonly regarded as the key accountability tools through which management reacts to the concerns of stakeholders (Hyndman & Anderson, 1995; Lamond, 1995). Performance reporting seems to have become a preferred method of public accountability in order to achieve greater efficiency and effectiveness. There is greater acceptance that public sector reporting should provide information for both decision-making and accountability to wider stakeholders (Nelson, Banks, & Fisher, 2003).

3.6.2 The Legitimacy Perspective

The organisational legitimacy perspective views organisations as controlled by community concerns. The level of corporate disclosures will increase if the organisation perceives that its "legitimacy" is threatened by public concern (Brown & Deegan, 1998). Organisations need to be responsive to changing values and the annual report is used as a tool of management to signal its reactions to the concerns of powerful stakeholders which is seen as important to the legitimating process (Stanton & Stanton, 2002). Successful legitimating depends on convincing both society at large and other institutional actors that a congruency of actions and values should and does exist (Neu & Wright, 1992). In

71

New Zealand, questions have been raised about whether public sector reporting against a statement of objectives is being manipulated to report only the positives to provide an organisation with legitimacy which has nothing to do with the efficiency and effectiveness of its operations (Norman, 2003).

3.6.3 The Political Economy Perspective

The political economy perspective is characterised by the recognition of power and conflict in society (Burchell, Clubb, Hopwood, Hughes, & Nahapiet, 1980; Cooper & Sherer, 1984). It views reporting as a powerful mechanism that can function rhetorically to assert specific values and persuade the report reader of the truth of the claims in the accounts themselves, or to draw attention away from specific interests (Graves, Flesher, & Jordan, 1996). The political economy perspective views an annual report as a proactive tool used by management to influence and shape what is important to wider society (Burchell et al., 1980) by suppressing, mystifying and transforming social conflict (Tinker & Neimark, 1987).

3.6.4 Image Management Perspective

An image or impression management perspective views annual reports as instruments used to create favourable impressions (Stanton & Stanton, 2002). McKinstry (1996) suggested that the annual report was turning into a public relations document. While some studies on the image management perspective have examined annual reports in broad terms, others have chosen to analyse narratives, graphs, and photographs. Studies of narratives are mainly on elements in the writing, readability, and understandability. However, readability may be manipulated to present information as more favourable than the reality (Deegan & Gordon, 1996), and what is omitted is as significant as what is included in the narrative (Adams & Harte, 1998). Language can be used to blur attributions (Meyer et al., 1997) and Aerts (1994) found attributions to be a "hedonic bias", meaning anything negative is attributed to external environmental causes, and positive outcomes are attributed to internal factors. What seems interesting from the image management perspective, is the intent of the public relations exercise and how the content achieves that purpose (Stanton & Stanton, 2002).

3.6.5 The Marketing Perspective

The marketing perspective views reporting as a communication strategy whether performance is favourable or unfavourable (Kohut & Segars, 1992). Here, reporting becomes a proactive process of an overall marketing effort to "sell" a corporation as a brand to its multiple audiences (Mitchell, 1998). In this context, reporting is not viewed as an isolated public relations document (Droge, Germain, & Halstead, 1990). As a marketing tool, reporting is used to enhance corporate management performance or "de-emphasize" negative news (Subramanian, Insley, & Blackwell, 1993; Tushman & Anderson, 1986). It also serves as an instrument of marketing strategy and a publicity function to establish and maintain mutual understanding between an organisation and its public (Adcock, Bradfield, Halborg, & Ross, 1995). It contributes to the corporate identity and image of the organisation.

3.7   A NIT View

NIT posits that organisations are subjected to the influences and expectations of the broader institutional environment in which they operate. They adopt certain strategies, structures, norms, routines and practices and become isomorphic with these environments (Meyer & Rowan, 1977; Scott, 2003b; Scott & Meyer, 1994). External reporting and performance measurement may be such a routine or practice. Organisations that conform to these routines and practices receive public support and confidence (Meyer & Rowan, 1977, p. 352). By conforming to the institutional expectations, the organisations are regarded as legitimate players and gain resources needed to survive even if there are no specific technical notions of performance accomplishment (DiMaggio & Powell, 1983). Annual reports may not be the most efficient and effective means of demonstrating accountability, but may be the most accepted form for conforming to institutional pressures from regulatory agencies, the profession, and general expectations of society. Over time, in response to institutional pressures, organisations' annual reports may increasingly resemble one another through coercive, normative, and mimetic processes within the same organisational field. Hence, the organisation fields and institution logics may prescribe appropriate reporting behaviour and provide the archetypes (Greenwood & Hinings, 1993) or templates for annual reporting (Powell & DiMaggio, 1991). Thus,

performance measures and contents of annual reports on commercialisation may have a ceremonial or symbolic and legitimacy role in TEIs, decoupled from internal operations and performance.

In discharging accountability, there needs to be an appreciation of much wider communicative mechanisms in addition to annual reporting. In the context of research commercialisation, communicative mechanisms provide narratives of past events, actions, and performance that are constructed to demonstrate the appropriate discharge of accountability. Within the TEIs, some of the most common communicative mechanisms include university profiles, strategic plans, annual reports, research reports, newsletters, and web-site based information. According to Black (2008), the narrative constructed may have no effect on the organisation; may not be constitutive of organisational norms or practices; or it may be false in order to serve the organisation's own interests to enhance the organisation's legitimacy. When the narratives are rationally constructed to enhance the organisation's legitimacy, communicative mechanisms simply serve as strategic devices to manipulate the perceptions of the organisation's activities and performance (Black, 2008). The organisation may alter the narrative if it does not make sense to itself or, alternatively, it may seek to decouple the activities requiring maintenance of formal legitimacy structures (Meyer & Rowan, 1977). Recognising the communicative dimension of accountability is important to help determine whether the image of accountability is an abstract, technical process that can be tweaked or manipulated and deployed at will to ensure that appropriate norms and outcomes are achieved. Alternatively, it could be an interpretive and discursive schema with its own logic in which participants make sense of each other's role (Subramanian et al., 1993).

3.8   Chapter Summary

The aim of this chapter was to identify a theoretical framework that would help explain how TEIs identify and render accountability for research commercialisation. To pursue that aim, three broad conceptual dimensions of the study were identified which provided the framework within which the essential theoretical elements of commercialisation will be explored. The question of accountability is a natural extension of a TEI's role in its pursuit of a commercialisation agenda. At the macro-level of analysis, the institutional

environment factors influencing commercialisation decisions of TEIs were explored. At the micro-level of analysis, appropriate frameworks that seek to explain a TEI's response to manage expectations through strategic and structural transformations was discussed. Following this discussion, the applicable theory base that would inform the study was considered. NIT was chosen for the study based on its explanatory power. It offers a rich theoretical frame of reference that is multi-dimensional and less deterministic of the theorisation of institutionalisation and organisation change. It recognises the importance of organisation-environment linkages and provides useful insights into both the macro and micro perspectives of commercialisation. Finally, the theoretical research perspectives employed to discharge public accountability, including external reporting of the results of research commercialisation, were discussed.

The next chapter provides the research methodology and methods of data collection and data analysis that would be used to answer the research questions.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 *Introduction*

This chapter explains the research methodology and methods used for data collection and analysis. Section 4.2 begins with a brief discussion of the research paradigm followed by a justification of the qualitative research methodology in section 4.3. Section 4.4 discusses the selection of case studies as the research design strategy. This is followed by a discussion of data collection strategies in section 4.5. Here, the issues relating to case selection, research sites, units of analysis, gaining access to data, and the piloting of data collecting instruments are addressed. Section 4.6 discusses multiple sources of evidence that includes the use of interviews, documents and archival records, direct observation, and participant-observation techniques to enable triangulation. Section 4.7 explains how data was analysed. In sections 4.8 and 4.9, the research limitations are recognised and the standards of quality using objectivity, validity and reliability checks are outlined. Finally, in section 4.10, key ethical considerations are noted.

4.2 *Research Paradigm*

A research paradigm is a basic set of beliefs and assumptions about the world that helps guide the researcher's action (Denzin & Lincoln, 2005; Guba, 1990; Guba & Lincoln, 2005). This belief system or worldview is bound by the epistemological, ontological, and methodological premises that can be determined by responses to three fundamental questions (Denzin & Lincoln, 2005; Guba & Lincoln, 2005), as follows:

- The ontological question is, *What is the nature of reality?*
- The epistemological question is, *What is the relationship between the inquirer and the known?*
- The methodological question is, *How do we know the world, or gain knowledge of it?*

This study assumes that reality does not exist objectively and independently from human experiences. Therefore, reality has a subjective meaning that is constructed and

reconstructed through a human and social interaction process (Burrell & Morgan, 1979). This study investigates how TEIs identify and render accountability to enable research commercialisation and it should be recognised that there are multiple realities constructed by the participants involved in the research, including those of the researcher. A relativist ontology based on constructivism is, therefore, appropriate for this study. Epistemologically, knowledge is obtained through an understanding of the human and social interactions by which the subjective meaning of the reality is constructed. To ensure that the research phenomena were fully explored, the researcher interacted with the participants by way of site visits, semi-structured interviews, informal discussions, attendance at workshops and seminars thus minimising the distance between the researcher and the participants. Reliance was also placed on interpretive material, including documents and archives compiled by the participants. The study is, therefore, interpretive as the researcher aims to make sense of the reality that has been constructed. To generate interpretive knowledge, the researcher engaged in the real social (naturalistic) setting being studied and learnt how the interaction took place from the participants' perspective. A qualitative research methodology is, therefore, appropriate for this study. Given the relativist ontology, subjective and interpretive epistemology, and interpretive, naturalistic methodology, this study fits Denzin and Lincoln's (2005) and Guba and Lincoln's (2005) constructivist-interpretive paradigm structure of the qualitative research process. In the context of this study, the constructivist-interpretive structure has been used to allow the researcher to simultaneously collect, inductively analyse, and interpret contextual data in order to construct emergent themes.

4.3 *Justification of Qualitative Research Methodology*

Qualitative research has several characteristics with many advantages. Creswell (1997, p. 14) identified some common elements that characterise qualitative research as undertaken in a natural setting, with the researcher as a key instrument of data collection who gathers words or pictures, analyses them inductively, describes the outcome as a process, and focusses on the meaning of the participants' perspectives.

Denzin and Lincoln (2005, p. 3) define qualitative research as "an interpretive, naturalistic approach to the world" where qualitative researchers use a variety of empirical materials "to make sense of, or interpret, phenomena in terms of the meanings people bring to them". Miles and Hubermann (1994, p. 10) explain that the strength of qualitative research lies in its natural setting and real-life context that provides the *"richness and holism"* in revealing complexity of meanings people place on events, processes, and structures. Other strengths they identify include the flexibility of qualitative research enabling the adjustment of research to ideas and issues as they arise, and the fact that data is collected over a sustained period making them powerful for studying any process and even for assessing causality. Marshall (1985a, 1987 in Marshall & Rossman, 1999, p. 57) recognises that qualitative research is useful in delving in-depth into complexities and processes; where little is known about the phenomena; when research on real, as opposed to stated, organisational goals is required; when research on informal and unstructured linkages and processes in organisations is necessary; and when research cannot be done experimentally, or for which relevant variables have yet to be identified.

Many of these characteristics and strengths have particular relevance to this study. In particular, the conduct of the study in its natural settings (real organisations) allows a clearer understanding of the context in which the research is situated. The social and physical setting including the norms, traditions, roles, and values are crucial aspects of the complex research environment that applies to this research and need to be understood (Marshall & Rossman, 1999). The qualitative nature of the study also enables a closer involvement of the researcher with the phenomenon of study, thus encouraging a much deeper and intimate understanding of the complexities of the research commercialisation process.

The emergence of commercialisation in TEIs involves complex variables that inter-relate in many different ways. Through face-to-face interactions, the meanings that participants attribute to their actions, thoughts, feelings, cultural beliefs, values, and assumptive world could be understood better (Marshall & Rossman, 1999). This understanding helps provide a rich description of the organisation's culture, events, behaviours, and actions of

people, and facilitates exploring unforeseen relationships (Covaleski & Dirsmith, 1990, p. 544). Compared to quantitative approaches, qualitative research is considered more *"sensitive"* to complex environments (Bryman, 1984), thus providing a much better understanding of the processes or sequence of events. This is particularly important for this study which seeks to understand the complexities surrounding the identifying and rendering accountability for research commercialisation. Hence, given the complex nature of this study, the use of qualitative approaches and relevant methodology is warranted.

Qualitative research can be conducted using a variety of strategies[18] such as case study, phenomenological and ethnomethodological techniques, grounded theory, ethnography, and biography (Creswell, 1997; Denzin & Lincoln, 2005). In order to choose an appropriate research design, the researcher must consider the purpose of the study and select strategies and specific methods that are most effective in collecting and analysing data to address the specific research questions that have been presented (Denzin & Lincoln, 2005; Marshall & Rossman, 1999). In this study, case studies have been used as the appropriate research strategy. The rationale and discussion of the use of case studies follows next.

4.4 *The Case Study Approach*

The use of case studies is a research strategy commonly used to understand complex social phenomena at all levels - individual, group, organisational, social, and political, or any related phenomena (Yin, 2003, 2009). According to Yin (2009, p. 18), a case study is *"*an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*"*. He explains that it is "an all-encompassing method covering the logic of design, data collection techniques, and specific approaches to data analysis" that relies on multiple sources of evidence and benefits from the prior development of theoretical propositions to guide data collection and analysis (Yin, 2009, p. 18).

---

[18] Each of these strategies is connected to a complex literature (Denzin & Lincoln, 2005, p. 25) and discussing each of these approaches is beyond the scope of this chapter.

Given the wide research capabilities, the use of case studies is an ideal research strategy to investigate accountability approaches to research commercialisation in a variety of organisations in this context. It is deemed appropriate for this research because it allows flexibility to help uncover extremely rich, detailed, and in-depth information arising from real-life contexts which cannot be manipulated directly. Its research scope is adaptable and its focus can be expanded or shifted, as necessary, to show different perspectives on the problem, processes, and issues bounded over time and place. In this study, utilising a case study research strategy provides a holistic description and deep understanding of commercialisation practices and interrelated activities, including those of the actors involved either directly or indirectly in the commercialisation process. This research strategy is appropriate in sourcing meanings and understanding of knowledge through interviews, observations, discussions, and documentary analysis.

Corcoran, Walker and Wals (2004, p. 11) provide further clarity by describing case study research as "a study of practitioners' actions and the theories they hold about their actions". They explain that case study research will enrich the understanding and improvement of practice (both technical and normative) when practitioners are confronted with their own and others' theories and belief systems to bring about change (Corcoran et al., 2004). Case study method also informs theory by providing a deeper understanding of phenomena and opens the door to the *"sense making"* process (Berg, 2007). Yin (2009, p. 35) endorses theory development prior to any data collection as an important part of research design since it provides guidance on which data to collect and what approaches are to be used for analysing data. According to Yin, that is the point of difference between case studies and related strategies such as ethnography and grounded theory. Finally, the use of case studies is the appropriate strategy in the context of the study since the central research question of the study is a *"how"* question, and according to Yin, case studies are the preferred method when *"how"* or *"why"* questions are posed (Yin, 2009, p. 2).

There are many different case study research methods depending on the purpose of the study, size of study, people involved, theories developed and the theories tested (Corcoran et al., 2004). The three most common types of studies determined by the

purpose they serve are exploratory, descriptive, and explanatory case studies (Yin, 2009, pp. 7-8). An exploratory case study may be seen as a prelude (pilot study) to a more comprehensive study (Berg, 2007) with the goal to develop an appropriate theory and propositions for further inquiry (Yin, 2009). This implies that an exploratory study will be undertaken when the existing knowledge base is poor and does not lend itself to development of good theoretical statements. The descriptive case study requires the researcher to present a descriptive theory and the goal is to describe the incidence or prevalence of a phenomenon (Yin, 2009). An explanatory case study is suitable when conducting causal studies, particularly in very complex and multivariate cases with a plurality of influences (Berg, 2007). Here, pattern-matching techniques could be used to relate several pieces of information to a theoretical proposition. Even though each type of case study has its distinct characteristics, according to Yin (2009), the boundaries between the methods are not sharp and there are large overlaps among them. Therefore, Yin contends that the goal is to avoid gross misfits and it may be most appropriate to take an inclusive and pluralistic view. Going even further, Gillham (2000, p. 96) believes that "it is not enough to be descriptive, you have to be able to explain what you find."

The current study can be classified as both descriptive and explanatory. It is descriptive because it is describing the themes and patterns, activities, and causal linkages aimed at enhancing understanding of accountability practices enabling commercialisation of research. It is explanatory because the study makes comparisons of case data by looking at patterns and themes and, through the rigours of interpretation, provides explanations of the phenomenon of interest. Bringing data to bear on explanations requires interpretation. According to Patton (2002), statements about how one thing leads to other things and how processes lead to outcomes are natural areas for interpretation and theorising. Interpretation involves going beyond the descriptive data and attaching significance and meanings, making sense of findings, and considering causes, consequences and relationships (Patton, 2002, p. 480).

Case studies can be designed as either single or multiple cases, using holistic analysis of the entire case or an embedded analysis of a specific aspect of a case (Creswell, 1997; Yin, 2009). Yin (2009, p. 49) provides five rationales for using the single case study, as

follows: when it represents a critical case in testing a well-developed theory; where the case is an extreme or unique case; when it is a representative or typical case; where the case is of a revelatory nature; or when it is a longitudinal case. However, he advises that, when given the choice and resources, multiple case designs, even with two cases, will be preferred over single case designs. This is because the analytical benefits of using two or more cases may be substantial, with the possibility of replication or contrasting situations making the study more robust.

This study has used a multiple case design comprised of three cases, thus allowing for both within-case analysis and cross- or between-case comparison, as detailed by Eisenhardt (1989), Miles and Hubermann (1994), and Yin (2009). The use of multiple cases is considered to provide more compelling evidence that adds credibility and confidence to the findings (Miles & Hubermann, 1994, p. 29; Yin, 2009). It leads to better understanding and better theorising compared to a single case approach (Stake, 2005, p. 446). Evidence from multiple cases vastly strengthens the results by replicating the pattern-matching, thus increasing the robustness of the theory (Yin, 2009, p. 53).

4.5 *Data Collection*

The qualitative case study design requires a systematic approach to collecting, organising, and analysing data. The data collection strategies must ensure the gathering of comprehensive, systematic, and in-depth information about each case of interest.

4.5.1 Case Selection

In choosing what case to study, a purposeful sampling methodology has been employed. The logic and power of purposeful sampling, also referred to as purposive or judgement sampling, lie in selecting information-rich cases to illuminate the questions under study and provide for in-depth understanding rather than empirical generalisations (Patton, 2002, p. 230). According to Stake (2005, p. 451), cases that offer the most opportunity to learn should be selected, and that may mean taking the most accessible or the one we can spend the most time with. The case selection based on purposeful sampling allows one to learn a lot about issues of central importance to the purpose of the inquiry (Patton, 2002). An ideal case site is where entry is possible; a rich mix of people, processes, structures,

and interactions is present; the researcher and participants have a trusting relationship; the study can be conducted and reported ethically; and data quality and credibility of the study are assured (Marshall & Rossman, 2006, p. 62).

Purposefully selecting information rich cases requires different sampling strategies. Patton (2002, pp. 242-244) presents a range of sampling strategies and emphasises that they are not mutually exclusive, and that the sampling strategy and sample size must be selected to fit the purpose of the study, the resources available, questions being asked and the constraints being faced. Using Patton's (2002) classification, this study utilises the mixed sampling strategy within the purposeful sampling framework. It combines elements of intensity sampling, criterion sampling, theoretical sampling, maximum variation and stratified sampling.

4.5.2 Research Sites

As explained previously, multiple case designs involving three separate TEIs have been chosen as cases to make the study more robust for the purpose of providing rich descriptions and compelling explanations (Yin, 2009). The three cases in the sample are designated as "Premier", "Universal" and "North-West"[19]. All three cases were chosen based on a predetermined criterion of involvement in commercialisation activities as well as their potential manifestation or representation of the theoretical constructs. Hence theoretical sampling, a more conceptually-oriented version of criterion sampling, applies as it allows elaboration and examination of the theoretical constructs and its variations (Patton, 2002). All three cases also allow for maximum variation in the sample based on their diverse characteristics such as size, age, nature of institution and variations in approaches to commercialisation.

Premier is a high-ranking, research intensive TEI in New Zealand with a mission to be a research-led international university. It is also one of the oldest universities established in New Zealand. Premier has been involved in commercialisation of research activities for over twenty years, making it one of the earliest universities in New Zealand to be involved in commercialisation. It has a separate commercial company considered to be

---

[19] The names of the TEIs have been changed to maintain the anonymity of the interviewees.

one of the largest university commercialisation companies in Australasia. The commercial company handles all commercialisation activities that are kept separate from the university operations. The commercial company operates on a pure business model where it generates its own revenue, pays all its expenses, and returns an operating surplus to the university. Based on its intense manifestation of the phenomenon of interest, namely, the institution's deep involvement in commercialisation activities, it could also be argued that the logic of intensity sampling applies to Premier University.

Universal is a new university with commercialisation at an early stage of development. It is one of the fastest growing universities in New Zealand and has placed major emphasis on developing its research capability. In recent years, it has made a major commitment to commercialisation of its research. Universal is new to commercialisation and has a commercial company that has been in operation for the past five years. In contrast to Premier, Universal's commercial company is integrated and supported within the university structure. It is likely to remain that way until such time as it is able to start generating sufficient revenue to support its entire commercial operations.

North-West describes itself as an innovative and entrepreneurial TEI based on its range of programmes and activities. It regards itself as a dual-sector institution offering university-based programmes at both undergraduate and postgraduate level as well as community-based programmes. It was one of the first TEIs in New Zealand to offer postgraduate programmes in innovation and entrepreneurship and to set up business incubation and development facilities. The institution has an applied research focus and commercialisation is still in its infancy stage. Unlike the other two TEIs, North-West does not have a separate commercialisation company, and schools and departments are largely responsible for commercialisation activities within their own disciplines. Recently, the central research office has taken over the co-ordination role to ensure that appropriate policies and procedures are followed and that commercialisation opportunities are not lost.

Given that each sample TEI represents a different model of commercialisation with maximum variation, there is ample opportunity for capturing uniqueness and describing

the central themes that cut across the marked variations (Patton, 2002, pp. 234-235). The major strength of this study is that any common themes from the three cases take on added importance because they emerge out of heterogeneity, thus making the findings of high quality. The three TEIs are also representative of a stratified sample of above average, average, and below average cases of commercialisation that will allow the capture of any major variations as well as identifying a common core. The benefits of the mixed sampling strategy are its flexibility, potential contribution to triangulation of perspectives, and its ability to meet multiple needs and interests (Patton, 2002).

4.5.3 **Unit of Analysis**

Decisions about appropriate units or units of analysis to be studied are an important component of the research design and data collection strategy (Patton, 2002; Yin, 2009). According to Yin (2009, p. 30), the definition of the unit of analysis (or "case") is related to the primary research questions which, if accurately specified, should lead to the favouring of one unit of analysis over another. Patton (2002, p. 229) explains that the key to selecting and making decisions about the appropriate unit of analysis is to decide what it is you want to have findings about at the end of the study.

The primary research question for this study is to determine how TEIs identify and render accountability for research commercialisation. The main unit of analysis is the TEI (organisation) which is the level being addressed by the main study question. Within the TEI is the embedded commercialisation unit amenable to a more focussed approach and providing rich meanings sought in the study. Hence, the case study also contains embedded units of analysis which are the commercialisation and research units within TEIs. Data collection from these embedded units enables the study of specific phenomena in operational detail. However, this study has not been undertaken in isolation from the broader institutional issues related to managing accountability for research and commercialisation. Yin (2009, p. 88) warns about the undesirable confusion between the unit of data collection and unit of analysis. He clarifies the situation by stating that the unit of analysis of the case study may be an organisation on which findings are based, but the unit of data collection may be from individual sources that belong to the organisation. Therefore, protocol questions need to be about the

organisation and not the individual. In this study, the unit of analysis is the organisation on which findings are based, but data collection is from multiple sources in an attempt to build an in-depth picture of each case under study.

4.5.4 **Gaining Access**

Gaining access to the research site is a fundamental issue that confronts all researchers (Baxter & Chua, 1998). As Baxter and Chua (1998, p. 70) explain, getting access to an organisation enables proprietary documents to be viewed and copied; organisational participants can be interviewed; and organisational functioning and processes can be observed and experienced in a real-life setting. These internal organisational perspectives and experiences cannot be obtained by relying solely on publicly-available documents and public accounts of organisational activities and processes.

In this study, gaining entry to the research sites and obtaining data was largely a matter of establishing trust and rapport with appropriate gatekeepers (Patton, 2002). The researcher sought access to the three case study sites and eight contextual sites (Ministry of Education, Tertiary Education Commission, a spin-off company, a professional business advisory organisation, three international research universities, and a local research partner institution). For all three case sites, the most senior appropriate manager was approached via an email explaining the purpose of the study and the information required. It was not uncommon for this senior manager to then forward this request to other more appropriate senior management staff for commercialisation. Access was then negotiated directly with appropriate senior management staff who had agreed to be interviewed. The researcher also made direct phone and email contact with other key research and commercialisation staff within or related to the organisation.

At the three main research sites and the eight contextual sites, additional key contacts were established by referral (see Appendix 1 for a complete list of interviews). The researcher also took every opportunity to attend seminars, workshops, and research presentations relating to commercialisation, providing valuable opportunities to establish contacts with some leading experts from academia as well as practitioners from business and industry. An information sheet (see Appendix 2) was provided outlining the purpose of the study, research method, information required, and extent of employee involvement.

Participants were required to sign a consent form (see Appendix 3) giving their formal approval to participate in the study.

4.5.5 **Piloting of Data Collection Instruments**

The conduct of a pilot study serves as a useful final preparation for data collection. It helps refine data collection plans with respect to data content and procedures to be followed, including the development of relevant lines of questioning. It also helps provide conceptual clarification for the research design (Yin, 2003, p. 79).

For this study, the researcher recognised the complexities of data collection from interviews and used his initial experience in the field to trial case protocols, develop relevant lines of interview questions, and build further experience in interviewing techniques. The researcher conducted two pilot interviews. Interview questions were directed towards encouraging the participants to reflect on their perceptions of TEI engagement in research commercialisation activities. The aim was to help uncover the participants' views and allow meaningful perspectives to emerge (Marshall & Rossman, 2006). Following the pilot interviews, the researcher analysed the data and reflected on the findings as well as the interview process itself. Much confidence was gained from this preliminary work. Reflections on the interview process led the researcher to rethink the use of some of the probe questions in the pilot study. Although the interview guide served its purpose, some minor revisions were made to ensure that more attention was given to the use of less directive probe questions. Further refinement of the interview questions was also aimed at achieving greater consistency in the line of inquiry. Appendix 4 provides a list of the interview questions that guided the study.

4.6 *Multiple Sources of Evidence-Triangulation*

Yin (2009) recommends six sources of case study evidence: documentation, archival records, interviews, direct observation, participant-observation, and physical artifacts. While no single source has a complete advantage over others, they are highly complementary, and a good case study will use as many sources as possible (Yin, 2009, p. 101). According to Patton (2002, p. 306), no single source of information can be trusted to provide a comprehensive perspective on the program, hence, multiple sources

of information are sought and used. In this study, the researcher chose an array of data collection methods relying on the strengths of each method to help elicit the desired information. Multiple data sources enables triangulation and helps validate and cross-check findings as the strengths of one method can compensate for the weaknesses of another (Marshall & Rossman, 2006; Patton, 2002). The case study evidence for this research is based on interviews, documentation, archival records, direct observation and participant observation, which are discussed in the following sections.

4.6.1 Interviews

Case study researchers rely extensively on interviews as one of the most important and essential sources of rich, in-depth, experiential information (Fontana & Frey, 2003; Marshall & Rossman, 2006, p. 108; Yin, 2009, p. 106). Interviews are active interactions between two or more participants leading to construction of research relevant knowledge around questions and responses (Holstein & Gubrium cited in Fontana & Frey, 2003).

One particular strength of interviews lies in the importance given to their focus on allowing the researcher to understand the meanings the participants hold about their organisation and its structures, systems, processes, and everyday activities (Easterby-Smith, Thorpe, & Lowe, 2008; Marshall & Rossman, 2006). It is a useful way of targeting the phenomenon of interest and gathering large amounts of information quickly across a large number of participants while allowing immediate follow-up and clarification (Marshall & Rossman, 2006). Interviews can be insightful as they can record the facts of the matter, opinions, attitudes, feelings, and emotions. The flexibility inherent in some forms of interviewing enables the researcher and research participants to move back and forth between past, present and future via the processes of reconstruction, interpretation, collaboration and prediction (Cohen & Manion, 1994; Marshall & Rossman, 2006; Yin, 2009).

The interview as a data collection method also poses several challenges to the researcher. A common challenge is to choose well-informed respondents who can be depended upon to provide important insights into the phenomenon (Yin, 2009). Once the interviewees have been determined, there is the further challenge of getting the chosen participants to co-operate as it is essential to the success of the case study research (Marshall &

Rossman, 2006). At the same time, the researcher needs to be cautious about becoming overly dependent on a key informant (Yin, 2009). The interviewees' responses are subject to limitations and weaknesses of reflexivity, where the respondent provides the answer which they believe the interviewer is seeking; bias resulting from poor or inaccurate articulation of research questions or in relation to the respondent's answers; poor respondent recall; respondent discomfort in disclosing sensitive information; and the time-consuming nature of interviews (Burns, 2000; Cohen & Manion, 1994; Easterby-Smith et al., 2008; Marshall & Rossman, 2006; Yin, 2009). A reasonable approach to limit some of these weaknesses is to triangulate or corroborate interview data with data gathered from other sources (Marshall & Rossman, 2006; Yin, 2009).

There are different types of interviews available to the researcher distinguished by the degree of structuring, formalisation or standardisation. At least three major categories most commonly identified are the structured (standardised or formal); unstructured (non-standardised or informal); and semi-structured (semi- standardised or focussed) (Berg, 2007). In structured interviewing, all respondents are asked exactly the same set of pre-established questions in the same order or sequence (Fontana & Frey, 2003). The inflexible nature of interviewing as a result of asking the same questions minimises the impact of the interviewer on response quality, especially where a number of different interviewers must be used (Fontana & Frey, 2003). It also makes data analysis much easier since responses can be easily matched to the standardised questions (Patton, 2002). However, by eliciting rational responses, it overlooks the social interaction context that can influence the responses (Fontana & Frey, 2003).

Unstructured interviewing, also referred to by Patton as the informal conversational interview, is the most open-ended approach to interviewing relying entirely on the spontaneous generation of questions in the natural flow of interactions (Patton, 2002). According to Patton, this approach to interviewing offers flexibility and spontaneity with the interviewer free to go with the flow wherever the data and respondents lead. It takes account of the individual differences and immediate surroundings that can influence responses. It relies on the conversational skills of the interviewer and because different

questions will generate different responses, large amounts of the data collected may be difficult to analyse (Patton, 2002).

The semi-structured interview is located between the extremes of completely structured and completely unstructured interviewing. It allows some systemisation to ensure that the same basic lines of inquiry are pursued, but the interviewer is also allowed the freedom to digress and probe far beyond the answers to their standardised questions to elucidate and illuminate a particular subject area (Berg, 2007; Patton, 2002). This approach is necessary to reflect awareness that individuals understand the world in varying ways and the interview process must capture the individual's perspective and experiences (Berg, 2007). Thus, the interviewer has the freedom to word questions spontaneously and build a conversation within a particular subject area or topic of interest (Patton, 2002). A semi-structured interview offers significant advantages when time is limited and specific issues need to be explored. It makes interviewing a number of different people more systematic and comprehensive and helps keep the interactions focussed while allowing individual perspectives and experiences to emerge (Patton, 2002, pp. 343-344).

In this study, forty-seven face-to-face interviews, each lasting between half-an-hour to one-and-a-half hours were conducted between December 2007 and September 2009. Appendix 1 provides a full list of interviews with dates. Forty interviews were of a semi-structured nature and seven interviews were informal conversational. In order to gain rich data related to enabling commercialisation of research, the study targeted CEO's of commercialisation and spin-off companies, commercialisation managers, research directors, researchers, senior academics, policy-makers, planning managers, finance managers and other "gatekeepers" within each TEI (refer Table 4.1 below). It was important to ensure that the perceptions and experiences of a variety of individuals, who were posited differently within the research and commercialisation activities of the TEIs, were gathered. The major strength of the face-to-face interviews was the "richness" of communication that was possible with people willing to talk about things they would not normally disclose in an anonymous questionnaire (Gillham, 2000, p. 62). All formal interviews except for one were held in the participant's office, thus ensuring a natural setting that enabled the participants to interact with the researcher in their own

environment on their own terms. One interview scheduled outside office hours was held in a café at the request of the participant to make it more convenient for her. Three interviews were also conducted with senior tertiary policy and funding managers within the Ministry of Education and the Tertiary Education Commission in Wellington to gain an understanding of the government's role in encouraging commercialisation at TEIs, their performance expectations, and accountability and reporting requirements. Three interviews were conducted at international research universities in Australia, and three further interviews with research organisations were conducted in Christchurch. Additional perspectives were also gained from industry sources through informal conversational interviews.

Each participant was given an information sheet[20] detailing the purpose of the study and their rights and obligations (Appendix 2). Before commencing the interviews, participants were required to sign a consent form giving their approval to participate in the study and their understanding of the study's objectives (Appendix 3). All interviews for which consents were obtained from participants to be taped were later transcribed. Consent to tape record was not obtained for two formal interviews and seven informal interviews. Notes were also made during the interview, and directly after the interview, to ensure that data was not lost in the event of the audio-recording failing and also to account for any additional observations that were not captured on tape.

Table 4.1: Interview Categories and Numbers

Interviewee Categories	Number of Interviewees
CEO/Director/Manager, Commercialisation & Spin-off company	7
Director, Research Institutes/Centres	7
Director's & Manager's – Finance/Policy/ Planning	7
Researchers/Research Professor's/ Senior Academics	13
Government Sources	3
Industry Sources	4
International Research Institutions	3
Other Research Institutions	3

---

[20] As the study progressed, the focus of the study was narrowed down to commercialisation of research and IP. The information sheet was revised to reflect this change in focus.

4.6.2 **Documents and Archival Records**

Documents and archival records provide an important and valuable source of case study evidence. They have the advantages of being unobtrusive, being able to be reviewed repeatedly, and can provide exact details as well as a broad coverage in terms of time, events, and settings (Yin, 2009, p. 102). They are also considered to be rich in portraying the values and beliefs of participants (Marshall & Rossman, 2006, p. 107). According to Yin (2009, p. 103), the most important use of documents in case studies is to corroborate and augment evidence from other sources, such as interviews. However, documents may be difficult to find or access to them deliberately withheld; collection may be incomplete leading to biased selectivity; or they could be subject to author bias (Yin, 2009, p. 102). In light of these difficulties and to maximise their overall value, systematic searches for relevant documents are, therefore, important in any data collection plan when undertaking case studies (Yin, 2009, p. 103).

A broad range of documents and archival records were accessed and analysed for the period 2002-2010 during this study (refer Appendix 5 for document types and period covered). The documents included TEIs' charters, profiles, strategic plans, investment plans, organisation charts, annual reports, research reports, newsletters, research and commercialisation policies, commercial company and research institute web pages, performance data and publicity materials. Internet searches produced invaluable information regarding the history and context surrounding the TEIs and their commercialisation activities. A review of documents and archival records prior to and during site visits proved valuable as it facilitated direct learning and provided insightful sensitising information. Documents also served as a stimulus for points of further inquiry and the development of appropriate probe questions that were used during interviews. Most importantly, the wide range of documents used in this study helped corroborate and augment evidence from interviews and observations. Where the institutional rhetoric and inferences as conveyed in the documents were found to be not corroboratory or contradictory, they were then subject to further investigation.

4.6.3 **Direct Observations**

Direct observations are another useful source of evidence in case study research (Yin, 2009). In this study, the site visits to the natural settings of the case provided opportunities for direct observations and personal contact. The key strengths of direct observation include better understanding of context and reality, and provide first-hand experience of the phenomena under study. There is also an opportunity to see things that participants may overlook or be unwilling to disclose (Patton, 2002; Yin, 2009). Its weaknesses include its selective nature due to time and cost constraints and the potential for reflexivity, implying that events proceed differently because they are being observed (Yin, 2009, p. 102).

In this study, the informal direct observations were made of research and commercialisation facilities and infrastructure throughout the field visits. This helped reconcile the nature and extent of TEIs verbal and documented commitment to commercialisation against the actual existence and adequacy of such activities and facilities. For example, a visit to the commercial company and the spin-off company facilities enabled the researcher to gain first-hand knowledge of their size, capability, and scale of operations. The researcher also attended a number of meetings, presentations and workshops on research commercialisation (refer Appendix 6 for details). This enabled the researcher to gain a better understanding of how commercialisation was actualised at the TEIs. It also allowed the researcher to acknowledge and make observations of potential obstacles and challenges of commercialisation that may have been missed by other data collection methods such as interviewing or review of documents.

All the participants were made aware that the researcher was observing the event or situation on hand, satisfying any ethical concerns. Field notes were taken during the observational phase of the study and dated at the time of data collection. Field notes briefly described the situation on hand, where and what occurred, what the setting was, who participated in it, and the researcher's opinions and feelings towards the situation. These notes were taken to reduce the threats of validity and reliability from observer bias (McKinnon, 1988).

4.6.4 **Participant-Observation**

Participant-observation has been described by Yin (2009, p. 111) as a special mode of observation in which the researcher is not merely a passive observer but assumes a variety of roles within the case study situation. According to Marshall and Rossman (2006, p. 106), the first-hand involvement or immersion allows the researcher to hear, see, and experience reality and learn directly from his own experience of the setting. In this study, the researcher is also a participant-observer based on his current and previous employment in two case study institutions chosen for this study. The contractual employment and consulting relationships with two of the institutions included a variety of roles. They were in teaching and other administration roles in financial and management accounting with responsibilities for overseeing the funding, financial management, and the development of appropriate accounting and reporting systems that included research and commercialisation (entrepreneurial) activities. These experiences placed the researcher in an enviable position of an insider with an emic perspective (Patton, 2002). Over an extended period of time the researcher has developed an insider's view into the research and commercialisation activities of both institutions. Not only has the researcher observed what is happening, but he also feels what it is to be part of the setting. These perspectives have given the researcher a unique insight into the gap between the rhetoric and the actual behaviour relating to the development of research and commercialisation processes at those two institutions.

4.7 *Data Analysis Strategies*

Data analysis is the process of organising, structuring, and making sense of large quantities of collected data (Patton, 2002). It involves a search for general statements or themes among categories of data for the purpose of demonstrating the extent to which it represents the social phenomenon or truth (Marshall & Rossman, 2006). Similarly, data analysis, as defined by Miles and Hubermann (1994), consists of the concurrent flow of activities of data reduction, data display, and conclusion drawing and verification. Data reduction occurs through coding, writing summaries, and developing themes or patterns. Many data analysis techniques exist in literature, but there is no single correct formula, cookbook recipe or superior technique that offers better analysis (Coffey & Atkinson, 1996; Patton, 2002; Tesch, 1990; Yin, 2009). As noted by Patton (2002, p. 432), when no

formula or recipe exists for the transformation of data into findings, guidance and directions can be offered, "but the final destination remains unique for each inquirer, known only when – and if – arrived at". Yin (2009, p. 126) offers four general strategies that underlie the analytic techniques or approaches for conducting case study analysis – relying on theoretical propositions, developing a case description, using both qualitative and quantitative data, and examining rival explanations. This study relies on its theoretical propositions which, according to Yin (2009), is the most preferred strategy because the case study design including the research objectives and questions, literature reviews, and theoretical foundations of the study were originally based on such propositions.

Different researchers may use different techniques or approaches to transform the same data into findings. However, the analysis should be methodical, flexible, reflexive, and intellectually rigorous (Coffey & Atkinson, 1996, p. 10). Tesch (1990) points out that data analysis on the whole should be a data-led, inductive activity, and refers to de-contextualization and re-contextualization as a process whereby information is reduced into patterns, categories and themes. In this study, data analysis occurred on an ongoing basis with enough flexibility at each stage to allow for new data to be collected and analysed, when necessary, to strengthen interpretation. Following Marshall and Rossman (2006) and Yin (2009), the research questions and theoretical framework developed earlier in the study were used as guidelines for data analysis.

4.7.1 Analytic Procedures

The data analysis process undertaken in this study broadly follows the analytic procedures described by Marshall and Rossman (2006, pp. 156-164) and Tesch (1990, pp. 142-145). According to Marshall and Rossman (2006), typical analytical procedures fall into seven phases, as follows:

a) organizing the data
b) immersion in the data
c) generating categories and themes
d) coding the data
e) offering interpretations

f) searching for alternative understandings, and

g) writing the report or presenting the study

Phases (a) to (d) of the analysis entail data reduction, while phases (e) and (f) are concerned with interpretation. In terms of organising the data, it was important to get all data into a format suitable for further analysis. Raw data collected from interviews were transcribed and saved in Word files. Separate files were created for each interview data and the individual files were organised using separate interview folders created for each case study institution. Similarly, documents gathered and field notes written throughout the data collection process were organised in separate Word files and document folders. All files recorded the type of data according to the date, time, place, event, and participants. Proper file organisation facilitated retrieval, browsing, copying and editing of data. A qualitative research software package, NVivo8[21], was used by the researcher to assist in the data organisation and management. NVivo8 enables data to be directly downloaded from the Word files and organised into file directories according to various sources, such as interviews, documents, etc. for further analysis. Not only does NVivo8 encourage the creation of documents as early as possible in the data collection process, it also allows for coding during the writing, and editing while coding, or as progressive understanding of the data grows. Coding itself is a useful procedure in the organisation and retrieval of data (Miles & Hubermann, 1994). The data organisation part involves a system for categorisation of various chunks of data to enable the researcher to quickly locate, retrieve, and cluster the segments relating to a particular research question, construct, or theme (Miles & Hubermann, 1994, p. 57).

In terms of immersion in the data, the researcher read and re-read the data collected from all sources to become intimately familiar with the material and to ensure that careful reduction of data took place. A wide range of documents were gathered throughout the study which were often lengthy and varying in format. The contents of these documents were reduced and placed in the context of the present study using a document summary form (see Miles & Hubermann, 1994 for an example). The document summary form

---

[21] NVivo8 software was developed by Qualitative Solutions and Research (QSR) International Pty Ltd. See http://www.qsrinternational.com/products/productoverview/NVivo_7.htm for further information.

helped clarify and summarise the data in a form that was more meaningful and could be used for further analysis.

The next phase in the data analysis undertaken by the researcher was to generate categories and themes, and code the data. Miles and Hubermann (1994, p. 56) describe codes as "tags or labels" attached to chunks of data to provide meaning and facilitate interpreting and drawing conclusions. Coding is about linking data fragments to a particular idea, topic, theoretical concept or theme (Coffey & Atkinson, 1996). Hence, careful attention was paid to develop codes that best represent the meaning of the data in a fairly consistent manner using the research questions and theoretical concepts developed earlier in the study. Coding definitions were reconfigured as required by the emerging analytical themes. Initially, the researcher utilised Tesch's (1990, pp. 142-145) guide to data analysis by starting with a simple document to get "a sense of the whole". Three interview transcripts were analysed using this approach, after which data were directly input into NVivo8 software for coding and to help generate themes (called nodes in NVivo8). Because of the abundance of data, this stage was very time-consuming. However, having a computerised data base with files organised in Word format allowed data to be directly imported into NVivo8 to enable coding to take place. As the researcher developed ideas, concepts, and categories for understanding the data, they were content analysed and coded into nodes. A node is a container for categories and coding. Nodes can be linked in many ways to generate themes, patterns, and understanding about data. "The term pattern usually refers to a descriptive finding", whereas "a theme takes a more categorical or topical form" (Patton, 2002, p. 453). When dealing with complex data, NVivo8 can help represent it by linking ideas in trees of nodes which can be filtered, changed or displayed in different ways by utilising the modelling capability of the software. The main advantages of using NVivo8 for this study include its ability to facilitate in creating codes, moving coded data, merging codes during the coding process, and storage and display of data. At the end of each coding process, codes were checked and stored as free nodes or tree nodes in the database, and saved as a project created in NVivo8.

As categories and themes started to emerge from the data, it became necessary to offer interpretations to bring meaning and coherence to the emerging themes, patterns and categories. Patton (2002, p. 480) refers to interpretations as "attaching significance to what was found, making sense of the findings, offering explanations, drawing conclusions, extrapolating lessons, making inferences, considering meanings, and otherwise imposing order". During the interpretation phase, the researcher was engaged in determining the usefulness of data to inform discussions and illuminate the research questions. NVivo8 was particularly useful in offering many different modes of coding, data integration and data display to permit sense-making and rich meanings to emerge from the data. This phase involved evaluating the data for its usefulness and centrality (Marshall & Rossman, 2006) and, where variations were noted, alternative data were sought to test the validity (Patton, 2002; Yin, 2009).

The final phase before writing the report involved searching for alternative understandings and explanations. During this phase the researcher was engaged in critically challenging the apparent patterns and themes. This was important to help determine the most plausible explanations for data and linkages between them. Essentially, the apparent themes and patterns emerging from the data were tested against the predicted theoretical patterns to determine their validity (Yin, 2009). As stated by Patton (2002, p. 454), this confirmatory stage is deductive analysis to affirm the authenticity and appropriateness of the inductive content analysis of discovering patterns and themes in the data. Where considered necessary, an additional literature review was also conducted to "check out" the emerging themes for theoretical sensitivity.

4.8 *Research Limitations*

Although the case study research method makes it particularly appropriate to answer the research questions, the study also has its limitations relating to perceptions of subjectivity, potential for bias, and generalisability of findings and explanations. These limitations must be acknowledged and any validity and reliability concerns addressed if the findings of the study are to be considered credible (McKinnon, 1988; Patton, 2002; Yin, 2009).

4.8.1 **Subjectivity**

Case study research requires going into the field and getting close enough to the people and circumstances to personally understand and capture the realities and complexities of the situation being studied. While closeness to data sources makes in-depth understanding possible, critics of qualitative inquiry have criticised this approach as being too subjective (Patton, 2002). It compromises the objective nature of the positivist research tradition and the belief that the truth exists out there as an independent fact. However, as pointed out in the discussions on the research paradigm adopted for this study, reality does not exist objectively and independently from human experiences. Reality has a subjective meaning that is constructed and reconstructed through a human and social interaction process (Burrell & Morgan, 1979). Patton suggests moving away from terms such as subjectivity and objectivity, using instead trustworthiness, authenticity, and neutrality. In this study, the researcher relied on systematic data collection procedures, multiple data sources, triangulation and other techniques to ensure that the findings are credible, trustworthy, authentic, and balanced. These issues are discussed in the next section under the standards of quality.

4.8.2 **Researcher Effects**

The researcher's current and previous employment relationship with the case study institutions raises concerns for potential bias by going native. To avoid such bias, careful attention was given to suggestions made by Miles and Hubermann (1994, p. 266). In particular, the researcher avoided the "elite" biases by including people across different hierarchical levels, as well as some former actors and people outside the focus of the study who were able to provide background and historical information. The spread of informants allowed people's different perspectives and points of view to be considered. Site visits were also spread out and data was collected using several data collection methods over different time periods to provide triangulation and avoid being overly dependent on talk or observation to make sense of the settings. Potentially conflicting information was thoroughly verified from different data sources. At no point did the researcher demonstrate how much he knew and always kept the research questions firmly in mind, nor did he wander too far away from the questions when following exciting leads.

4.8.3 **Generalisability**

A further limitation concerning case study research relates to generalisability of findings and explanations. As with all case studies, generalisation to broader populations is not possible because there are too many elements that are specific and unique to the case being studied (Gillham, 2000). According to Stake (2005, p. 460), a *"case report is not to represent the world, but to represent the case"*. The aim is to provide rich contextual descriptions which place the onus of transferability to the reader rather than the researcher (Lincoln & Guba, 1985; Stake, 2005). Case studies, while not generalisable to populations or the universe, are generalisable to theoretical propositions referred to commonly as analytic generalisation (Firestone, 1993; Yin, 2009). Case study generalisations to theories help offer common explanations of events, or identify multiple events with common theoretical features (Cooper & Morgan, 2008).

4.9 *Standards of Quality*

The standards of quality refer to the criteria for assessing the "goodness" or "soundness" of the research (Marshall & Rossman, 1999, 2006). Lincoln and Guba (1985, p. 290) refer to this as establishing the "truth value", applicability, consistency, and neutrality of the study. Traditional research based on a positivist paradigm has used terms such as internal validity, external validity, reliability, and objectivity as tests of standards of quality. However, qualitative researchers such as Lincoln and Guba (1985) have argued for new concepts with different connotations to more accurately reflect the assumptions of the qualitative research paradigm. Patton (2002, p. 542) explains that qualitative research has diverse approaches to inquiry, thus requiring different criteria for judging quality from different perspectives within different philosophical frameworks. As a result, new concepts have emerged to distinguish quality in qualitative research. However, despite the subtle differences in meaning, some of the criteria within these frameworks overlap with those inherited from traditional social science research (shown in brackets). Some common concepts that have emerged as tests of quality in qualitative research include credibility (internal validity), transferability (external validity), dependability (reliability), and confirmability (objectivity) (Lincoln & Guba, 1985; Miles & Hubermann, 1994; Patton, 2002). When combined, these criteria help assess the

trustworthiness and authenticity (Patton, 2002) or reliability and validity concerns of qualitative research.

A discussion of the tests of quality, including the tactics used in this study, is described in the following paragraphs.

4.9.1 **Confirmability**

Confirmability (objectivity) emphasises neutrality and freedom from unacknowledged researcher biases (Miles & Hubermann, 1994). It is concerned with determining whether the logical inferences and interpretations of the researcher make sense to someone else (Marshall & Rossman, 2006). Lincoln and Guba (cited in Patton, 2002, p. 575) have suggested replacing objectivity with emphasis on trustworthiness and authenticity. In relation to case study research, Yin (2003) recommends establishing correct operational measures for the concepts being studied to overcome criticisms relating to "subjective" judgements used to collect data. He refers to this as a test of construct validity. Following Yin (2003, p. 34), the tactics used to increase the construct validity of the research included:

- Seeking multiple sources of evidence to take account of multiple perspectives, multiple interests, and multiple realities. As discussed previously, data was derived from document analysis, site visits, observations, as well as from interviews. This tactic was used to encourage convergent lines of inquiry. The use of multiple sources of evidence also helped provide a comprehensive perspective of the study.
- Establishing a chain of evidence. An audit trail was maintained through the use of NVivo8 which enables the coded data to remain readily auditable back to the transcripts and source documents, even when taken out of their original context.
- A draft copy of interview transcriptions was made available to the key informants for review. The researcher also read and re-read each transcript several times to ensure the accuracy of the transcriptions.

In addition, the following tactics, as discussed by Miles and Hubermann (1994), were used to enhance the objectivity and trustworthiness of the research:

- Emphasis on transparency - by inclusion of a full and detailed description of the study's general methods and procedures.

- Being as explicit and self-aware as possible about personal assumptions, values, and biases and their effect on the study. The researcher is committed to outlining the biases and the study's limitations.

4.9.2 **Credibility**

Credibility (internal validity) as described by Patton (2002) refers to the use of sound techniques and methods to ensure the integrity of the data collected and the analysis undertaken. The goal is to ensure that the subject was appropriately identified and described (Marshall & Rossman, 2006) so that the inquiry is "credible to the constructors of the original multiple realities" (Lincoln & Guba, 1985, p. 296). Miles and Hubermann (1994, p. 279) refer to this as arriving at "the crunch question: truth value", established by asking whether the findings make sense and are credible to the people being studied as well as the readers. The tactics used to improve the credibility of the evidence and research findings of the study included the following procedures:

- Triangulation - the researcher used multiple sources of evidence and data collection methods to search for consistency of information and help validate and cross check findings.

- Context-rich and meaningful (thick) descriptions of the settings, participants, and the themes of the study are provided (Creswell & Miller, 2000). A further tactic of following up surprises in data collection and analysis was used to generate rich data and ensure that novel insights emerged (Miles & Hubermann, 1994, p. 271).

- Negative evidence – the researcher searched for consistent themes and categories and then exhaustively pursued negative evidence in an attempt to disconfirm what appeared to be true (Miles & Hubermann, 1994, p. 271).

- Rival explanations were actively considered. Evidence about the possibilities of "other influences" was tested through rigorous data collection strategies (Yin, 2003).

4.9.3 **Transferability**

Transferability (external validity) refers to the usefulness of the findings to others in similar situations with similar research questions (Marshall & Rossman, 2006). Miles and Hubermann (1994) refer to transferability as the extent to which findings can be generalised or have a larger import to other contexts. Transferability or generalisability to other populations has already been discussed as a limitation to the case study research. However, analytic generalisation is considered more relevant as it helps offer common explanations of events and identifies multiple events with common theoretical features (Cooper & Morgan, 2008). Tactics used to improve the external validity of the study included:

- Use of prior theory– the theoretical framework developed in Chapter 3 provided the basis of prior theory against which results of a single case were tested to determine whether the findings are consistent or confirmatory of prior theory (Miles & Hubermann, 1994; Yin, 2003). This served as a vehicle for generalising to new cases.

- Use of replication logic - the prior theory was further tested by replicating the findings to two other cases to determine whether there was strong support for the theory. Once the results were accepted as providing strong support for the theory, analytical generalisation could be claimed (Yin, 2003).

4.9.4 **Dependability**

Dependability (reliability) is concerned with determining whether the study has been done with reasonable care, is consistent, and reasonably stable over time and across researchers and methods (Miles & Hubermann, 1994, p. 278). According to Yin (2003, p. 37), the goal of reliability is to minimise errors and biases in the study. Some common tactics used to improve the dependability and reliability of the study included:

- Researcher reflexivity – which involves clearly specifying the basic research paradigms and analytic constructs. As reliability depends, in part, on its connectedness to theory, it is necessary to inform the reader why particular theories and research methods were adopted (Creswell & Miller, 2000; Miles & Hubermann, 1994).

- Use of a case study protocol – which incorporates an interview question guide, document summary sheets, and reflexive diaries (Yin, 2003, 2009). The case study protocol is important to keep the researcher targeted on the subject of the study, forces the researcher to anticipate problems, and provides guidance on ways of completing the report (Yin, 2003, p. 69).

- Development of a case study database – a separate case study database was created and maintained in NVivo8. The database also stores interview transcripts and documents which help facilitate the traceability of the conclusions drawn from the case study report to their sources.

4.10 *Ethical Considerations*

Qualitative researchers are often faced with complex ethical issues. While it may not be possible to anticipate the full array of ethical challenges, it is important to "reveal an awareness of, an appreciation for, and a commitment to ethical principles for research" (Marshall & Rossman, 2006, p. 82). This study received the ethical approval of the Auckland University of Technology Ethics Committee (AUTEC) and was conducted under the guidelines and key ethical principles established by AUTEC. These relate to informed and voluntary consent; respect for rights of privacy and confidentiality; truthfulness including limitation of deception; social and cultural sensitivity; and avoidance of conflict of interest.

Obtaining informed and voluntary consent is a fundamental ethical commitment that insists on the subject's rights to be informed about the nature and consequences of their involvement in the research. As explained by Christians (2005, p. 144), proper respect for human freedom is based on the subject's right to voluntary participation (i.e., without physical or psychological coercion), and participation must be based on full and open information. In this study, each participant was given an information sheet that outlined the purpose of the study, their role and procedures relating to their participation, how the information will be collected and used, expected outputs, and potential benefits arising from the research. Each participant was also requested to sign a consent form stating that they had read and understood the information provided about the study and that they had

the right to withdraw, at any stage, without being disadvantaged in any way. Participants were also given access for verification purposes to a copy of their interview transcript.

Attention was paid throughout the study to respect the rights of privacy and confidentiality of participants. While it was not possible to guarantee anonymity in all situations, confidentiality was assured as the primary safeguard against unwanted exposure. The researcher demonstrated this commitment through the use of pseudonyms for the institutions. Any data that could identify individuals or the institutions in which they worked was also disguised. All interview transcripts and associated data have been kept safe and secure from interception or appropriation by unauthorised persons.

This study is based on informed consent of participants. The knowledge gained and richness of the information obtained during the course of the study depended heavily on the development of mutual trust and rapport between the researcher and participants. Although the research did not target any specific cultures or social groups, particular consideration was given to respect the values, practices and beliefs of the cultures and social groups of all participants. There is no conflict of interest between the duties and responsibilities of the researcher and his participants. Finally, this research has received no sponsorship, funding or commercial support that could compromise its adequacy or ethical integrity.

4.11 *Chapter Summary*

This chapter has described the research methodology and methods applied to the study that seeks to understand the complexities of identifying and rendering accountability to enable commercialisation of research at TEIs in New Zealand. It justifies utilising a case study research strategy to provide a holistic description and in-depth understanding of the commercialisation practices arising from real-life contexts. Strategies utilised in data collection and analysis are comprehensively described and justified. The chapter also outlines the standards of quality and the ethical principles guiding the study. The next chapter will provide a discussion of the research findings, including an analysis of significant cross-case issues arising from each case.

CHAPTER 5:   CASE STUDY RESULTS

CASE PREMIER

5.1 *Introduction*

Chapters 5, 6, and 7 provide the results of each of the three case studies undertaken in the study. The use of a multiple case study approach involving three separate TEIs was chosen in order to provide rich descriptions and compelling explanations (Yin, 2009). The three cases in the sample are designated as "Case Premier", "Case Universal" and "Case North-West". The names of the TEIs have been disguised and details that may identify the interviewees have not been provided to maintain the anonymity of the interviewees. All three TEIs are ranked among the top ten tertiary institutions in New Zealand and were chosen based on a pre-determined criterion of involvement in research commercialisation activities, as well as for their potential to allow elaboration and examination of the theoretical constructs and potential variations. All three cases were purposefully selected to also allow for maximum variation in the sample based on their diverse characteristics such as size, age, nature of institution and variations in approaches to commercialisation. The full justification for the selection of these cases has been provided previously in Chapter 4.

The results of each case study are presented in a similar format which roughly corresponds to the four research questions posed earlier in the study. After a brief case description, the institute's mission, strategy, and institutional drivers that provide an understanding of the accountability obligations towards enabling commercialisation of research are discussed (Research Question 1). Specific themes used in each case analysis involve the influence of government, the engagement with industry, researcher perspectives, international partnerships, the role of the wider community, and financial considerations. This is then followed by a discussion of the institutional processes and mechanisms employed to help manage accountability expectations (Research Question 2). The thematic structure used in each case analysis involved an assessment of the research and innovation culture, efforts aimed at building research capability and

capacity, structures, systems and processes, management of IP, rewards and incentives, governance mechanisms, risk management strategies, and leadership. To help determine appropriate levels of accountability discharge, performance measures and results of commercialisation are reviewed (Research Question 3), and the reporting strategies used by specific TEIs are critiqued (Research Question 4). This format is consistent with the conceptual dimensions and key theoretical elements of literature presented in Chapter 3, Table 3.1 and Figure 3.1. At the conclusion of each case, an analytical summary is tabulated and presented, thus allowing for a multiple case analysis from which cross-case issues and emerging themes are further explored in Chapter 8, and theoretical conclusions drawn in Chapter 9.

5.2 *Case Description*

Premier is among New Zealand's leading and largest TEIs in terms of student enrolments, research staff and concentration of research activity. Established over 120 years ago, it is also one of the oldest tertiary institutions operating in New Zealand. Premier prides itself on being a comprehensive, research intensive institution with an international reputation and is ranked among the world's top 200 universities by the Times Higher Education QS World University Rankings. It has a strong international focus with affiliation to various international research–led universities. Teaching and research at Premier are conducted over eight faculties, a large school, and two large-scale research institutes. Approximately 42,000 students on eight campuses are enrolled in a wide range of undergraduate and postgraduate programmes, covering Arts, Business, Education, Engineering, Law, Medical and Health Sciences, and Science. Premier has established itself as a major provider of postgraduate education and attracts staff and students from all over New Zealand and overseas. The institution is widely recognised for its leadership role in New Zealand's tertiary education system as it hosts several national Centres of Research Excellence (CoREs), is a recipient of a sizeable portion of government research grants, and obtains considerable non-government funding. It trains a significant proportion of the country's emerging researchers and some of its top researchers have been accredited with ground-breaking research across a wide spectrum of disciplines. Research and teaching are undertaken by over 2,000 academic staff

supported by a further 2,400 general staff. All academic staff are encouraged to engage in research, both pure and applied, across established and emerging disciplines, to advance the frontiers of knowledge and innovation.

Premier has over twenty years of involvement with commercialisation of research making it one of the earliest TEIs in New Zealand to be engaged in such activity. It has a wholly-owned subsidiary company governed by an independent board, which includes directors drawn from commerce and industry, to manage commercialisation activities. The mission of Premier's commercial company is to create opportunities based on advanced university research, technology and educational capabilities. It manages all of the university's commercial research and consultancy contracts in New Zealand and internationally, and is considered to be among one of the most successful university technology transfer companies in Australasia. The commercial company operates on a business model where it generates its own revenue, pays for all its expenses, and is required to return an operating surplus to the university. In its strategic plans, it has consistently set ambitious goals to substantially increase its externally-generated research revenue.

5.3 *Mission and Strategy*

Premier's mission is to be a research-led international university, recognised for excellence in teaching, learning, and research. As a research-led institution it seeks to make significant contributions to the intellectual development, research productivity, and development and commercialisation of its research to serve its local, national, and international communities.

To fulfil its mission and role in society, Premier recognises that research commercialisation is an important function of the institution that works together synergistically with teaching activities. As such, it has made a strategic commitment to actively engage in commercialisation of research alongside teaching and research. The commercialisation mission also signals Premier's firm commitment towards the government strategy for innovation, national development and growth. Premier's commitment to commercialisation is reflected in various documents including its charter,

profiles, and strategic plans. The charter is a statutory document[22] that guides governance and management of the institute. It defines broad strategies and sets out the institution's mission and role. The profile is an ex ante document of accountability that demonstrates how TEIs will give effect to their charter. It sets out agreed activities and associated objectives and targets against which the institution subsequently reports. From 2008, profiles have been replaced by investment plans which are rolling statements describing the TEIs plans and activities for the next three years, and also the base document which the Tertiary Education Commission (TEC) must utilise to fund TEIs. Premier has been one of the earliest TEI's in New Zealand to actively engage in research commercialisation. In its 2003 Charter, it publicly stated its commitment to the following institutional values:

"The development and commercialisation of enterprise based on its research and creative works. [Premier] plays a special role in the discovery and transmission of knowledge, and in technology transfer, both fundamental elements of wealth and well-being in the current world."

The charter was developed after a range of consultations with key stakeholders including staff and students, and was approved by the institute's governing body (council) and the Minister of Tertiary Education. Therefore, Premier's commitment to commercialisation has the support of senior management, key stakeholders, and government. Premier recognises that it requires a well-defined research strategy to fulfil its mission to be a research-led international university. As noted in its Profile 2005-2007:

" [Premier's] research strategy is to promote the value of research to the economy, society and community; to undertake high quality research which contributes to social, economic, and cultural development; to build and consolidate areas of research excellence in the wide range of disciplines expected in an international, multi-disciplinary university; to attract, encourage and retain the best possible researchers; and to provide the appropriate infrastructure and other resources to support research."

Premier also recognises that it needs a highly developed international research profile which is enhanced by its engagement in research commercialisation activities. Premier's

---

[22] Under amendments to the Education Act 1989 that came into effect on 1 January 2008, the Charter has ceased to be a statutory document. Premier has decided to retain its Charter which remains effective until December 2011.

Profile 2005-2007 specifically states that its success in developing an international research profile depends on key factors such as:

"A*n uncompromising commitment to excellence in all aspects of research endeavour from fundamental research, through innovation and applied/developmental research, to commercialisation."*

Premier also prepares a strategic plan that is approved by its governing council. The strategic plan provides Premier with broad strategies and operational priorities for engagement in commercialisation of research. However, it does not provide specific goals and objectives of research commercialisation. A review of Premier's strategic plans for the periods 2002-2004 and 2005-2012 indicates that its strategic priorities are largely influenced by the goals set by government as part of the nation's tertiary education strategy and national innovation strategy aimed at encouraging TEIs' engagement in research commercialisation. Premier's Strategic Plan 2005-2012 emphasises the need to substantially increase performance in research and demonstrate its commitment to innovation, discovery and wealth creation to support the institution's mission and values.

Premier has also made a strategic commitment to carry out research of a consistently high international standard, thus contributing to the global advancement of knowledge and to the nation's goals of innovation, economic and social development. Additionally, it remains committed to the development of its resources and infrastructure in ways which fully support its research, including making specialised expertise in the commercialisation of intellectual property easily accessible by its staff and postgraduate students. Premier's strategic plan forms the basis of institute-wide planning. Each faculty and research institute has developed a robust research plan aligned to Premier's strategic plan with the key focus on facilitating the best possible research outcomes in terms of Performance-Based Research Fund (PBRF) goals. Interviewees explained that their research focus on PBRF took priority because government funding for research was based on PBRF assessment, and funding largely influences their behaviour in terms of research engagement. It seems odd that despite a strong commercialisation mission, Premier has failed to operationalise research commercialisation in terms of specific goals and objectives. Interviewees explained that the uncertain context and long-term nature of

research commercialisation made it difficult to set clear goals and objectives. Premier's strategic documents, however, clearly identify that it has the responsibility and the capacity to help foster research commercialisation to help advance the country's identity and its economic, social and cultural development goals.

5.4 *Institutional Drivers*

A discussion of the institutional drivers of research commercialisation helps identify Premier's key stakeholders, and provides an understanding of the factors that impose accountability obligations. A combination of these institutional drivers and factors creates a much stronger accountability obligation towards enabling commercialisation of research. The following subsections describe the institutional drivers of research commercialisation at Premier:

5.4.1 **Government**

Premier operates in an institutional environment and is subject to the pressures of the regulatory environment impacting on research commercialisation. In New Zealand, the central government and its funding agencies provide the regulatory framework and establish policy and funding mechanisms to encourage commercialisation of research.

"We have to admit that government and its ministries are very influential in New Zealand because we are a big government country. It is still pretty much a socialist country, unlike USA, so influencing those policy-makers is important." (PU: CEO, Commercialisation)

Although there is no specific legislation in New Zealand requiring TEIs to engage in research commercialisation, the Education (Tertiary Reform) Amendment Act 2002 requires TEIs to enhance the contribution of New Zealand's research capabilities to national economic development, innovation, international competitiveness, and the attainment of social and environmental goals. Premier, as one of New Zealand's largest public-funded research institutions, is widely expected to engage fully towards the achievement of the government's innovation strategy. Its obligation is recognised through the commitment it has made in its strategic documents, that states:

"[Premier] supports the aim of the Government to strengthen research and the creation and uptake of knowledge so that the country can participate more fully in the development of knowledge societies and economies." (PU Profile: 2005-2007)

Interviews with government officials helped determine that the government recognises Premier is uniquely placed to provide R&D, innovation and technology transfer to meet the nations economic and social development goals. According to a Senior Manager, Tertiary Policy, the government is proactive in trying to create a framework and environment which enables commercialisation to occur more readily. It is very supportive of TEIs' research commercialisation efforts and sees commercialisation as an important economic opportunity. It has been drawn to Premier as a key driver of the knowledge economy based on its research capability and capacity. As was commented by PU: CEO, Commercialisation:

"It is recognised by some in government as well that there is more of an act of faith and it is obvious that you need to have a good vital research activity in your country if you want to participate in the knowledge economy".

Premier collaborates regularly with the government that provides funding incentives to coerce TEIs to increase the impact research has on national outcomes. A majority of government sponsored national CoREs are housed by Premier to demonstrate its commitment to research excellence in areas of national innovation priorities. CoRE represents the government's commitment to promoting collaborative research links between industry, government agencies, research organisations and TEIs. The government provides substantial research funding to Premier and expects to see tangible returns on its investment.

"We get the biggest pot of research money from New Zealand government and they are expecting or looking for what the research opportunities are going to be". (PU: Deputy Director, Research Institute).

To demonstrate its specific commitment to commercialisation of research, the government has established a Pre-Seed Accelerator Fund to support TEIs' efforts towards commercialisation of research. The government has contributed major funding to Premier through its Partnerships for Excellence scheme to establish large scale research institutes to work closely with multiple partners in the industry sector. The aim of the scheme is to develop innovative ideas and improve outcomes that will enable NZ industry to remain competitive in a rapidly growing world market. The government is also placing increased

emphasis on commercial outcomes from research due to increasing competitive global pressures on innovation. It has established a Trans-Tasman Commercialisation Fund; a collaborative venture of the Australian and New Zealand governments involving Premier, Australian TEIs, and businesses. The fund provides support for the commercialisation of intellectual property developed at these TEIs. Government has also collaborated extensively with Premier in organising national summits and has appointed some of Premier's top-ranked researchers on government committees to offer advice on national priorities for innovation. In collaboration with Premier, it piloted the formation of strategic advisory groups of business people to more closely align research and commercial opportunities. This initiative resulted in the formation of two new companies based on research at Premier. Interviews with government officials confirmed that the government provides the direction setting through the tertiary education strategy and also provides funding, but leaves the TEIs to determine how commercialisation is actualised at the institutional level. The government subsequently uses the public and government accountability mechanisms as a means of assessing what has happened.

5.4.2 **Industry**

Premier places high value on excellence in research which it considers as a defining feature of world-class universities. Some of its top researchers have been engaged in ground-breaking discoveries as a result of years of dedicated research. In this process of discovery, they have produced high quality research and intellectual property, a necessary condition for commercialisation. To enable commercialisation of these discoveries, heavy reliance is placed on connectedness with industry to adopt and further develop the research and technology. Premier has dedicated technology teams within its commercial company to work alongside researchers to promote and protect new technologies and explore commercialisation opportunities with industry. This clearly demonstrates a willingness to engage with industry, and it has reported success in establishing collaborative partnerships with companies through licence and purchase agreements to develop its technology. Fostering connectedness with industry provides benefits shared by both sides of the collaboration. This includes financial benefits as well as cultivating relationships by way of partnering with other companies. The following comments in Premier's 2005 Annual Report capture the nature and scale of such benefits.

"Commercialised by [Premier, this technology] *is now used by major industries around the world and has so far returned over $7 million in licensing fees to the university. Another* [Premier] *spin-out company... is developing* [this technology] *for use in its leading technology for wireless monitoring of biological functions."*

Many major corporations are looking more and more to TEIs as research partners as in-house R&D is abandoned in favour of innovation using external expertise. Premier has recognised this trend and has already started to capture some of the benefits of its research capability in health innovation, information technology, medical research and electronics by working with some of the most well-known companies in the world.

"The accelerating trend of outsourcing of research and innovation by many of the world's largest companies has created an opportunity for [Premier] *to position itself as a provider of a set of world-class capabilities."* (PU Strategic Plan: 2005-2012)

For Premier, fostering industry relationships has created opportunities for sponsorship and industry participation in research consortia. The government and industry funding support has helped create research institutes in health informatics, plastic, and timber innovation that operate at the forefront of New Zealand and global research. With increasing global pressures to access new ideas and skills, Premier is well supported by leading international companies such as IBM, Oracle, and Microsoft looking for joint commercial research opportunities to draw on existing projects underway at Premier. Funding from industry is used in various ways to build research capacity, for example:

"The money that we got ...was partly to fund the Manager ... and the rest was used for scholarships for students...we had a lot of research going on, a lot of interesting stuff, it was a hot topic..." (PU: Director, Research Institute).

Researchers and research scientists interviewed at Premier also place a lot of value on industry linkages to help create a high profile for their research teams, and are very supportive of industry to be productive and create wealth.

"I like the high profile of the research unit and I am excited by the possibility of building a much larger research centre. And, also, the aim would be to support the New Zealand industry so that they are more productive and create wealth." (PU: Researcher)

Premier sees industry linkages as not only valuable for the research income and sponsorship; they generate job opportunities for staff and students.

"It provides a real interface for our staff and students between their research and training, and commercial outcomes, and interface with business". (PU: CEO, Commercialisation)

Industry recognises this interface and large companies like Fonterra have expanded their relationship with Premier to include support for post-doctorate research fellows and research expenses. To support businesses, Premier has also been successful in helping incubate new business based on new technologies. Among them are some of the spin-out companies of Premier that have various staff members with the company. Premier hosts CoREs and has funding incentives to act commercially. Government funding is renewed every few years and industry provides matching funding. Apart from funding incentives, the Directors of the research institutes believe that effective collaboration with government and industry partners is fostered; national wealth is created; and the research reputation of the institution is enhanced. Premier is also placed under a strong normative obligation to transfer trained people to industry and apply the outputs of publicly-funded research to stimulate economic and social benefits such as job creation. Premier also recognises that effective interactions with business and industry are particularly important to create research of value to the economy.

Interviews with industry sources helped establish that industry now recognises TEIs as key sources of innovation. Through collaboration with TEIs, industry can get increased access to new research and discoveries and leverage their respective comparative advantages, with TEIs considered better at basic research and industry better at developing and commercialising research. The major concern expressed by industry sources during interviews was that some IP owned by Premier was difficult to access as it did not meet Premier's criteria in terms of commercialisation. According to one interviewee, *"They* (Premier) *were so driven by funding...*(and) *incredibly difficult and very unwilling to help in the process of getting this truly commercialised..., this piece of IP is just going to sit on the shelf and nothing is going to happen, and who is accountable for that?"*

Industry sources also expressed concerns relating to the lack of a commercialisation culture. Those interviewed strongly felt that there still needs to be a willingness by TEIs

to co-operate with the industry partner given that the industry partner will have expectations in terms of contract obligations, care taken with IP, input into research, and research results even though there could be no guarantee of commercialisation. Industry sources indicated that TEIs' collaboration and linkages with industry have potential benefits, not just for the firm but also for the wider community.

5.4.3 **Researchers**

Researchers include both staff and students. Premier's strategic documents emphasise that participation by staff is integral to the success of the commercialisation process, and it has an obligation to staff to ensure that the commercialisation potential of their research projects are fully realised. Premier aspires to create a research culture that encourages staff to reach their full potential, and the institution's charter and strategic plans recognise staff as an important stakeholder group where individuals are valued and respected, academic freedom is exercised with intellectual rigour, and critical enquiry is encouraged.

The strategic plan also signals the institution's commitment to enhancing its overall research environment to ensure a high quality experience for research students working alongside excellent researchers. Interviews with research institute Directors suggested that students are the key to real commercialisation. It was emphasised that some new research with commercialisation potential emerges out of student projects, and some discoveries emerging from student projects have led to successful commercialisation. According to the CEO of Commercialisation, Premier already has some of its top research graduates working for the spin-off companies it has created. Premier is committed to attracting and retaining research staff and students of the highest quality which it claims will have a key influence on the direction and quality of its research. It boasts having one of the highest concentrations of top researchers in the entire country demonstrating the strength of the research capability it has built over many years. As stated in its 2007 Annual Report:

"The very high quality of our staff was evidenced in many ways, most notably through international and national awards."

"The release in early 2007 of the 2006 Performance-Based Research Fund (PBRF) evaluation also demonstrates the quality and productivity of our staff. ...this [Premier] *won 27 per cent of the funding associated with staff research quality ..."* (PU: Annual Report 2007)

Some of Premier's top-ranked researchers have achieved ground-breaking outcomes, the result of many years of dedicated research across a spectrum of disciplines, with the primary aim of expanding and enriching the country's knowledge base and directly contributing to social, economic and policy development. The researchers who produce research that has potential to be commercialised are keen to get involved with commercialisation endeavours.

"They do it voluntarily so they have to buy in; it is not something we can actually determine for them." (PU: CEO, Commercialisation)

However, there are funding incentives as well as other professional obligations influencing their involvement. At Premier, some of the top-ranked research scientists have pioneered research and founded their research centres so there is a lot of pride and reputation involved. Based on their pioneering research, some top research scientists have developed larger scale research institutes through engagement with cross-disciplinary teams and international research networks. Interviews with researchers indicated that they are largely motivated by the history and culture of their departments and professional peer influence. Some of their work is a result of up to 40 years of dedicated research indicating a very strong professional obligation to create value from research. Commercialisation not only enhances their reputation but also provides valuable funding opportunities which help them to engage in further research. It became very clear from interviews and documentary evidence that the most successful commercialisations are based on long-term projects. For example, Premier's Profile 2009-2010 reported that it has developed *"...the world's first anatomically correct computer simulation of the human heart, a product of more than 40 years research ...",* and research that took *"...some twenty-five years, ... has led to the development of a number of anti-cancer treatments,* [that] *...was licensed to a UK biotechnology company ..."*.

Interviews revealed that new researchers primarily involved in teaching, and those largely driven by publications and PBRF measures of performance, usually do not have any

commercialisation plans. At Premier, the majority of researchers belong to this group that drives the institution's research culture and a major obstacle to its research commercialisation initiatives has resulted.

"I am concerned that the signals from PBRF drive university, drive the staff culture to a large extent, [but] do not reward and recognise commercial outcomes, patents and contracts even." (PU: CEO, Commercialisation)

Premier's commercial company is often faced with major challenges as it aspires to engage academic staff fully in the achievement of the institution's commercialisation mission. From the interviews, it became clear that moving away from academia into commercialisation is a difficult decision for many academic staff and, in many ways, it is contrary to their best interests as academics. It requires them to modify their role identity and there is an element of fear about whether the research they are undertaking will have industry support and eventually get into the market.

"Some of the top contributors are people who have got enough confidence, or have achieved their academic objectives and, so, don't feel quite as threatened in a way." (PU: CEO, Commercialisation)

Premier recognises that it needs to provide incentives to researchers to guide behaviour beyond basic research and towards encouraging commercialisation. Its strategic documents state its obligation to retain and manage students for the duration of their projects, and to inspire them by providing opportunities to do projects working with the best researchers, utilising the latest cutting-edge technology, tools, techniques, systems and processes. Students attached to large multi-disciplinary research institutes said that they were more excited with the opportunities available to them for research. Postgraduate student researchers also valued engagement with industry and funding opportunities available for research. On the question relating to type of staff most likely to undertake commercialisation challenges and what prompts their involvement, the CEO Commercialisation responded by stating that:

"Well, they are people who like to see an outcome, so they're motivated and what we are trying to do is to engage more people with that sense of accomplishment by seeing a commercial outcome. They're discovering that the Deans are, in fact, inclined to reward, at least in the promotional context, that kind of behaviour, despite maybe some prejudice or misconceptions that all the drive for promotional criteria is how many papers you've

118

published. It is very clear to the VC, down at least to the Deans level, that that is not how people are judged."

Researchers interviewed suggested that successful commercialisation resulted from being embedded in networks of innovation with industry and international partners, which in turn, is influenced by the larger, uncertain and highly risky commercial environment. For Premier, high profile and reputation is enhanced by researchers working with industry and international partners. Success in commercialisation requires production of commercialisable IP, which may take a very long time to develop. Researchers felt that Premier needs to encourage and support them to take their research all the way to the commercialisation level. This does not seem to be a problem in large research institutes set up to enable research commercialisation.

"But, we would expect for any of our research projects to have commercial awareness, and there is a process where we are looking where commercialisation opportunities are and looking to find appropriate resources to make sure commercialisation opportunities are advanced across different projects. Sometimes there is a strong commercialisation focus, other times there is really just part of the discovery...commercial opportunities may be further down the track." (PU: Deputy Director, Research Institute)

Some researchers not aligned with large research institutes were more interested in using their research projects to help generate government grants to fund further research. They felt that research success at Premier was evaluated more in terms of funding received by researchers for their research projects.

5.4.4 International Partners

Premier has aspirations to be a world-class research-led institution which requires effective international networks to be established and maintained. Some of Premier's pioneering researchers have had many years of involvement in international research collaborations. Premier recognises that it has an obligation to develop these partnerships further to realise its commercialisation vision.

"[Premier] engages actively in international partnerships to support its position as a leading research university, to participate in innovative and collaborative projects, to provide international opportunities for students and staff, and to benchmark against international standards." (PU: Profile 2009-10)

Interviewees indicated that research results produced by some of its larger research institutes have attracted international recognition, reputation and interest which, in turn, have helped in building its image and profile. Premier has formal partnerships with renowned international universities across a wide range of disciplines. Some of its top international research partners in health science and bioengineering research include world-renowned institutions such as Oxford, MIT, and Harvard. Interviewees explained that international partnerships help share best practice, promote synergies and gain access to relevant expertise. As was commented by a research scientist:

"There are huge opportunities; not only for staff but students as well ...I think the profile of our research is much better internationally than here." (PU: Researcher)

Researchers explained that the primary aims of most international collaborations are to contribute to the development of international communities and the knowledge base. In the area of health research, the primary aim is to improve disease prognosis and therapy, ultimately leading to the improvement of the health of the local, national and international communities. As reported in its 2008 Annual Report:

"Another trend has been an increasing participation in global efforts to use bioengineering technologies to improve and reduce the costs of healthcare."

Interviews with Directors of well-established research institutes indicated that international networks help attract international students to Premier's research institutes. Likewise, staff and students from Premier are assisted to develop connections with leading international institutions. As has been reported in Premier's 2008 Annual Report, gaining international recognition remains a high priority as it means that graduate students are in high demand around the world and many funding opportunities are created. Interviewees indicated that international collaborations help create opportunities for the New Zealand government and businesses to build on the relationships Premier has established, including developing connections with some of the world's fastest growing economies. Premier's international collaborations also offer attractive funding opportunities and research infrastructure.

5.4.5 **Wider Community**

Premier's distinctive role, as stated in its Charter 2003 and Profile 2008, is to foster the nation's identity and advance its economic, social and cultural development. It has a specific objective to develop effective partnerships with the local, national, and international communities it serves. To be a research-led university, Premier recognises that it has an obligation to undertake research, innovation, and technology transfer to address the social, economic, and cultural concerns of the wider community. It has a strong commitment to the broader community and has been active in building mutually beneficial links with the local, national, and international communities within which it operates. Some of Premier's top researchers have been involved in research projects with clear social objectives such as reducing the spread of disease, reducing death in newborn babies, and improving and reducing the cost of public healthcare, which are immediate priorities of government and meet public expectations. By undertaking these activities, Premier is able to fulfil its 'corporate citizenship' role in society. Engagement with meeting the social development needs of the wider community helps enhance Premier's public image, which, in turn, helps demonstrate its accountability for the public funding received to support such initiatives.

"We run that programme on behalf of the Ministry of Health as a direct social responsibility. But, the general public have a greater interest in what happens in the university and the commercial arm is responsible for the stewardship of anything that [Premier] *creates."* (PU: Director, Commercialisation)

The research undertaken by Premier is disseminated within the wider national and international community if it has important cultural and social outcomes. For example, through international collaborations, Premier is developing a research programme to combat obesity and diabetes in Asian populations. Research programmes into metabolic and cardiovascular diseases are also being developed.

"The development of this research is timely as these two diseases are rapidly increasing in prevalence throughout the world." (PU: Researcher)

Interviews with researchers indicated that the primary aim is to improve human health worldwide, as well as to help foster the country's identity and create a very good public and international profile of the research institute. Thus, the extension of Premier's role to

incorporate global corporate citizenship behaviour provides an opportunity platform by generating intangible assets such as reputational capital, commitment, loyalty, and legitimacy that helps enhance performance and accountability. It also provides global recognition and opportunities for further international collaboration.

5.4.6 Financial Considerations

Financial considerations are viewed as key to understanding the primary rationale for Premier's active involvement in commercialisation of research. Consistent calls have been made to both the public and the private sectors to spend more on research and development in a sustained and positive manner to ensure it flows to the brightest minds and the best ideas. The current government R&D funding to TEIs is for basic research and cannot be used to subsidise commercialisation activities. As such, there have been recent moves by government to set up some specific funds to provide support for commercialisation of intellectual property. These are targeted funds for specific use and remain highly contestable. Premier has relied on these funds to advance some of its research commercialisation projects. It has received funding support from government's Partnerships for Excellence scheme to establish large scale research institutes to work closely with multiple partners in the industry sector. Fostering connectedness with industry also provides substantial financial benefits to Premier. The government is placing increased emphasis on commercial outcomes from research due to increasing competitive global pressures on innovation. As such, it has established a Trans-Tasman Commercialisation Fund, and a New Zealand drug company commercialising research from Premier has been one of the first recipients of funds from this initiative.

Premier also has a very deliberate strategy to generate additional revenue from commercial sources to fund its R&D activities. Greater reliance is being placed on its commercial company to meet its revenue targets. According to a former Business Manager of the commercial company:

"I think it is all very simple; the only reason why they commercialise is to get revenue". Mostly, I find that if I talk to my ex-colleagues at Australian universities, none of them are bothered about revenue, and that to me is crucial. If the money is not important, nothing is. What we are doing is about money. It is not an academic exercise." (PU: Business Manager, Commercialisation)

The view of the CEO, Commercialisation, on revenue targets was:

"...that's a measure, not that we chase revenue, but that's a broad measure of how much commercial or contract research we bring into the university."

He went on further to explain that:

"Commercialisation has to be fully funded and not subsidised by any other source of funding. [Premier] *seems to be now placing greater reliance on* [the commercial company] *to generate additional income and, obviously, that is consistent with the strategy...half of the total research the university does is commercially oriented. That makes us one of the most commercially-oriented universities in the world, so it is very important and it is given a high level of emphasis."*

Commercialisation provides a vital source of revenue to fund new research opportunities, to invest in further research with commercial potential, and to secure intellectual property as a basis for future licences and equity. As was noted from comments made in Premier's 2006 Annual Report, *"...success is a virtuous circle where today's revenue funds tomorrow's research"*.

Funding from commercialisation activities has significantly increased Premier's ability to invest in technology development with the commercial company encouraging research staff to seek the potentially valuable innovations inherent in their work. A significant portion of the revenue generated by Premier's commercial company goes towards the salaries of staff it employs as well as the researchers in Premier. Revenue from commercialisation has also funded the creation of research centres and spin-out companies. These are perceived to be investments in Premier's long-term commercialisation vision. Premier receives substantial licensing fees from the spin-out companies it has created.

"Our motivation for that kind of investment is that we were looking to create investment opportunities, or investable companies, and that those companies would then invest the funds back into [Premier] *in continued research."* (PU: CEO, Commercialisation)

Premier's international collaborations also offer attractive funding opportunities which help to build its research infrastructure, research capability and culture, enables international staff and student exchange, and enhances the profile and reputation of the institute. Premier regards gaining international recognition as a prerequisite to

international collaborations which, again, require a highly developed research capability and research infrastructure. So, there is an explicit link between the financial and the altruistic considerations which are offered as dual rationales for commercialisation. Premier recognises, though, that competition for funding has intensified recently, as was explained by a senior research scientist:

"Usually, in various funding, you should be able to support the arguments of powerful research outcomes." (PU: Researcher)

However, this does not necessarily mean that powerful research outcomes will lead to commercialisation. Researchers involved in commercialisation initiatives were of the view that putting more money into basic research is not necessarily the way to go. Funding needs to be targeted at research that has commercialisation potential.

5.5 *Managing Expectations*

Managing expectations to enable research commercialisation requires changes in organisational infrastructure as well as adaptation to the TEI's culture and mission. Effective commercialisation is not possible without an enabling research culture, which is discussed next.

5.5.1 Creating a Vibrant Research and Innovation Culture

Much of the data collected from document reviews and interviews suggested that Premier is a forward-looking TEI with a clear strategy focussed on developing a vibrant research culture. Over the past several years, it has been intent on making investments in research and development that have had a profound impact on nurturing a strong research culture and generating a critical mass of excellence. In its 2006 and 2007 Annual reports it acknowledges that:

"A strong research and innovation culture is a key requirement for any modern international university" (PU: Annual Report 2006); and *"A vibrant research culture enables universities to attract better staff and students, and to build a culture of inquiry and academic rigour that enables them to contribute more effectively to society in a rapidly changing world."* (PU: 2007 Annual Report)

Premier's ambitious research and innovation culture is based on a strategy aimed at recruitment and retention of high quality researchers and promising postgraduate

students. It values the participation of all staff in institutional life and encourages them to achieve to the highest level to reach their full potential. Its charter outlines its commitment to creating a diverse, collegial research community in which academic freedom is exercised with intellectual rigour and critical enquiry is encouraged. It provides support for research and study, recognition of staff achievements and access to opportunities that come with being part of an institution of high international standing. To nurture a vibrant research and innovation culture, Premier also pursues a strategy of building and promoting excellence in research by establishing large-scale research groups and programmes with sufficient critical mass, and targeting research funding to investigations in emerging fields of interest and those in which it already performs strong research. It also has a deliberate strategy to promote government initiatives that help leverage off government funding for its research institutes and CoREs. Funding received from government and industry enables acquisition, maintenance and expansion of world-class research facilities and infrastructure. Research centres have been created to allow for industry engagement that helps develop Premier's own research culture as well as a research culture in industry. Premier seems to be promoting its achievements in creating a vibrant research culture to raise its research profile, as noted from the following comments provided in its 2007 Annual report:

"The strong research culture of the University is amply evidenced by the University's performance in the PBRF, by the accolades accorded to our research staff, and by the premier role of [the Commercial Company] *among technology transfer and commercialisation companies in Australasia."*

Several interviewees emphasised that to be well-regarded by industry and to be successful in commercialisation efforts, it is important to not just nurture and maintain a vibrant research culture but to also build an enterprising and innovation culture. Industry concerns have been highlighted previously in section 5.4.2. It was widely acknowledged within industry sources that industry is only willing to deal with TEIs with the right innovation culture that encourages commercialisation of its research. Interviews with some industry experts revealed a concern that some research intensive TEIs, including Premier, are regarded as "empty vessels" because researchers do not have a burning desire to engage with industry. This was somewhat concerning to Premier which stated

that it has aspirations to engage staff fully in the achievement of the institution's commercialisation mission. A senior research scientist commented:

"But we would expect for any of our research projects to have commercial awareness and there is a process where we are looking where commercialisation opportunities are and looking to find appropriate resources to make sure commercialisation opportunities are advanced across different projects. Sometimes there is a strong commercialisation focus, other times there is really just part of the discovery." (PU: Researcher)

He went on further to emphasise that:

"We can support those who really are pure science discovery-based academics and don't have a strong commercialisation plan, to those really who are contemplating on purely commercialisation efforts."

From interviews and review of strategic documents, it became clear that Premier recognises that a vibrant research and innovation culture is a characteristic of the world-class university that it aspires to become. It is also a key element of the process of building research capability and capacity which is discussed next.

5.5.2 Building Research Capability and Capacity

Premier's commitment to its research commercialisation mission requires management to continually develop its research capability and capacity, thus ensuring a high quality research environment. Premier recognises that building research capability and capacity is a continuous process that requires long-term strategy with explicit objectives and a clear focus.

"Our challenge for the future is to build on this strong base to establish ourselves firmly among the world's leading universities." (PU: Profile 2009-10)

Over past years, Premier's strategic plans and profiles (key strategic documents) have outlined the major areas of its research capability development. They were mainly in key areas of strategic importance determined by using the government's Tertiary Education Strategy (TES), Growth and Innovation Framework (GIF), and PBRF results. Premier's commitments, stated in its Profile 2008-2010, remain in areas of developing staff capability and resourcing needs, continual improvement of the organisational support systems and infrastructure, and ongoing engagement with its local and international

communities. In terms of developing its research staff capability, Premier's Profile 2008-10 specifically states that:

"It seeks to attract the best possible researchers, invest in the development of their research careers, and provide extensive strategic, infrastructural, and administrative support to enable them to gain both a reputation for excellence and external funding."

Over the period 2008-10, Premier aims to:

"Improve research performance of existing staff members, enhance support for emerging researchers, and increase emphasis on research performance in hiring decisions." (PU: Profile 2008-10)

Premier has a strong focus on building high performance research groups and programmes in key research areas and broad disciplines. It aims to build and consolidate areas of research excellence in a wide range of disciplines to provide sufficient critical mass to compete internationally. It has been developing large-scale research institutes where it has appropriate strength and research capacity. Additionally, it seeks to build and maintain internationally-ranked capacity and develop an international research profile. Building critical mass provides research strengths that complement those at other research institutions and helps develop an international research profile. Pursuing a strategy of building and promoting excellence in research also requires Premier to develop research linkages in multi-disciplinary research areas. Premier aims to build cross-institutional research alliances to maximise research synergies and resourcing opportunities. It aims to strengthen links with industry and government through sponsored programmes, including the Partnerships for Excellence programme and CoREs, to ensure that research capability and outcomes contribute to economic development and lead to increased external funding opportunities.

"The continuing rapid growth in research contracting and commercialisation activities with business and industry..., and the growing number of companies spun-out from academia, clearly attest to the fact that university research capability is one of the key drivers of local and international innovation systems." (PU: Annual Report 2006)

Major efforts towards the development of Premier's research capability are also aimed at strengthening international research links to provide its researchers improved access to ideas and facilities offshore. In particular, development of linkages and structures enable

better access to research collaboration and resourcing opportunities. Premier is currently engaged in a medium- to long-term programme of substantially rebuilding and expanding its research facilities. This includes providing appropriate equipment, facilities, and infrastructure to support research activities. Premier recognises that funding determines the extent to which it will be able to build its research capability:

"It, therefore, relies extensively on research funding from external sources (almost exclusively competitively-gained research contracts) to provide the resources necessary to achieve its research mission. If Government and private sponsorship of research and development were to falter over the next few years, the capacity of the University to support its researchers would be seriously compromised." (PU: Profile 2008-10)

Premier's Strategic Plan 2005-12 outlines a deliberate strategy to actively develop enhanced sources, particularly offshore, of public and private research funding. Premier also established substantial internal staff research funds to develop its staff capability.

5.5.3 Developing Structures

To manage the accountability expectations of its key stakeholders, Premier, in its Strategic Plan 2005-2012, had undertaken to develop large-scale research institutes of excellence to provide an appropriate operating environment with clear accountabilities; invest in selected institutes to ensure that they can achieve sustainability at the required scale in the shortest time possible; encourage co-operation between research institutes and faculties, so as to maximise mutual benefit and minimise internal competition; and ensure that institutes which fail to grow and perform to the required level are closed so as to release funding for other ventures. Structure is largely dependent on funding and there is considerable emphasis on research institutes and centres to generate external research income which is also a key measure of the success of their operations. Premier has a complex structural configuration mainly arising from the size and complexity of its research operations. Currently, it has two large-scale research institutes and eight smaller, multi-disciplinary institutes, some of which are world-renowned and focussed on pioneering research. The large-scale research institutes are autonomous multi-disciplinary units independent of the faculty structure. Some institutes are inter-faculty institutes launched as a joint initiative between faculties and administered through the commercial

company. The institute structure enables Premier to increase its capacity and capability to undertake novel and leading-edge fundamental research.

"I think the critical thing with the institute is that there is enough critical mass and I think momentum that we can support people who have different interest and capabilities in totally different areas." (PU: Deputy Director, Research Institute)

In some areas, especially research related to areas of major health importance, the large-scale research institutes are committed to maximising the benefit of their research for the wider community. Intellectual property is licensed to industry or start-up companies associated with the institute, with the terms of the arrangements providing funds that can be committed to further cutting-edge research.

"The University and, therefore, the Institute have taken this approach, with the aim over time of increasing the capacity of the University and the Institute to undertake novel and leading-edge fundamental research. Most of the research within the Institute is, and will always be, of this nature and can never attract commercial investment." (PU: Web Page, retrieved 22 January 09)

Some aspects of the intellectual property originating from the institute are further developed by the start-up companies associated with the institute and commercialised through Premier's commercial company. The start-up company also contracts back to the institute some elements of its research and development programmes, thus providing further funding opportunities to the institute and incentives to staff to personally benefit from interest in the start-up initiatives.

Premier also has more than thirty-five smaller research centres to promote, support and conduct multi-disciplinary and collaborative research. Some are multi-faculty, multi-disciplinary university centres, whereas some of the smaller research centres are located within schools of the faculty. There are some research centres that have been established in collaboration with external research institutes. Premier has also established some commercially-focused research centres and research institutes to interface with industry sectors. Structurally, the research centres are a means to develop a broad but focussed research programme and create a sufficient critical mass for sustained quality researchers. Some of the smaller research centres provide the research infrastructure and support essential to fostering the development of innovative technologies. They help co-ordinate

research, manage resources and provide an organisational unit for staff with expertise in a specialist area.

Premier and its large-scale research institutes also houses government-funded CoREs to support world-class research considered of national and international importance. A major portion of government funding for research is channelled to the CoREs and renewal of funding is performance-based. The CoREs combine extensive national and international networks and utilise complementary skills from Premier's research institutes and centres, partner universities, industry, and government research agencies to promote cutting-edge research.

"[It] brings together over 200 researchers in multi-disciplinary teams working in drug discovery and development aimed at serious diseases." (PU: Profile 2009-10)

Premier has a central research office to facilitate the overall management of the research affairs of the university. The research office manages the accountability expectations of the university community by providing assistance in research grant management. It also facilitates development and implementation of the university's strategy to grow research revenues and enable an environment across the university that encourages and supports excellence in research.

The various forms of structural configurations adopted by Premier provide professional researchers with autonomy, enable pooling of the required resources to build research capacity and capability, and promote a strong research culture. They help attract much-needed funding as funding success has become a prerequisite to the creation and survival of these structures. Given this emphasis, it seems that research institutes, centres, and faculties are primarily driven by funding success as a measure of their performance rather than achieving wider research commercialisation goals. Premier also promotes its research structures mainly in terms of funding success. Interviews with Directors of research centres and institutes revealed that funding success is important as it provides them with legitimacy, raises the profile of the research capability, helps forge international collaborations and attracts top research talent. It enables development of

staff and student research capabilities and achieves a critical mass of research excellence which is demonstrated through the growth of the centres and institutes.

Premier has a wholly-owned commercialisation company to facilitate research of a commercial nature, manage intellectual property, and provide consulting and technology transfer. As stated in Premier's Strategic Plan 2005-2012, a separate commercial company helps to:

"Make specialised expertise for commercialisation of intellectual property easily accessible by university staff and students and not unnecessarily duplicated within the organisation."

According to the CEO, Commercialisation, the separate commercial company structure has helped establish formal links between Premier and industry and international partners. It provides a strong business focus to help identify and develop intellectual property, seek commercial outcomes, negotiate contracts, manage risk, make investments, find markets, and bring value back to the university; something not possible under the bureaucratic university structure.

"...they (Premier) *set us up as a separate business unit so we could act as a commercial entity, and I mentioned earlier – de-politicise decisions. I can't emphasise that enough. It is very convenient sometimes to constrain behaviour according to other prerogatives that exist in the university. Definitely, we can move faster. That's absolutely true."* (PU: CEO, Commercialisation)

Premier's commercial company is also charged with developing the TEI's research capacity and capability by increasing its research base and resources. It promotes and protects new inventions, runs multi-million dollar funds to develop bright ideas arising from research through to the point where they are ready for investment, and develops new infrastructure by sponsoring new centres of research at the institution. It has separate technology transfer teams that manage areas of very strong potential future growth. Reported highlights in technology transfer include numerous successful proofs of concept experiments and market surveys for new technologies. The commercial company also helps incubate new businesses based on new technologies developed at the research institutes. A separate business incubator has been established in partnership with local companies, and Premier has successfully spun-out some of its own companies involved

in commercialisation of its research. The following comments help sum up the views on the commercialisation structure:

"I think for a country the size of New Zealand, we would be struggling to justify not having a commercialisation structure because we can't afford just to be doing blue sky research because something will pop out. I think there are truck loads of good ideas, everyone has good ideas all around the world and to make sure it is good ideas, it's the execution of things that bring good ideas to market is what is difficult. We are only able to support certain number of execution of models. I think it is important that universities do have a strong commercialisation structure. It is good to have good ideas and great takers and push them on the frontiers." (PU: Director, Research Institute)

Interviewees emphasised that Premier's separate commercial company structure provides financial independence from the parent institution as there are often high costs involved in building commercialisation capacity. A separate commercialisation company structure helps identify a steady flow of ideas from researchers and enables appropriate action to be taken to prevent commercial ideas being overlooked or put at risk. Interviewees explained that the choice of organisation structure influences commercialisation performance through shaping the flow of resources, reporting relationships, degree of autonomy, financial independence, incentives, and commercialisation strategy.

5.5.4 Systems and Processes

Commercialisation requires access to a wide range of technology-specific, market skills and professional skills such as contract preparation, deal negotiation, IP valuation and protection. To help facilitate these activities, efficient systems and processes are required. According to interviewees, the commercialisation system includes elements ranging from motivation and education to initiatives to support specific projects such as innovation centres, incubators, patenting offices, and seed capital funds. Premier's commercial company maintains a separate management information system including financial systems, human resources, payroll, marketing, and contract administration systems. It also maintains separate incentive and reward systems to encourage research commercialisation and help ensure that sufficient skills, expertise and resources are available to help turn good ideas into commercial reality. According to the Director of the commercial company, to generate positive culture changes in researchers, systems and procedures have been established within Premier to help identify IP that may have commercial potential. Systems and processes have also been established to ensure that

research commercialisation staff have an active presence in faculties giving presentations to researchers and talking to heads about research projects and effective protection of IP.

The decoupling of the commercial company's systems and processes from Premier's centralised systems appears to have led to some inevitable tensions relating to the extent of autonomy the commercial company has over its finances, resources, and accountability and reporting obligations. A concern expressed by a Director at Premier was that *"...I am not getting the detail of the management reporting I need....We are all working for one organisation....It is not as though it is their money, in general, it is the university's money. Therefore, they are also accountable for producing business cases to support any investment that they want to do....and abide by the parent's* (Premier's) *policies and procedures."*

Given these comments, it seems that despite the autonomy, the commercial company still suffers from internal bureaucratic control and compliance procedures of NPM imposed by Premier.

5.5.5 Managing IP

Where research undertaken at Premier is a productive source of commercialisable IP, management has adopted a strategy to protect, develop and exploit the IP. Premier recognises that it needs high quality IP as a necessary condition for the generation of commercialisable outcomes. Commercialisation opportunities are lost if IP ownership is not clear and discoveries are not disclosed and protected at the appropriate time. A research professor reflected on a missed commercialisation opportunity he had several years ago.

"This was a novel feature. We should have patented it but the advice I got at the time was that we should not, it was not worth it as it was so specialised, and that was a mistake at that time. I took their advice and did not patent it and, in fact, (we) *were quite open about what we were doing. The idea was immediately out in the public domain."* (PU: Researcher)

Interviews and strategic documents revealed that Premier now has in place arrangements to ensure early identification, protection and management of its IP. It has an IP policy that requires all IP developed by staff to be assigned to the commercial company.

133

Similarly, all IP created by students and related to their field of study is also required to be disclosed to the commercial company. According to the CEO, Commercialisation, this helps develop a critical mass of IP and often it is easier to commercialise a related body of IP through centralisation by pulling elements of IP together that provide more attractive commercial opportunities. The commercial company will assess the IP and make decisions related to its commercialisation. Premier's IP policy defines IP that includes patentable information, discovery, know-how, trade secrets, methods, computer software, designs relating to devices, processes, chemical compounds, treatment, or other which may provide commercial advantage. It is the policy of the commercial company that staff should continue to be involved in the commercialisation process. Premier's commercial company has undertaken successful commercialisation of IP developed by its researchers. Its policy states that it is able to invest in development of IP and promote its use world-wide. The commercial company has put into place mechanisms to manage IP and to ensure that commercialisable IP is progressed within reasonable timelines and that expectations of outcomes are clear. Skilled Business Managers and Technology Transfer Managers are assigned to separate discipline areas to offer advice and assistance. There appears to be some general consensus that commercialisation success is not about who owns the IP but is largely affected by the level of commitment and arrangements made by management on how to commercialise it.

"One should remember that commercialisation is not only about IP, like a patent, it is about having the knowledge and creating that into dollars." (PU: Business Manager)

According to Premier's research policy manual, researchers who believe that they have patentable research, or a patentable research idea, are encouraged to contact a Business Manager before any public or private disclosure is made. This is important because delivering or publishing a paper before patenting may destroy the commercial value of IP. Premier recognises that the patent procedure is very costly and complex.

"...patents are a key to our success. You can say, here's the right to this particular technology, no-one else in the world has that right, you can exploit that right for your own benefit through whatever mechanisms it takes to do that. But, very often an international exploitation of a patent will be worth quite a significant amount, millions to just get it away." (PU: Director, Commercialisation)

Premier will normally file a provisional patent as a first step in protecting IP. This gives virtually world-wide protection for 12 months so that publication of research papers and open discussion with other parties who might contribute to the commercialisation process may take place. The key objective of Premier's commercial company is to promote the university's IP and they are somewhat flexible in their approach. It might spin-out a company for IP and invest the IP into those companies. At the same time, it would bring in external investors and retain a royalty share of the licence for the product or even hold an equity position. In some instances, it might licence its IP to a limited liability company.

"The critical driver is getting the IP that we have stewardship over back into the community where it can be invested in by potential investors that have the capability to take it to market, have the size and reputation to get it international, and then deliver back to university more research revenue, more royalties and possibly capital gains." (PU: Director, Commercialisation)

To assist the development of IP across the so-called "valley of death" and into new or existing businesses, Premier has also taken an important step forward by negotiating access to seed funding.

5.5.6 **Providing Rewards & Incentives**

Premier has a policy that when a revenue stream arises from commercialisation, it shares the surplus with inventors and contributing staff, and departments. The proportion shared with inventors depends in each case on the contribution made by departments, Premier and any outside joint venture partners. According to most researchers interviewed, the incentive for big dollars is generally not the greatest incentive because of the rarity of such events. Commercialisation has a much longer timeframe, usually decades between discovery and exploitation, and there is no certainty of outcomes that may lead to financial success. Interviews revealed that most academic researchers are not prepared to take such a risk which may jeopardise their career. However, many researchers indicated that the greatest reward and incentive for them was getting a sense of accomplishment in the value they create in their research projects. This, they say, also helps demonstrate to the funders that money was used for the purpose it was given thus meeting the

requirements for ongoing funding support. The CEO of the commercial company's comment on the type of researchers most likely to get involved in commercialisation was:

"Well, they are the people who like to see an outcome, so they're motivated and what we are trying to do is to engage more people with that sense of accomplishment by seeing a commercial outcome".

For career academic researchers though, the promotion criteria remain a major influence on their behaviour and culture. As the promotion criteria are largely based on publications and the PBRF requirements do not fully recognise the value of engagement with commercialisation work, career academic researchers felt that they have little incentive to be involved with commercialisation activities. Some, in fact, consider commercialisation as a diversion from their core activities:

"I am concerned that the signals from PBRF which drive the university, drive the staff culture to a large extent, do not reward and recognise commercial outcomes, patents and contracts even. Contracts are where somebody from the outside says I do value what you can do so well that I will pay for it." (PU: CEO, Commercialisation)

Some top researchers are largely driven by normative and cultural-cognitive obligations. These are the researchers who have achieved their academic career goals and place high value on solving societal problems and disseminating their results to the wider community. They often place high value on more intrinsic rewards like seeing an outcome for the cure for a disease. Some value peer recognition within the scientific community, publications, grants, or have a desire to secure additional research funding mainly for students, research expertise and lab equipment, as indicators of success. Most researchers appear not to be primarily motivated by potential to make money for themselves even though financial rewards were welcomed. There are others who are largely motivated by better students, better research facilities, and opportunities for international research collaboration with world-class researchers.

"I love working with students, we have fantastic students, I like the high profile of the research unit and I am excited by the possibility of building a much larger research centre." (PU: Researcher)

During interviews it became clear that lack of status and visible recognition is discouraging researchers from involvement in commercialisation, especially with the

insufficient kudos attached to filing of patents. The formal reward systems recognised a narrow band of activities and concerns were expressed that there was limited recognition of many of their commercial activities. Researchers were made to believe that academics need to have an acceptable publication record that contributes to the TEI's performance under the government's PBRF scheme.

"PBRF does not recognise the nature of the work we do unless it meets their publication requirements. Over the years, I have written over a hundred reports but they don't count towards PBRF." (PU: Researcher)

For this reason, many researchers saw that their role was to teach and not to look for commercial opportunities. Others, with a more positive view, saw commercialisation as central to their professional role but were less clear about the extent of their continuing role. It became obvious that a culture, supportive of commercial activity to help staff to overcome barriers such as lack of recognition for commercialisation work, was needed. Researchers saw the main benefits of commercialisation as the opportunity for collaboration and access to expertise outside the university; greater research funding opportunities; enabling researchers to be relevant and to give something back to their community or region. Commercial work was seen to improve staff performance in both research and teaching and to lead to a higher profile and improved promotional prospects. Impediments to research commercialisation were identified by researchers as bureaucratic systems, rewards systems which recognised only a narrow band of activities, and the lack of time and resources for commercial engagements.

5.5.7 Governance Mechanisms

Premier's commercial company has an independent board comprised of five internal members and five external members all appointed by Premier's council. The council ensures that the board composition is balanced between independent and internal members. The internal members include the Vice-Chancellor (VC), Deputy V-C Research, and three Deans from the largest contributing faculties who bring expertise to the company. According to a Director of the commercial company, the external members bring to the board expertise in their fields, which are as wide as IT and marketing, research into medical therapeutics, accountancy and finance, and banking, insurance and law. When questioned on whether having the V-C as the chair of the board compromised

the independence and constrained the commercial company's operations in any way, he went on to explain that:

"Having the V-C as the chair of the board.... he acts as a sponsor for (the commercial company) *inside the university to ensure that there is no discontent about* (the commercial company's) *operation inside the university and there is continuous engagement between us and the staff of the university. By having him as the chair,* (the commercial company) *can hold up that figurehead as well, this is the university's own company, we are operating on the path of and for the benefit of the university, and the chairman is regularly a sponsor and a promoter of* (the commercial company's) *activity around the university...."* (PU: Director, Commercialisation)

Officially, the board is responsible for approving policies and setting the strategic direction, and providing guidance to management of the commercial company. The senior management of the commercial company prepares strategic plans which are then worked through and approved by the board. The commercial company also has its own audit committee with independent directors on it. A Director of Premier emphasised that it was important that the commercial company's operations were aligned to Premier's strategic plan. According to the Director of the commercial company, the board makes sure that the strategic plan is aligned with the goals of the parent university so that they move in the same direction. Comments during the interview also indicated that the commercial company's board does not have complete autonomy and operates under the direction and constraints set by the council of Premier. The commercial company reports on its activities and results of operations to its board on a regular basis. Since the commercial company board is appointed by the council of Premier, it has annual reporting back to the council. The governance structure of the commercial company provides an appropriate framework to encourage and manage research commercialisation, however, it is also challenged by its structure, composition and authority system.

5.5.8 Risk Management
Premier had set a limited liability commercial company to manage all risks associated with research commercialisation activities. The CEO, Commercialisation, emphasised that Premier's risk management strategy encourages well-considered risk-taking on specific commercialisation initiatives. The commercial company structure can take action to prevent commercial ideas from being overlooked or put at risk. It allows the steady flow of ideas with commercial potential through gate-keeping which helps identify

research with high scope or high priority which needs IP protection. A separate commercial company also allows for risk management from a full portfolio of businesses that includes consultancy income and licensing fees income to cover important costs. The development of a portfolio of commercialisation activity helps diversify the benefits from successful projects and outweighs the failures. The Director of Commercialisation explained that managing each project as a portfolio also allows predicting of cash flows more accurately and minimises the impact of the inevitable failure of some projects, for example, licences provide predictable cash flows but returns from spin-outs are less certain.

5.5.9 Committed Leadership

Fostering a culture that enables successful commercialisation depends on strong commitment from senior management. Premier's strategic documents provide a clear mandate from senior management that commercialisation is a legitimate function alongside teaching and research. These documents send a strong message that commercialisation will be valued and is a very important function of the institution. Commercialisation is championed by the CEO, Commercialisation, who is on the senior management team and there is executive level support from Deans and Directors of research institutes. Some pioneering researchers have also become the institutional leaders of their research institutes and multi-disciplinary research teams to further progress their research to commercialisation success. The commercial company staff have active presence in all faculties talking to Heads, giving presentations, and conducting workshops. Interviews with researchers and some senior management staff revealed some discontent in terms of real commitment to research commercialisation. Interviewees commented that senior management gave priority to PBRF initiatives and not research commercialisation, as PBRF provided a formal assessment of their research performance against which Premier received the bulk of its research funding. Interviewees felt that proactive leadership within faculties was needed to address bureaucratic obstacles and the organisational challenges of research commercialisation and to help make it a priority.

5.6 *Measuring Performance*

Premier prepares a strategic plan that sets out the institution's long-term goals, objectives, and action plans. The strategic plan objectives are generally expressed as targets to be achieved over a five-year period. These strategic objectives are then operationalised in Premier's profile (replaced by investment plans from 2008) in terms of planned activities and performance targets against which actual results are measured. Premier's profile also aligns the institution's strategic direction and objectives with the government's long-term tertiary education strategy. This alignment is important to ensure that both the institutional goals as well as the nation's goals on tertiary education strategy are achieved. The profile, once negotiated and approved by the TEC, becomes the contractual basis on which government delivers funding to TEIs. It also becomes the key document that Premier utilises to measure results and report on its performance in terms of the TEC-approved objectives and performance indicators.

The introduction of the Performance-Based Research Fund (PBRF) changes since 2003 reinforced research as a critical measure of the standing of TEIs and as a basis for government funding. Premier was early to recognise the importance placed on research measures and, in its Strategic Plan 2002-2004, it set out its long-term goal to conduct research of a consistently high international standard that contributed to the advancement of knowledge, and to the national goals of innovation, economic and social development. In line with government strategy on research and innovation, this has continued to be a key goal for the next seven years in Premier's Strategic Plan 2005-2012. The institution's research strategy and objectives against which performance has been measured since 2002 has continued to be largely in terms of being able to create and promote research of consistently high value and quality that contributes to social, economic, environmental and cultural development; to build and consolidate areas of research excellence in the wide range of disciplines; to attract, encourage and retain the best possible researchers; and to provide the appropriate infrastructure and resources to support research. Table 5.1 presents the key research-related objectives and performance indicators against which actual results of performance were measured and publicly reported by Premier for the period 2003-2008.

Table 5.1 Objectives and Performance Indicators for Premier 2003-2008

Objectives	Performance Indicators
2003-2005 Objectives **Recruit nationally and internationally staff who are excellent researchers in their fields.** **Work to increase external funding and support for research and creative work.** **Fully engage the skills and capabilities of the University in carrying out research that meets the research goals of the University and assists the nation to meet its strategic goals.** **Develop portfolios of research that enhance the University's capacity to carry out research of regional, national and international relevance.** **Protect, develop and exploit the intellectual property developed in the University.** **Recruit increased numbers of postgraduate research and post-doctoral students and provide them with research supervision, infrastructure and support of the highest possible quality.** **Promote research alliances and collaborative partnerships with other tertiary institutions, research institutions, public agencies and the private sector.**	2005 Performance Indicators PBRF-eligible staff who achieve an A Quality Category in the research quality evaluation report. Increase research revenues by at least 5% per annum. Participation in CoREs, and outcome-based investment initiatives. Establish clusters of University research institutes and of major research areas. Establish at least two new major research institutes per year. Increase the number of strategic research intensive professorial appointments made each year. Patent applications filed, University IP exploited in at least one new initiative a year. Research students as a % of postgraduate students (EFTS). Doctoral theses completed (number) Links with research consortia, industrial and research partners, Crown Research Institutes. 2003-2004 Performance Indicators* Research-based postgraduate (EFTS) Research grants from external sources ($m) Publications and creative works (Numbers) *Premier had not developed a comprehensive set of performance indicators until 2005.
2006-2008 Objectives **Develop a high quality research environment.** **Develop international quality graduate programme.** **Provide enhanced support for research activities by doubling external research income.** **Develop large scale research institutes of excellence.** **Develop a high quality student body.** **Create a culture that encourages staff to reach their full potential.**	2006-2008 Performance Indicators PBRF targets of A: B: C ratings of staff. Doctoral and masters completions. External research income targets. Number of large-scale research institutes. External research income per large-scale research institute. Have 10% student body in research postgraduate programmes. Number of prestigious international awards held by staff. Professional development expenditure per full-time-equivalent staff.

Interestingly, Premier relies mostly on input/process KPIs with no real attempt to measure knowledge outputs and outcomes. The objectives and performance measures are also largely dictated in terms of the government-approved PBRF measures. As stated in Premier's Strategic Plan 2005-2012:

141

"We intend to target our investment to improve performance in each of the three sub-measures of PBRF: quality evaluation of staff; external research income; and research degree completions."

Strategic documents and interviews indicated that improving performance in terms of the PBRF measures is vital for Premier to maintain its high ranking as a research-led institution and enhance the international reputation of research staff and the institute. At the same time, basic research component funding is based on success in terms of the PBRF measures, so Premier is strongly motivated to improve performance in terms of its PBRF measures to maximise its research income from PBRF:

"Increased levels of research income will improve our performance in the PBRF and provide additional support for our growing research activities. A broad base of research income provides the University with greater financial flexibility, and reflects the extent to which external parties are willing to invest in our research infrastructure and activities. Such research grants and contracts reflect important partnerships between the university and its communities." (PU: Strategic Plan 2005-2012)

The external research income target is a key performance indicator of research institutes and centres. Their survival, success and growth are measured in terms of the amount of external research income generated. The above list does not include objectives and performance measures directly related to research commercialisation activities. Premier's commercial company handles all commercial activities, and research commercialisation objectives and performance measures have been decoupled from Premier's strategic documents so that it does not have to comply with TEC requirements to measure and report on research commercialisation performance. The only exceptions were in 2003-2005 when Premier had stated that one of its objectives was to protect, develop and exploit the intellectual property developed at Premier. The key performance indicator for this objective was the number of patent applications filed. However, interviews with a Director responsible for planning and reporting indicated that this was discontinued from 2006 onwards mainly because TEC does not fund commercialisation of research activities. Premier recognises that it has no obligations towards TEC for any unfunded commercial activities. Therefore, it does not set objectives and performance indicators for research commercialisation activities in its strategic documents against which it measures

performance. It was interesting to note that although measures of research commercialisation activities have been decoupled from the technical requirements of TEC-funded objectives, Premier still requires its commercial company to prepare its own strategic plan. According to a Director of the Commercial Company:

"The board makes sure that the strategic plan of our organisation is aligned with the goals of the university. The strategic objective of the company is around increasing the research revenues, the educational training revenues and the commercialisation revenues in the university. We set the objectives for how much activity we are putting into the university, the number of staff we engage, the number of patents and licences that we have for our commercial IP, the number of new invention disclosures that we get through the university every year, so that we can actually measure our activity, and we set goals for those to actually achieve." (PU: Director Commercialisation)

Interviewees were concerned that performance measures for research commercialisation activities are difficult to specify, quantify, and measure because of the long-term nature of the projects. Premier chooses simple measures such as external revenue targets to help cover shortfalls in government funding. As was explained by the CEO of Commercialisation, *"Revenue is a simple one ...these are the measures that government funding agencies have put on universities, so you can't blame the universities for behaving like that, they are behaving the way they're trained."*

He went on further to explain that in terms of the commercial company's performance:

"We're rated by the volume of good quality research we bring to the university, and we're rated by the reputation we bring to the university Thirdly, it is accumulation of assets on behalf of the staff and the university and this might be in the form of equity or licensing."

Premier has consistently set external revenue targets as a key performance indicator of success for its commercial company and research institutes. Research consultancy and contracting were found to be the most common forms of commercialisation revenue. Research units and researchers' performance have been consistently measured over the years by their ability to obtain research grants. Measures of success for the research institutes are also in terms of major achievements that "*...include new major research funding, new prestigious international collaborations, rapid growth in ... Network(s)..., and increased public promotion of science and research outputs.*" (PU: Annual Report 2007)

While the focus on revenue is deemed not very public spirited as it does not reflect the broader understanding of the commercial and economic benefits of research commercialisation, interviewees explained that external revenue is important to cover shortfalls in government funding. It became clear during interviews that, ultimately, Premier measures the success of its commercial company in terms of revenue generated for the institution. The institutional pressure imposed in terms of revenue targets has also forced the commercial company to publicly state its key strategic objectives in terms of revenue to be generated rather than specific commercialisation of research activities. Premier recognises that effective accountability requires meaningful objectives and targets for commercialisation to be put in place and monitored consistently. The commercial company also recognises that monitoring performance of research commercialisation through a system of metrics will help inform organisational practices and innovation policies that support the development goals of the nation. However, the common problem it continues to confront is the selection and adoption of commercialisation measures that accurately reflect such performance. As has been acknowledged in Premier's 2005 Annual Report:

"...an atmosphere of intellectual excitement...is hard to define and measure, but it might be best explained as the spirit that unites the university as a scholarly community"...

In terms of measuring commercialisation success, Premier relies on common metrics such as licensing revenue, contract research and consultancy income, new invention disclosures, number of patents filed, licences signed and spin-out company formation. However, these capture only a small portion of the commercialisation performance which is largely reported by Premier in terms of commercialisation success stories.

5.7 *Reporting Strategies*

Premier uses a wide range of communicative mechanisms to keep its stakeholders informed about its research and commercialisation initiatives. The institution's charter, the strategic plan, profile and investment plan are public documents that clearly lay out the intent and commitment to research and commercialisation. Premier also produces faculty newsletters, research news bulletins and its website contains extensive information on the research activities of the institution, including those of the faculties,

research centres, and research institutes. The websites mainly provide details of the research centre objectives, functions, membership, staff and student profiles, achievements, and funding success stories. It also provides an extensive narrative of past events, activities, and performance. Most of the information on the website is largely publicity material aimed at generating positive public relations and creating a good impression in terms of Premier's research activities. Premier's commercial company also has a separate website with links to Premier's web pages and produces a whole range of publicity and promotional materials. Publicity materials are those used to create a positive spin largely aimed at raising the research commercialisation profile. Promotional materials are produced to inform and build confidence with clients and stakeholders in terms of research commercialisation success.

Premier's annual report is the institution's key accountability document in terms of formal reporting to stakeholders on financial performance and achievement of objectives. The contents of the annual reports for the period 2003-2009 were formally reviewed using NVivo8 to determine the nature and extent of reporting on research commercialisation activities. Interestingly, Premier's annual reports do not report on specific performance in terms of research commercialisation objectives, key performance indicators, and achievement of actual results. Interviewees explained that the annual reporting is based around the strategic objectives and key performance indicators that the government has negotiated with Premier and provided funding for:

"The objectives will flow from the government approved profiles (now replaced by investment plans). It is really just collecting the information up around the particular KPI that we are choosing to report on." (PU: Director)

Interviews with Directors responsible for planning and financial reporting revealed that research commercialisation activities are not funded by TEC and, therefore, Premier is not obligated to set goals and objectives and measure and report on commercialisation outcomes. Effectively, these requirements have been decoupled from the technical NPM reporting requirements of the institution. The commercial company receives all funding from commercial activities and is responsible for reporting the results of its activities and financial performance to Premier. The total income and expenditure of the commercial company is consolidated into Premier's annual financial report.

"If it goes through the (commercial company), it is reported through the (commercial company). If it is public good, it is reported through the university. The annual report actually separates out 'university only' and the 'group'." (PU: Director)

In the absence of any formal reporting in terms of goals, objectives and achievement of actual results against targets, Premier provides positive commentaries on commercialisation activities in the narrative section of its annual reports. The narratives have been generally compiled as success stories on events, activities and revenue generated by the commercial company and the associated research institutes involved in research commercialisation. As the Director of the commercial company commented:

"We write a report to highlight some of the major activities we have done that year. It is difficult for any particular reader to grasp the full width of our business...so, quite often we just highlight some of the things that are engaging to the reader, most readers have got no interest in what we do…"

On decisions regarding what goes in the annual report and the purpose of reporting, the PU: Director commented:

"Well, we decide on a theme for each year and then we extract stories out of each area; that is usually seen as a cross-section of activities across the university. We produce this as a marketing document as well."

The common view held by interviewees was that positive reporting in terms of seeking publicity and building a good public profile was extremely important for Premier's research commercialisation efforts.

"The publicity is really building up. The publicity is really important and extremely valuable to us. We are really getting more organised, the university is getting more organised with the media relations. There are often good stories to begin with and we are fortunate in the place we work with. .and (the) *Institute has a very good public profile because of their good research...... There is a greater twist now on promotion values on what we do. Why we do is part of accountability for funding".* (PU: Deputy Director, Research Institute)

From an analysis of narratives in Premier's annual reports, it became obvious that reporting emphasis was on achievements, highlights and initiatives that promoted efforts made towards building a strong research culture; developing research capability; improving research quality; undertaking research collaborations; and securing much needed external research funding. Premier uses its annual reports to raise awareness of

the importance of building its research culture and capability. Some quotes from the 2006 university annual report capture some of the major themes as follows:

"A strong research and innovation culture is a key requirement for any modern international university"

"The continuing rapid growth in research contracting and commercialisation activities with business and industry and the growing number of companies spun-out from academia, clearly attest to the fact that university research capability is one of the key drivers of local and international innovation systems."

Premier's annual reports also serve as an effective communicative medium to justify the resourcing needs of the institution and voice concerns about the obstacles and challenges confronting the development of its research culture and capability. In this regard, the annual reports have continued to emphasise that building its research culture was dependent on having autonomy, achieving excellence, and creating an innovative and enterprising environment. Building its research capability was dependent on the recruitment of top-ranking researchers and development of its research infrastructures. These are some of the more important issues that Premier has continued to strive for in recent years, and reporting in this manner has not only helped it to justify its actions but to also gain much-needed stakeholder support. Annual reporting has also been used regularly to voice concerns about government policies and research funding levels. The following are some examples noted from Premier's 2005 Annual Report:

"(The) University is at risk of being held back by funding levels and government policies....Institutional funding severely lags behind international norms, and quality incentives in the system are weak. ...there is too little compensation for the costs of establishing and maintaining a research infrastructure..."

By echoing these concerns, Premier was able to gather support from other institutions that ultimately led to a favourable response from government. It is interesting to note that in its 2006 Annual report, Premier has welcomed the government's response but, at the same time, has maintained pressure for a more comprehensive response and issued further challenges.

"Although we do not yet have a comprehensive response from Government on future funding policies, there were some signs during 2006 that our message is being heard and understood. Postgraduate funding rates were increased as was the PBRF. ..In a similar vein, the Government carried out a review of medical funding and responded very positively to a joint submission from the Universities..., increasing funding rates

significantly...This was a very welcome, but small, first step... The Government's challenge is to recognise the future value to New Zealand and all New Zealanders of a world-class university in this country, and to invest accordingly."

Annual reports have been used to communicate success in terms of ground-breaking discoveries and to acknowledge contributions from staff, students, and other collaborative partners. Staffing awards and honours won, prestigious fellowships, professional achievements and recognition, and success in terms of research grants have become a regular feature in Premier's annual reports. This makes the annual report a public relations vehicle designed to reassure the public, with a feel-good image that helps create a favourable basis for relationships with stakeholders. It is also aimed at influencing the public perception about Premier's role as a key driver of both the national and international research and innovation systems. Apart from constructing positive narratives about commercialisation activities in its annual reports, Premier does not report on specific commercialisation goals and objectives. However, it requires the commercial company to provide more comprehensive reports to the university to avoid any accountability deficits.

"Connecting that with accountability, we have quite a high level of reporting around where we have spent our money, to allow the university to see that, buying patents or investing in further developments of an idea to take it to a commercial point". (PU: Director, Commercial Company)

On reporting by the university commercial company, the Director of the Commercial Company explained:

"Setting up our strategic plan actually determines where we are actually most interested in reporting back to our stakeholders, which are, in the first case, the university and their staff, and then following on from that their customers who are stakeholders, as well as the general public both here nationally in New Zealand, and internationally. So, we see the stakeholders' interests in information are heavily connected to our strategic plan, so we take the drivers for revenue, commercialisation, and inventions and for research, sales or education sales, as all being the critical measures that we look to report."

He went on further to explain:

"The board makes sure that the strategic plan of our organisation is aligned with the goals of the university. The strategic objective of the company is around increasing the research revenues, the educational training revenues and the commercialisation revenues in the university. We set the objectives for how much activity we are putting into the

university, the number of staff we engage, the number of patents and licences that we have for our commercial IP, the number of new invention disclosures that we get through the university every year, so that we can actually measure our activity, and we set goals for those to actually achieve". (PU: Director, Commercial Company)

The commercial company also produces an annual report which is circulated widely to its clients. The annual report does not contain any financial information but has narratives on events and activities.

"What we have always tried to do is provide a stakeholder report through our annual report, which allows the stakeholders to see what our activities are and what we were doing and how we are going about it, to make sure there is a very good view, and that report we put out 4,500 copies, a lot to the staff but also our customers, to our banks and to our international clients." (PU: Director, Commercial Company)

The primary motivation behind reporting is largely aimed at projecting a positive image as well as providing a measure of confidence to clients in the research capability of staff.

"That's a promotional document." (PU: CEO, Commercialisation)

"We have really aimed to try to tell people as much as possible about commercial activities that we have been successful with, continuously lifting the reputation of the organisation, because reputation is important to our success because it builds confidence with clients that we can deliver against our projects." (PU: Director, Commercialisation)

Premier provides regular reports on its commercialisation activities to University Commercialisation offices of New Zealand (UCONZ). These reports are consolidated into a New Zealand report on commercialisation. According to a Business Manager of Commercialisation, New Zealand sector performance is best viewed by looking at the macro perspective. This perspective was also confirmed by the Director of Commercialisation who said that a New Zealand measure of commercialisation is important and is quite often used to illustrate to government that there is a lot of return on investment from the research in New Zealand universities.

5.8 Chapter Summary

This chapter presented the analysis of data pertaining to Case Premier to help explain how it identifies and renders accountability towards enabling commercialisation of research. A review of Premier's strategic documents illustrates that it was one of the earliest TEIs in New Zealand to make a strategic commitment to the research commercialisation mission in an effort to contribute to the global advancement of

knowledge and to the nation's goals of innovation, economic and social development. Premier operates in a wider institutional environment and data analysis on the institutional drivers of research commercialisation were presented to help identify its key stakeholders and factors that impose accountability obligations towards enabling commercialisation of research. While government and industry are the major stakeholders in terms of funding and research collaboration initiatives, data analysis suggests that Premier has a strong professional (normative) accountability and cultural-cognitive obligation to researchers and the wider community to engage in commercialisation initiatives.

To manage its accountability expectations, Premier relies on a strategy of recruitment of top researchers and has created large research centres and institutes. It evaluates the success of its research centres and institutes based on the external research income they generate. Premier concentrates its efforts towards the creation of a vibrant research culture and development of its research capability. However, its research culture has been largely influenced by its PBRF goals which seem to have taken priority over, and become counter-productive to, the research commercialisation initiatives. Research evidence suggests that Premier needs to develop an innovation and entrepreneurship culture that is supportive of research commercialisation work. It needs to address bureaucratic obstacles and organisational challenges to help make research commercialisation a priority.

Finally, in terms of accountability discharge, Premier's strategic documents provide a positive construction of a strong commitment to the research commercialisation mission. However, what seems interesting is that Premier does not set specific objectives and performance measures for research commercialisation activities in its strategic documents against which it formally reports. It has effectively decoupled itself from the formal requirements to measure results and report on its research commercialisation performance. Its voluntary reporting really takes the form of promotional and marketing initiatives and some of the reporting also takes the form of lobbying government. A summary of the case findings of Premier is presented in Table 5.2. The next chapter presents an analysis of data pertaining to Case North-West.

Table 5.2 Summary of Case Findings for Premier

Mission & Strategy	• Become a research-led international university • Contribute to the nation's innovation strategy • Undertake high quality research and develop areas of research excellence • Development and commercialisation of research • Promote value of research to the economy, society, and community • Attract, encourage and retain the best possible researchers • Provide appropriate infrastructure and other resources to support research • Develop an international research profile
Institutional Drivers (stakeholders and factors imposing accountability obligations)	**<u>Government</u>** • Provides the regulatory framework • Establishes the national innovation strategy and related policy • Regards Premier as having a central role in the achievement of government's goals in innovation and nation development • Provides funding incentives • Important collaborative partner and sponsor of CoREs **<u>Industry</u>** • Needs high value research with commercialisation potential • Important collaborative partner to leverage competitive advantages • Provides financial benefits through licence and purchase agreements • Joint commercial research projects help build research capability • Linkages help create high profile research teams and culture • Helps cultivate relationships and provide job opportunities for researchers • Provides funding for CoREs and sponsors research consortia • Requires greater accountability in terms of willingness to co-operate **<u>Researchers</u>** • Participation is integral to the success of commercialisation • Majority are driven by the PBRF culture, not commercialisation • Some pioneering researchers emerged as institutional leaders – driven by an expectation to see research commercialisation outcomes • Professional obligations – lot of pride and reputation involved • Funding incentives for on-going research and to build research capability • Student researchers require rich and meaningful experience working alongside excellent researchers utilising cutting-edge technology **<u>International Partners</u>** • Requires effective international networks • Collaboration helps share best practice, promote synergies, and gain access to relevant expertise • Provides international opportunities for staff and students • Attracts international recognition and reputation to build profile • Creates opportunities for government and businesses • Offers attractive funding opportunities and research infrastructure **<u>Wider Community</u>** • Expect research, innovation, and technology transfer to address their social, economic and cultural concerns • Meeting public expectations helps enhance reputation and public image • Fulfils global corporate citizenship role **<u>Financial Considerations</u>** • Funding providers help advance commercialisation projects and develop research infrastructure and capability • Commercial company provides a vital source of revenue to fund new research opportunities, invest in further research with commercial potential,

	secure IP, employ researchers, and build the research infrastructure • Funders need to target research with commercial potential
Managing Expectations	**<u>Research & Innovation Culture</u>** • PBRF culture strong • Focus on critical mass of research excellence • Engage staff fully in commercialisation • Strategy to recruit high quality researchers and create research facilities to world-class standards • Commercialisation culture needs development **<u>Research Capability & Capacity</u>** • Development is a long-term strategic process • Strategy determined by government and PBRF results - staff, resourcing needs, organisation support systems and infrastructure development • Focus is to build high performance research, collaborative links with multi-disciplinary research groups, industry and international researchers **<u>Structure</u>** • Develop large-scale research institutes of excellence, commercially focussed • CoREs –extensive network of researchers to support world-class research • Autonomous commercial company – provides flexibility and financial independence. Sponsors research units, ensures sufficient expertise and resources available • Provides organisational unit with identity and autonomy to researchers; enables collaboration, pooling of resources to develop critical mass and helps promote a strong research culture • Provides legitimacy for funding – funding success is prerequisite to the creation and survival of these structures • Enhances reputation and raises research profile, forges international collaborations and enables attraction of top research talent **<u>Systems & Processes</u>** • Commercial company maintains separate systems and processes • Decoupling from centralized systems has led to inevitable tensions • Still subject to bureaucratic control and compliance procedures of NPM **<u>Managing IP</u>** • Has clear policy and strategy to protect, develop and exploit IP • All IP developed by staff assigned to commercial company • Commercial company ensures IP is managed properly and progressed within reasonable timelines, and expectations and outcomes are clear • Belief that commercialisation is not about who owns IP but is largely affected by level of commitment and management • Staff to contact commercial company before any disclosure made • IP protecting mechanisms used – file a provisional patent, spin-out company, or licence arrangements **<u>Rewards & Incentives</u>** • Provided to change researcher behaviour and encourage engagement • Major incentives are professional and cultural–cognitive, sense of accomplishment of an outcome, desire to secure additional funding • Longer timeframe and uncertain financial success is disincentive • Reward systems recognise a narrow band of PBRF related activities – disincentive to research commercialisation **<u>Leadership</u>** • Strong commitment from senior management required • Commercial company CEO is on the senior management team • Pioneering researchers also become the institutional leaders

	• Proactive leadership within faculties required **<u>Governance</u>** • University council has ultimate responsibility • Commercial company has an independent board with 5 internal and 5 external members • Board approves policies, sets strategic direction, and provides guidance to management with reporting back to council. However, challenged by structure, composition and authority system **<u>Risk Management</u>** • Commercial company structure ensures commercial ideas not overlooked or put at risk • Managed as a portfolio of business to minimise risk
Measuring Performance	• Strategic documents set out goals, objectives and performance measures - largely influenced by PBRF goals • Use of input/process KPIs provides no real attempt to measure knowledge outputs - strongly related to PBRF and enhancing reputation • External research income is a key performance indicator to measure success of research institutes, centres and the commercial company • Does not set specific performance measures for commercialisation activities in strategic documents against which it reports • Commercial company captures a small portion of research commercialisation performance
Reporting Strategies	• Strategic document is a positive construction of commitment to research commercialisation • Website contains extensive publicity information on research activities • Annual report provides formal reporting to stakeholders • Narratives are compiled as success stories on research events, activities, funding success and staff and student achievements • Annual reporting emphasis is on initiatives promoted towards building research culture, capability, research collaborations and PBRF • Annual report also used to justify resourcing needs and for lobbying govt • Commercial company produces annual report as a promotional document

CHAPTER 6: CASE STUDY RESULTS

CASE NORTH-WEST

6.1 *Introduction*

This chapter presents the results of an analysis of data pertaining to case North-West. Accounts of how the TEI identifies and renders accountability that enables research commercialisation were elicited from interviews and an analysis of strategic and other publicly-available institutional documents. As stated in the previous chapter, the real name of the TEI has been disguised and data that may identify the interviewees have been withheld to maintain the anonymity of the interviewees. As with Premier, the case study results are presented in a similar format that roughly corresponds to the four research questions posed in the study.

After a brief case description, the institute's mission, strategy, and institutional drivers that provide an understanding of the accountability obligations towards enabling commercialisation of research, are discussed (Research Question 1). Specific themes used in each case analysis involve the influence of government, the engagement with industry, researcher perspectives, international partnerships, the role of the wider community, and financial considerations. This is then followed by a discussion of the institutional processes and mechanisms employed to help manage accountability expectations (Research Question 2). The thematic structure used in the case analysis involve an assessment of the research and innovation culture, efforts aimed at building research capability and capacity, structures, systems and processes, management of IP, rewards and incentives, governance mechanisms, risk management strategies, and leadership. To help determine appropriate levels of accountability discharge, performance measures and results of commercialisation are reviewed (Research Question 3), and the reporting strategies used by the TEI are critiqued (Research Question 4). This format is consistent with the conceptual dimensions and key theoretical elements of literature presented in Chapter 3, Table 3.1 and Figure 3.1. At the conclusion of the case, an analytical summary is tabulated and presented, thus allowing for a multiple case analysis from which cross-

case issues and emerging themes are further explored in Chapter 8, and theoretical conclusions drawn in Chapter 9.

6.2 *Case Description*

North-West has been a leader in applied tertiary education for almost 30 years. By blending together the academic rigours of a university with the practical orientation of an institute of technology, it has evolved into a dynamic and innovative institution. North-West has a strong international focus with membership of the International Association of Universities and has maintained formal relationships with many overseas institutions. It offers a wide range of qualifications, from certificates and diplomas to degrees and doctorates. Over 20,000 students from more than 80 countries choose to study at North-West's three campuses. It has seventeen schools organised as study areas ranging from Arts, Business, Applied Technology and Trades, Construction and Civil Engineering, and Natural Sciences. North-West has established itself as a regional tertiary institution providing opportunities to a diverse cultural and ethnic mix of learners that includes school leavers, professionals training for jobs in industry and trades, second-chance adult learners, and graduates returning to gain postgraduate qualifications. It offers postgraduate programmes in Architecture and Landscape, Business, Community and Social Practice, Computing and Information Technology, Design and Visual Arts, Education, and Health Sciences. Postgraduate students are supported by a Postgraduate Centre. North-West has a staff of nearly 1200 and, in most cases, they come from an extensive background of professional and industrial experience. Staff members also include nationally and internationally recognised experts in various discipline areas. Over the past decade, North-West has placed major emphasis on steadily growing its professoriate. All academic staff are encouraged to undertake research that is largely applied in nature and closely linked with advancing practice within a real-world context. The focus on applied research to serve the educational, social and economic goals, regionally, nationally and internationally is a deliberate strategy to distinguish itself from other TEIs.

Research commercialisation at North-West is at an early stage of development. Four research and development centres that were established almost a decade ago have operated as school-based, multi-disciplinary units with a focus on research and commercialisation. Unlike Premier and Universal, there is no established entity such as a separate commercial company to undertake the research commercialisation process. It has been individual school and department responsibility to identify research with commercialisation potential and progress its development further into a commercial product. The central research office also established almost a decade ago had provided much support to individual school's development efforts including the development of a research culture amongst staff. It also took a leading role in appointing staff and establishing systems and processes to assist schools with their research commercialisation efforts.

6.3 *Mission and Strategy*

North-West's vision, stated in its 2003 Annual Report, was *"...to be the most innovative and exciting university..."* within its region. It's approved Charter, effective until 31 December 2009, had set the institute's mission to inspire people to discover and apply their intellectual and creative potential and to contribute responsibly to their societies and cultures. To that end, it undertook to be research-informed with an emphasis on research valued by its stakeholders and by the academic community. It had also placed emphasis on fostering an institutional culture in which innovation and enterprise was expected and rewarded. In its Charter, it expressed its commitment in the following terms:

"We focus on applied research that serves educational, social, economic and environmental goals, regionally, nationally and internationally." (NW: Charter 2007-2009)

To give effect to its Charter, North-West in its strategic plans and profiles (now replaced by an investment plan) had continued to place emphasis on building its research culture and capability. The Investment Plan 2008-2010 documents areas of primary focus and sets out a rationale for government-funded activity at North-West for the next three years. The plan outlines the needs of the communities and students, the external and internal influences on the institution, and the strategies that need to be pursued within the framework of government tertiary education priorities. More specifically, in relation to

commercialisation of research, North-West's Investment Plan 2008-2010 states its commitment to increasing involvement in evidence-based technology development and transfer. To achieve this goal, North-West's Investment Plan 2008-2010 had also emphasised that it would:

"Agree developmental plans for a more systematic approach to technology development and transfer, for example, by enhancing links with and offering technology development services to firms, and/or building enhanced linkages with research organisations, including universities."

Its major focus has been on expanding its research connections and linkages that actively support collaboration with industry, with a focus on applied technological development in order to create economic opportunities. Its research commercialisation vision promoted by one of its largest research institutes was to add real value to regional economies and communities. This, it emphasised, was based on a model of innovation in applied research ultimately leading to commercialisation.

6.4 *Institutional Drivers*

A range of institutional drivers of research commercialisation discussed in the following subsections help identify North-West's key stakeholders and accountability obligations.

6.4.1 **Government**

The government is an important stakeholder with a significant role in supporting North-West in its research and commercialisation efforts. It has the primary role to develop tertiary education priorities and ensure that the nation's goals on research and innovation are properly aligned with the TEIs' goals. In its 2004 Annual Report, North-West had noted some initial concerns, stating that:

"The applied nature of our research, linked to teaching and industry, focusses on solving real and practical problems of relevance to society and the knowledge economy. While this focus does not provide a perfect fit with the application of the new funding regime, we are confident it meets the underlying goals of the innovation strategy being pursued by the Government." (NW: Annual Report 2004)

Despite research funding concerns, North-West continued its development efforts on building its applied research capacity. At the same time, the government through its funding agency TEC, had recognised that North-West was well placed to meet its national innovation goals of economic transformation and social and cultural

157

development. In its 2006 Annual report, North-West had acknowledged the role of government in supporting its efforts, stating that:

"...our fit with the Tertiary Education Strategy and the Statement of Tertiary Education Priorities is now very strong indeed." (NW: Annual Report 2006)

It went on further and confirmed its commitment to government priorities by stating in its Investment Plan 2008-2010 that:

"(North-West) *has adopted all the priorities* ... (and) *has also adopted the research transfer priority established for universities."*

North-West's investment plan, which had replaced its charters and profiles from 2008, is both a planning document as well as a government funding contract for a three-year period. The new investment plan had reaffirmed North-West's charter obligations, focussing on applied research directed at serving the educational, social, economic and environmental goals, regionally, nationally and internationally. The government expects North-West to build its role as a regional facilitator and to provide support to the innovation system at a regional level through building a shared understanding of the needs of local communities and industries. As has been outlined in its Investment Plan 2008-2010, North-West had welcomed the recognition accorded by the TEC and made a firm commitment to government strategy and priorities. In terms of accountability, North-West had a clear statement in its 2003 Charter that for its owners, the government, it will be accountable for its actions, provide sound stewardship of resources, and enhance their investment. The following comments re-emphasise the accountability obligations of North-West:

"I think we are accountable under the whole (government) *strategy, that's why I am doing it! ...we should be putting some support and putting some money in there and all sorts of things, which we are in a way, we are beginning to do that".* (NW: Manager, Commercialisation)

Government, on the other hand, has supported initiatives to enable North-West to meet its commercialisation objectives. Recently, with the support of NZ Trade and Enterprise, North-West was able to undertake a major initiative to engage with design and production in China. The government had also provided major funding through its Growth and Innovation Pilot Initiatives (GIPI) programme to assist with innovation

projects. Funding has also been made available to North-West to undertake projects designed to significantly strengthen its capacity to assist business and industry to respond to the changing needs of the region and nation. The role of government in supporting innovation and commercialisation has been acknowledged by researchers, as evident from the following comments by a Research Centre Director:

"I would say, to be fair, you actually have to give credit to this government's support of innovation programmes, and R&D funding, and tax credits, and support programmes, and NZ Trade & Enterprise seminars, and the list goes on and on of initiatives that have, I would say, arguably increased the number of commercialisable innovations in the country. So, that is one of the pressures...upward pressures from assistance programmes that have been happening over the past 6-7years, basically since the knowledge wave conference. So, that has been quite a positive, I think".

Interviewees, however, indicated that government should play a bigger role in helping North-West, through investments in research infrastructure, to further develop its applied technology-led innovation and commercialisation efforts which promise to bring about long-term economic and social benefits to the region.

6.4.2 **Industry**

North-West has a strong history of collaboration with business and industry and this relationship has been further strengthened by the applied nature of the research undertaken by its researchers. Maintaining strong links with industry and the professions also underpins North-West's contribution to the national innovation system. Industry partnership is considered necessary to keep up-to-date with recent trends and developments in industrial innovation and to ensure students are industry-ready. To demonstrate its commitment to industry and the professions, North-West has also tailored most of its academic programmes to be industry-oriented, giving effect to its applied research strategy of being research-informed. This includes a professional doctorate programme specifically designed to explore issues relevant to the practical work in the industry. Most schools have appointed Advisory Boards consisting of leading members of industry and the professions. Advisory Committees provide a direct link to industry and business and draw on the expertise of professionals and business leaders to advance development. Industry-recognised qualifications are informed by research and development. Key centres of research have also been established to facilitate

159

collaborative research with industry leading to commercialisation. The applied research culture encourages staff to undertake practical research with industry that benefits both sides of the collaboration, as is evident from the following comments:

"(North-West) has been particularly successful in building mutually beneficial relationships within the industry and the community. Many of these involve sharing of campus facilities, including the partnership... (That) provides excellent opportunities for student work placements in addition to the potential for providing research and consultancy opportunities." (NW: Annual Report 2003)

A striking feature of the partnership arrangement is that most commercially significant inventions have come from direct collaboration with industry that has been deemed relevant to their innovative activities. The following comments from North-West's 2004 Annual Report capture the nature and scale of research activities that benefit the industries it serves.

"The School has one of (North-West's) *three Key Centres, focussing in property and construction innovation....Recent work with the Building Research Association of New Zealand (BRANZ) developing an Urban Sustainability Information Resource, and ...developing Best Practice in Medium Density Housing Design, complements a strong sustainability theme that runs through much of the School's research activity. Expertise in sustainable energy initiatives has been established and ...The present research focus is on the development of a computer model for quantifying the sustainable energy options that accompany the use of a wide range of fuel types. This work is complemented by activity in waste minimisation, coastal engineering, ground water engineering, and concrete structures."* (NW: Annual Report 2004)

North-West has placed a lot of emphasis on industry linkages to help create a high profile for the institution and build the reputation of its researchers.

"I think another driver for (North-West) *is the fact that we like to be perceived as very much linked to industry and this* (commercialisation) *is clearly evidence of that type of linkage."* (NW: Head of Research Division)

The decline in government funding combined with increased competition for research funding has put pressure on North-West to become more entrepreneurial. It has sought closer links with industry as a means of expanding research support and to provide new sources of research funding. Interviewees indicated that the major challenges facing North-West are that industry in New Zealand is relatively small and fragmented, has low R&D investment and, generally, has a poor capacity to absorb university-generated technology. Interviews with industry sources revealed that the academic research culture

is insufficiently focussed on serving industry needs. For research commercialisation to become a reality, TEIs must strengthen their partnership with industry and undertake research that has practical application to the technical and business problems facing industry.

6.4.3 **Researchers**

North-West's charter made a strategic commitment to encourage and support researchers and to recognise and celebrate their contributions. Staff are encouraged to undertake research that enables them to reach and remain at the leading-edge of their disciplines and professions. Students are encouraged to engage in applied research projects that enable them to take their innovations back to the workplace, and put their ideas into practice immediately. The strategic documents recognise the need for postgraduate student researchers to work alongside nationally and internationally known researchers who remain at the leading edge of their disciplines and professions, utilising latest cutting-edge technology and tools. According to a research centre Director, being a smaller institution with a regional focus, North-West lacks sufficient breadth and depth of research capacity and the quantity and quality of researchers that can become involved in the research commercialisation function.

Interviews with researchers revealed that underdeveloped research capacity and shortage of quality researchers were the major obstacles to commercialisation. Despite these shortcomings, North-West remains committed to ensuring a research environment marked by innovation and creativity, and to helping address major issues facing societies and its regional communities. It recognises that good research projects have the potential for commercialisation, as shown by the Head of the Research Division's comment:

"You almost have a synergistic situation, you've got some external funding, you've got some student talent, you've got some staff ability and then some of those ...ideas are now going into commercialisation".

Interviewees stated that to be successful in research commercialisation initiatives, North-West needs to develop its research culture, capacity and capability by hiring experienced researchers who can generate a portfolio of postgraduate research programmes and attract top quality postgraduate students into those programmes.

North-West's Investment Plan 2008-2010 also emphasises its research strategy in terms of developing the research capability of staff, and increasing the quality and quantity of research outputs of relevant staff members. It has emphasised that in order to create and maintain a culture of excellence and innovation, it needs to recruit and retain high quality staff members. Some of the larger schools and research centres have already appointed staff members who are recognised nationally and internationally as experts in their fields, and most are active as practitioners in their chosen areas. This has placed them under considerable normative and professional peer pressure to engage in commercialisation efforts.

"I think that another primary motivation is because other people are doing it. If you had to be realistic, it is because the other players are seen to be doing it and it is also a measure of your sophistication, of your level of research capability, that actually somebody wants the outcome of that and it is patentable, it is commercialisable." (NW: Head of Research Division)

North-West recognises that it has an obligation to encourage staff to explore opportunities for commercialisation from their research discoveries.

"I think that for organisations like us, there is not too much in it but it is also trying to provide some opportunity for staff to take their ideas one step further. So, in some ways, there is almost a professional development/staff recognition component in there as well, which is a factor. You want to say, 'Oh yes, we'll help you take it to the next stage'." (NW: Head of Research Division)

At North-West there are small pockets of developments, largely initiated by research leaders in schools and research centres, to get staff involved in projects with commercialisation potential.

"I think people, some key professors and Heads of Departments, want it to happen." (PU: External Contracts Manager)

According to interviewees, while some schools have appeared to have reasonable success in terms of staff engagement in research commercialisation, others have struggled to get staff commitment. This, they explained, was because research commercialisation was seen as a marginal activity alongside teaching and research. Interviewees went on to explain further that the failure to get staff motivated towards commercialisation was largely due to the fact that their academic career is measured in terms of teaching and PBRF research outputs, not commercialisation contributions. Where commercialisation

success has been reported, it is largely due to research and development efforts of staff working closely with industry and industrial innovations. The following comments made by a research centre Director capture his frustrations in getting the commercialisation efforts off the ground.

"We have about one-third of our staff who are active researchers, another third who would like to be active researchers, and a third who don't really care. But the 'don't really cares' predominate in many schools ...The spirit of innovation and entrepreneurship, arguably, was snuffed out. I used to think it was my own fault, I kept saying is it my body, what's going wrong here, and I didn't realise at the time that there were certain things happening in the industry and in (North-West) *that affected my ability to organise the* (research centre)*."* (NW: Director of Research Centre)

North-West, in its 2008 Annual Report, reported a significant loss of research qualified staff in 2007 largely due to organisation restructuring. It has also reported the re-engagement of a greater number of doctorate–qualified staff in 2008 and established a research programme with significantly more outputs than the previous year.

"I think the challenge will be to get staff to feel secure about it. There have been some high profile cases of things that have gone wrong here, and specifically in this area, so it is going to take a while (for the staff) *to be OK and be able to trust us and what we want to do."* (PU: External Contracts Manager)

The External Contracts Manager, who has certain research commercialisation responsibilities, explained that staff who are involved in projects with commercialisation potential have a genuine desire and commitment.

"It has got to come from staff that are OK to do it. You push them too much and, if they have not had much success doing it, it falls over." (PU: External Contracts Manager)

Some of North-West's top contributors involved in exploring commercial opportunities from research projects include the well established and experienced researchers who have enough confidence and would like to see an outcome. As reported in North-West's 2004 Annual Report, many staff are regarded as experts in their fields and most are active outside as practitioners in their chosen areas. Interviews with researchers indicate that the more successful commercialisation initiatives have been undertaken by staff closely associated with the key centres of research and advanced practice, and for projects for which some external research funding has been received. Interviews revealed that research commercialisation helps staff develop their research profile and enhances their

reputation. It provides staff with the opportunity to actively engage in national and international research collaboration that also helps build the profile, reputation and credibility of North-West. These advantages also receive widespread recognition in North-West's annual reports. For example, it was reported in the Annual Report 2008 that:

"...staff in the School are actively engaged in national and international research that enhances its reputation and credibility as a provider."

Interviewees expressed concern that the majority of researchers are not engaged in research commercialisation initiatives, as PBRF measures do not recognise research commercialisation.

"Academics - their career is measured in terms of the research output and their teaching, not their commercialisation contribution." (NW: Research Commercialisation Consultant)

Given this concern, North-West has struggled to maintain a culture of research excellence, innovation and entrepreneurship. Interviewees suggested that North-West needs to develop a vibrant research culture and develop the research capabilities of staff beyond the short-term PBRF focus. Researchers interviewed indicated that bureaucratic obstacles and procedures need to be removed so that staff are adequately motivated and rewarded to undertake research that has commercialisation potential, and from which maximum value could be extracted in terms of product and process development.

6.4.4 International Partners

North-West's strategic goal is to achieve international recognition for its applied research. It defines internationalisation as working in partnership with its communities to participate successfully in an increasingly interdependent world. Its strategic objective is to integrate international and intercultural dimensions into its teaching, research and service functions. North-West's Investment Plan 2008-2010 provides its commitment to meet international standards of excellence in research and increase the international profile of its research activity. It has established two key centres of research that have helped draw together international researchers and industry partners. An interview with the Head of School who had sponsored one of the key centres of research, revealed that the research centre has already undertaken a couple of international research projects that

have helped secure external funding to support ongoing growth in research activity. She revealed that international collaboration has been strengthened with staff and student exchanges and joint venture arrangements. As has been reported in North-West's 2004 Annual Report:

"International networks and ties continue to grow. We maintain collaborative relations with London Business School, European Business School and Babson College (USA). Numerous other relationships are being developed, particularly in the USA, Germany and the United Kingdom."

Interviews revealed that international research partnerships have helped build research capability and enhance the reputation and profile of the institution. It has also helped inform the current policy environment within government, industry and the general economy. Some schools have established ambitious goals to have a leadership role, nationally and globally, in their respective disciplines. To help achieve this goal, they have established collaborative research with overseas universities and leading international researchers to provide expertise in research initiatives including those with commercialisation potential.

6.4.5 Wider Community

North-West's mission is to discover and apply its intellectual and creative potential and to contribute responsibly to societies and cultures. Its strategic documents reveal that it has maintained an increasing focus on research commercialisation, largely aimed at applied technology development and transfer to meet the needs of the communities it serves. As a public-funded regional institution, North-West is expected to build its role as a regional facilitator and provide support at a regional level through building a shared understanding of the needs of local communities.

"The first function of any commercialisation activity in a country this size is a service to the community because you are creating jobs, if you do it well." (NW: Research Commercialisation Consultant)

One of its key research centres has already established research links with local community groups. The centre for information technology research has taken a leading role by stating its vision as one of applied research adding real value to regional economies and communities based intrinsically on a model of innovation in applied research leading to commercialisation. It has been involved in community-based projects

to bring information and communications technology to community groups. For North-West, community engagement has been far and wide and, for some schools, that has included an international community-based research project:

"Working alongside NGOs, the Peruvian Government, World Bank and the Swiss International Aid Agency, this project will have a major and sustainable impact on the lives, living conditions, resource management and future opportunities for a number of remote communities in Peru." (Web Pages)

Engagement with the wider community helps raise North-West's profile, international recognition for applied research, enhance its reputation and develop its research capability. The benefits are much wider, as was explained by a researcher:

"...we have done some international collaboration and NZ has done something to help some poorer countries...we have put the (North-West) *name on a lot of maps in a lot of countries, and for* (my research colleague) *and me, we have been invited to do keynote addresses in three different countries...The benefits to* (North-West)*, apart from having that money come in, were that when you win research money then you get more government money, so we got that as well, so that was a benefit to* (North-West)*. Also, the research outputs that* (we) *get out of it now through PBRF get funded."*

Interviews revealed that North-West's involvement with the wider community is largely dependent on funding and research expertise that may not be readily available. Despite this limitation, the External Contracts Manager sees this as fulfilling its corporate citizenship role and offering great public relations opportunities. He commented that he would like to see North-West get itself in the game a little bit more and make the connections with the outside world.

6.4.6 **Financial Considerations**

North-West recognises that it needs to secure much-needed funding to further develop its research and realise its commercial potential. It has stated the need to increase external research income as an important goal in its Investment Plan 2008-2010. As was commented by a Research Commercialisation Consultant:

"...the research funding that you are bidding for today, is buying the seeds, you haven't even sown them yet." (NW: Research Commercialisation Consultant)

She went on further to explain that:
"One should remember that commercialisation is not only about IP, like a patent, it is about having the knowledge and creating that into dollars."

North-West has a primary obligation to funding providers to ensure that their research outcomes are achieved. Like most TEIs, it is government-funded predominantly and continues to rely heavily on government funding to support its research activities. Most of its external research income is received from the PBRF and research contracts, but income from commercialisation of research is yet to be sufficiently realised. As was commented on by the Head of the Research Division:

"I would say the factors that are prompting the increase in expectation for research commercialisation are the perception of income streams, and that's actually probably inappropriate because the income streams are few and far between, and usually long-term in nature but, nevertheless, that is a motivation. I wouldn't say it is the primary motivation."

On the contrary, some interviewees commented that having spent all public funds on basic research and teaching has put pressure on the institution to actually have a bit more accountability on people's ideas. As the External Contracts Manager commented:

"I just think it (commercialisation) *is something that has to happen, because of its nature. No, I don't think money is the motivation."*

Interviewees recognised that even the best case research commercialisation may not generate sufficient revenue and that is a risk that needs to be taken. Based on this assertion, there was general consensus that North-West should not pursue research commercialisation primarily as a major source of revenue. There are much wider direct and indirect benefits in terms of economic and social development that will emerge from research commercialisation. Interviewees also commented that North-West has recognised that it cannot achieve high levels of performance in its research and commercialisation efforts in all its discipline areas, given the financial and resource constraints it has. A research professor commented during an interview that commercialisation of research and innovation requires resourcing and that:

"We don't have the funding to do that and there are simply not the resources to do that, even though, arguably, (North-West) *is a better institution than many that I know in the US that we classify as State Universities."* (PU: Researcher)

North-West has identified some priority areas for funding in design, construction, and computing and has established key centres of research excellence in these areas.

6.5 *Managing Expectations*

To manage accountability expectations towards enabling commercialisation of research, North-West recognises that it needs to concentrate its efforts on the development of a vibrant research and innovation culture, develop its research capability and capacity, develop key research centres, systems and processes, and offer attractive rewards and incentives to researchers. These are discussed in the following sub-sections:

6.5.1 Research and Innovation Culture

North-West's corporate goals and research strategy have placed an increasing emphasis on the development of an enterprising research culture at the institution. More specifically, its Investment Plan 2008-2010 states that:

"We will foster an institutional culture in which innovation and enterprise are expected and rewarded..."

Over the past decade, North-West has progressively sought to become more innovative and entrepreneurial, pursuing strategies aimed at stimulating and integrating an entrepreneurial culture. The Research Office has maintained a strong commitment to the development of a research culture amongst staff and postgraduate students. Interviewees revealed that up until 2006, North-West invested heavily in research and development efforts and had built up a vibrant research culture. This was also reported in North-West's 2006 Annual report, as follows:

"We have fostered a vibrant research culture across all disciplines, informing and being informed by practice, and thus involving and impacting upon industry, professions and the wider society."

However, in recent years funding cuts and restructuring have led to significant loss of some of its top researchers. Interviewees revealed that since then, despite the recognition that a vibrant research culture is a vital component of researchers' inspiration and motivation, North-West has struggled to develop and maintain a strong research culture. However, schools with postgraduate programmes have been actively working to enhance and contribute to the development of a strong research culture and have reported some success with their efforts. This includes key research and development centres that have been established to operate as school-based, multi-disciplinary units encompassing the postgraduate programmes. Interviews with researchers indicated that creating a vibrant

research culture and capability was important for the development of PBRF goals, although it also encouraged staff to undertake applied research that benefits the industry. It was commented by a researcher that:

"So, a popular culture of innovation is leading to a lot of innovations popping up, but not necessarily of importance in commercialisation but they are largely small, level – well, NZ has three problems – distance, ignorance of foreign societies, and scale of market."

North-West's Investment Plan 2008-2010 has re-emphasised its continued commitment to the development of a research culture that supports and encourages staff and student research. It seems that this focus is largely on meeting its PBRF goals, although small pockets of a culture of innovation have been emerging. Interviews with researchers involved in commercialisation revealed the commercialisation culture is weak. Thus, enabling commercialisation requires going beyond PBRF quality scores to create value from research.

6.5.2 Research Capability and Capacity

North-West's strategic documents emphasise that it needs to have a highly developed research capability and capacity to ensure success in its research commercialisation efforts. With such realisation, it has made a commitment to develop its research capability and capacity to ensure that a culture of research excellence and innovation is created and maintained.

"I think there is a pretty good future here for commercialisation of IP but you have to start to walk, then you get to run, and between the walking and running you have to put the resources in the right place. I guess we are at that stage." (PU: External Contracts Manager)

In past years, some schools and key research centres have placed emphasis on growing their research capability to improve their research position in future years. These were mainly in terms of pursuing institute-wide strategies that were aimed at developing staff capability, maintaining close links with industry and business, diversifying the funding base, and strengthening the postgraduate portfolio of applied research programmes. As mentioned in North-West's 2003 Annual Report:

"The Research Fellowship scheme introduced last year provides a key mechanism for academic staff to build research capacity." (2003 Annual Report)

For the past decade, North-West's research capability continued to be a focus of growth. In its 2008-2010 Investment Plan, North-West has agreed to develop plans for a more systematic approach to technology development and transfer. Interviews with key researchers suggest that after restructuring of the institution, there is renewed emphasis on a research strategy aimed at development of research capability and capacity. Priority action areas identified in the strategic documents include continued development of research capabilities of staff, retention and recruitment of high quality staff members, increasing the quality and quantity of research outputs, increasing external research income, developing policies and processes in support of research, facilitating internal funding of research, and development, and maintenance of an organisational infrastructure that supports research.

6.5.3 **Developing Structures**

At North-West, research commercialisation initiatives are undertaken by individual schools and researchers supported by the central research office, key centres for research, and a business incubator. The central research office was established to foster the development of a research culture amongst staff. Interviews with research office staff revealed that, in many instances, they act as a broker between the academic and the business side of research management activities in terms of setting policies, managing and allocating the internal research funding, and assisting with external research grant applications. In addition to the central research office, four key centres for research and advanced practice have been established within schools. These centres have been active in building a community of researchers to co-ordinate national level projects, develop and support regionally-based and inter-institutional research clusters, develop formal research linkages with other institutions, and leverage localised partnerships with industry and community. The bringing together of staff and students from a range of discipline areas, other tertiary institutes and industry partners across New Zealand and internationally, has helped develop a critical mass of researchers within these key centres of research. Some key research centres have also formed joint ventures with industry to provide much-needed financial support for their research activities. A significant role adopted by some research centres is to facilitate the incubation and commercialisation of research projects. A business incubator unit has been established within the Design School aimed at

running research projects and providing a route into business for graduates. Interviewee comments on the reasons behind the current fragmented and decentralised approach of letting individual researchers or schools undertake the task of research commercialisation were that:

"Well, to be honest, we haven't really looked at the various models because we haven't had the option... Our model is a bit more personalised and in-house because of the size of the organisation. We buy in the talent. So we buy in the legal services, we buy in the advisor and so we have a 'smell of an oily rag' type of model. I think there is an evolution to that; you have to have some runs on the board before you can start setting up separate entities." (NW: Head of Research Division)

Similarly, comments from a consultant engaged to assist with the commercialisation process, were:

"I do not think there is enough, within (North-West) *space, where they are at the moment. I wouldn't even contemplate a separate company because they can't afford it."* (NW: Research Commercialisation Consultant)

North-West has realised that enabling research commercialisation requires well-developed structures. It was recognised that there is not a single best commercialisation company structure that accommodated everyone's needs. Even though North-West has adopted a fragmented and decentralised approach, interviewees agreed that a separate commercial company model provides a single entry point with systems, processes and talent to support the commercialisation. As was commented,

"It is commercialisation. It's not teaching, it's not research. Bring it under the umbrella. And then you can, as in any business, have a budget, have a target, have some strategies of improving your revenue, have strategies to improve your client service. It is not that difficult, it is just getting to understand what it is about. Because people think, as I say, IP, Oh my God, it is going to be tricky. Yes, it's tricky, but give that to the experts." (NW: Research Commercialisation Consultant)

Interviewees also stated that structure should reflect the complexity and risk associated with commercialisation.

"I guess it is that model of having a company on one side and a university or a polytechnic on the other. They have different goals, and it is just getting that bridge organised so that the academic is protected, and he or she is not taking any risk, and also that ...it is almost a marketing activity. You could see it as a lot of PR goes around it all." (PU: External Contracts Manager)

Interviewees also commented that commercialisation is about relationships and when it becomes too corporate, you lose that day-to-day involvement with your clients. It was also interesting to note comments that structure provides legitimacy that helps to gain access to funding. According to the Research Commercialisation Consultant, the originator or the research centre has access to rich funding for further research, so that is how the university as an institution gains.

6.5.4 Systems and Processes

North-West's 2008-2010 Investment Plan goals for research and advanced practice are focussed on developing policies and processes in support of its research strategy. It recognises the importance of implementing and maintaining effective systems and processes to manage expectations of research commercialisation. The implementation of effective systems and processes was considered essential to help identify IP opportunities, to protect and explore those opportunities, and to manage the actual commercialisation process. It also includes financial management and budgeting systems, systems for engaging a wide range of skills such as contract preparation, deal negotiation, IP valuation and protection, risk management, and systems for reward and recognition of staff. Interviewees expressed concern that North-West was missing out on commercialisation opportunities due to a lack of adequate systems and process:

"I would say that we are moving in that direction. We had some hiccups; some patents that went a bit sour and have resulted in legal challenges (before my time). But, I think we didn't really know what we were doing. We didn't have the systems and processes, or adequate policies. We were going along doing it quite nicely but now the systems and processes have been put in place and we have actually got better support structures and a better knowledge base. In addition to policies and procedures, we now have the ability to identify those opportunities." (NW: Head of Research Division)

During an interview, the External Contracts Manager confirmed that North-West was becoming a bit smarter about implementing adequate systems and has put together a series of procedures to help manage the process of IP commercialisation, including hiring a consultant to push a couple of projects along. The consultant, when interviewed, outlined that her priority was to have the systems in place to handle consultancy and research contracts efficiently, as these are the "bread and butter".

"I have got to worry about the ones that are already there and causing problems. And what I also intend to do is make presentations right through, and basically keep on doing that. First, it is just about what is IP, because people get all excited about it, and then the second job is how do we do it here? And keep on doing that. It's a sensitisation process." (NW: Research Commercialisation Consultant).

Interviewees indicated that lack of clarity over IP, overhead cost allocation and profit-sharing arrangements were impediments to research commercialisation initiatives being undertaken. Interviewees also revealed that because research commercialisation is not widespread across the institution, a centralised system has not been implemented. This has led to schools involved in research commercialisation initiatives developing their own systems and processes to suit their individual needs. Hence, the lack of institute-wide systems and processes may have contributed to some inconsistent practice across different schools.

6.5.5 Managing Intellectual Property (IP)

The research office has recently formulated an institute wide IP policy that provides guidance for the ownership, protection, and exploitation of the IP of researchers. Previous policy that had existed was developed by, and related to, individual school and research centre needs. For example, according to the Head of School, the centre for information technology had, as part of its mandate, developed policies and expertise in the effective management of IP and had actively worked with local research clusters to promote the best results for stakeholders to facilitate the incubation and commercialisation of research projects. The importance of IP management was emphasised by interviewees in the following statements:

"...because funders expect that IP should be managed and that the institution must have capability of doing so properly. The last thing any institution wants, including the Foundation of Science & Research, is to land in Court because they have not got the processes in place to manage IP properly." (NW: Research Commercialisation Consultant)

"... IP, and the whole process of protecting it, is such an art form, and so specialised, and there is almost some sort of a mystique about it, I don't think you can take a cavalier approach. All the knowledge has to be out there ..." (PU: External Contracts Manager)

Interviewees had also commented that previous school-based policy was more liberal and generous to staff as it gave them up to 50% of the share of profits with no central

overhead costs being deducted in many cases. However, the new, slightly amended central policy, providing basically a third/third/third split of profits to the institution, the school and the researcher, takes some of the incentives away from the researcher. It was explained by interviewees that after deducting a large proportion of the school and central overhead costs, there is not a great amount of profit remaining to be shared. Some interviewees felt that the institution's share of profit should be a much smaller percentage, given that a large percentage of central overhead costs have already been deducted.

6.5.6 Rewards and Incentives

North-West's Investment Plan 2008-2012 outlines the research strategy where individual staff members are supported by an average 20% research workload allocation, access to funds for research and advance practice projects, and a generous policy on conference attendance. Research funding is also allocated directly to members of the professoriate to enable them to remain active as researchers and research leaders. The following comment was made regarding incentives for commercialisation activities:

"The incentives, I don't think we are very good at that, except that IP policy is trying to be quite liberal so, in other words, there is a more overt sharing of our spoils with staff when it comes to potential returns. But I still think that the kudos attached to having a patent isn't quite there, as it is, say, maybe at the University of Auckland in the science or medical area. That has a lot of kudos, whereas I don't think we necessarily attach that same kudos given the largely teaching-orientated focus that dominates in our organisation" (NW: Head of Research Division)

Interviewees also expressed concern that academic researchers felt resentment towards engagement in commercialisation initiatives because their academic career is measured in terms of their PBRF research outputs and their teaching, not their commercialisation contribution. The following comments were made by a research professor on his recent visit to a research centre:

"...and we walked in to see all the innovations that they had there. They had amazing things and none of it was commercialised... That was sitting there for years because the scientist wanted to use it to get his next grant. But I hope that's changed." (PU: Researcher)

The interviewee also commented that because a component of the PBRF assessment score is based on external research income generated, there is a strong motivation for

researchers to use their research as a means of securing further research grants. Also, while money is an incentive, North-West has recognised that the commercialisation process is such that it would take a long time to realise the potential income streams, as was commented on by the External Contracts Manager:

"Well, there is a money incentive. Most academics might think it is not important to them. The package is being able to have your name on a patent and be successfully commercialising your own product that you have spent a lot of time and process on. I think a name on the patent; those are just as important academic incentives as commercial incentives. Getting invited to more places and that sort of thing, I think is good, not the money. The process is such that it takes a long time to get all the money but, having said that, it is in there, and people maybe in a couple of years' time might be beginning to get something moving."

Interviewees also revealed that, for them, appropriate rewards and incentives include gaining recognition and reputation for their research commercialisation efforts, access to leading-edge research facilities and infrastructure through collaboration with industry and research organisations, development of new research programmes and attracting top researchers and research students.

6.5.7 Governance

At North-West, the governing council has the responsibility to set the strategic direction of the institute. The institute council has approved the Investment Plan 2008-2012, that has made a strategic commitment to research commercialisation expressed in terms of engagement in applied research and technology development and transfer. According to the Research Director, research activities are reported to council as part of regular reporting by management. Interviewees commented that North-West is not at that particular stage where it needs an independent company and board to provide governance for its research commercialisation activities. It was commented by the consultant that:

"By definition, a university is extremely risk-averse. If you want to commercialise technology, what you need to do, you don't set off with three committees and board meetings, you make a decision and you go for it, like in a business. Therefore, there is always this clash of culture between form which is very much part of the academic environment, and substance." (NW: Research Commercialisation Consultant)

Interviewees generally agreed that North-West's governing council needs to become more proactive and take calculated risks in terms of enabling research commercialisation. It needs to send a clear message that research commercialisation will be valued and that it

is not just a marginal activity. Some interviewees also felt that there is a need to review TEI governance structures to ensure they provide an appropriate framework to allow for greater risk-taking in terms of encouraging and enabling research commercialisation.

6.5.8 Risk Management

People interviewed at North-West were well aware that, like any business, engagement with research commercialisation involved taking risks and, therefore, you had to be careful with not only what you do, but know what you are doing. As was commented by the Research Commercialisation Consultant:

"If you want to do risk management and you look at your portfolio, consultancy and research are relatively low-risk. If 80 per cent of your business is in that area, you place your bets and you manage your business. But, it is about knowing and being in the university."

North-West is at a very early stage of commercialisation of some of its projects and, as such, has no clear risk management strategy in place at this stage. It was commented, perhaps tongue in cheek, by the Research Commercialisation Consultant that:

"Not every patent is a success. If you are lucky, 1 in 4 would bring in some dollars. You can have very sophisticated decision-making matrices, or you can just as well use your gut. Obviously, if something is not patentable, you don't have anything."

Despite these comments, there was general acceptance from interviewees that as research commercialisation is further developed, North-West will need to implement clear risk management strategies so that it is able to take a certain degree of calculated risk.

6.5.9 Leadership

Interviews with researchers and a review of strategic documents reveal that for over a decade, the senior management of North-West has remained committed to the development of a strong research culture. The new Investment Plan 2008-2012, reinforces the research goals of the institution and clearly states the senior management's commitment to the development of an applied research culture leading to technology transfer and commercialisation. Interviewees revealed that active leadership from a few Heads of Schools has led to the establishment of research centres in those schools, including the appointment of some key research staff. However, strong senior

management leadership in terms of development of commercialisation initiatives originating from schools seems to be somewhat lacking:

"It is actually quite shocking that there is no response from senior management at (North-West)*, except to acknowledge that it is an issue that might be covered some day in some reputable university, ... But, at the same time, innovations that percolate up here are being sold, sometimes for millions of dollars of assets, in the case of the computer company that was residing in the ... building for more than three years. ..We simply don't have a regime ..., so that's where we are at right now."* (PU: Researcher)

Interviewees also expressed concerns that the fragmented approach to letting individual schools manage their own commercialisation initiatives had contributed to major problems, such as people who did not have the time and expertise making decisions related to businesses without necessarily trying to get it up to the top level. It was acknowledged by the External Contracts Manager that more proactive leadership and management of the commercialisation process was required and that is what North-West would want to work on.

6.6 *Measuring Performance*

Similar to other public TEIs in New Zealand, North-West is required to prepare an investment plan (previously charters and profiles) that sets out its goals and objectives, strategies, and performance targets, against which it measures and reports its actual performance. The investment plan intended for the next three years guides the development and delivery of government funded tertiary education and research at North-West so that it meets the needs of students, employers, communities and the region, as well as the nation as a whole. The plan also provides a link between government's Tertiary Education Strategy (TES) and the Statement of Tertiary Education Priorities (STEPs) to ensure that the institutional goals as well as the nation's economic transformation and social and cultural development goals are met. Once negotiated and approved by the TEC, the investment plan becomes a contract between the government and North-West. The government invests in the plan by delivering funding to the institution, and monitors performance to ensure North-West has made effective and efficient use of the government investment and delivered the agreed outcomes.

The measurement of performance in research has posed some major challenges for North-West, especially since the introduction of PBRF measures in 2003. As was stated in its 2004 Annual Report:

"Of course, the PBRF measures a particular kind of research output with specific relevance to the mission of the traditional research-led university. It significantly understates our overall contribution through research and advanced practice to business, industry and community development in New Zealand." (NW: Annual Report 2004)

A review of strategic documents revealed that North-West's research strategy and objectives since 2003 have been focussed on increased research outputs and funding, achievement of international standards of research excellence, and building its research capability. The metrics used to measure research performance have been stated as the number of research outputs, research funding income, number of international presentations, number of postgraduate students, number of key research centres, number of research active staff, and $/FTE allocated to staff professional development. The research-related objectives and performance measures, against which the actual results have been measured and publicly reported in North-West's Annual Reports for the period 2003-2008, are listed in Table 6.1 below.

Table 6.1 Objectives and Performance Measures for North-West 2003-2008

Objectives	Performance Measures
2003 Objectives	*2003 Measures*
To increase research outputs in all categories by:	Research output targets
Increasing research funding	Number of weighted outputs
Promoting research efficiency	Internal research fund ($m)
	Number of postgraduate research students
	Number of refereed outputs
To meet international standards of excellence in research by:	Number of international presentations or exhibitions
Increasing research outputs via international media and running international conferences	International conferences hosted
Establishing and seed funding research in key centres	Number of Key Centres operating
	Number of professors (incl. assoc. profs)
To promote an industry focus and increase external research funding	Research Key Centre funding ($m)
	External research grant income ($m)
2004 Objectives	*2004 Measures*
Building applied research capability	Number of research-active staff (PBRF)
Relevant and comprehensive staff development	Dollar per FTE spent on professional opportunities development
Excellence in attracting and retaining high quality staff	Staff survey rating, Percentage of academic staff with Doctorate, Masters degree, Bachelors degree

2005 Objectives	2005 Measures
Research excellence	Research active staff (% PBRF eligible)
	Number of Research outputs (PBRF Rules)
	Research income percentage of total
	Postgraduate percentage of total degree EFTS
Leadership to industry, professional and community groups	Number of non-PBRF research & consultancy outputs.
	Number of external collaborations
2006 – 2008 Objectives	**2006-2008 Output Measures**
Achieve international recognition for applied research and advanced practice that is aligned with educational programmes	Number of quality-assured research outputs
	Total research outputs
	Total research and advanced practice outputs
	Postgraduate enrolments as % of total degree EFTS Research degree completions
Develop the capability of academic and allied staff members at all levels.	$/FTE allocated to professional development

North-West had not set any specific objectives and outcome measures for research commercialisation during the annual reporting period 2003-2008. However, in its 2002 Annual Report, it reported the number of patents and applied/creative designs under the institute research profile. During interviews, it became obvious that North-West was focussed on setting objectives and measures directly related to PBRF requirements, and not to commercialisation of research which was not a government funded activity. As such, the KPIs are chasing an objective that potentially undermines the research commercialisation agenda.

"Oh, OK. Well, we have got a whole lot of key metrics that we use here but, of course, the predominance of those metrics are to do with publications and publication outcomes, external research income, those types of things. At the moment we are not treating that (research commercialisation) *as a separate reporting item. We will perhaps in the future. I think we do have a couple of metrics for commercialisation but not an extensive array, for example, the number of patents we have etc. The information is primarily reported internally ..."* (NW: Head of Research Division)

Despite North-West's 2008-2010 Investment Plan reporting a key shift in strategic direction towards commercialisation through increasing involvement in evidence-based technology development and transfer, it has failed to identify any KPIs for specific initiatives. The External Contracts Manager commented during the interview that North-West is right at the beginning of developing a system of performance measures but acknowledged that, as yet, this has not been given a priority.

6.7 *Reporting Strategies*

North-West, similar to other TEIs, has used a wide range of communicative mechanisms to keep its stakeholders informed about its research and commercialisation activities. Its charters and profiles (replaced by investment plans from 2008) are public documents that have helped communicate the vision, mission, goals and objectives of the institution. Primarily, the preparation of these documents has been a TEC requirement for approval and allocation of government funding. The government funding pressures have somewhat sensitised the organisation to utilise positive communication in terms of its commitment to the government's strategic priorities on the nation's research and innovation system. North-West's website contains much of the information on research activities of schools and research centres. This includes details of research centres such as goals and objectives, staff and student achievements, success in terms of research projects, and external grants received. The nature of reporting suggests that these are largely publicity information aimed at raising the research profile and reputation of the institution and its research centres. North-West had also produced research and development reports, school research reports and newsletters. Four times a year it publishes its magazine of innovation and research. It contains articles about the research conducted by staff and students, illustrating how research and advanced practice serve the needs of industries, communities and professions. Recent stories on research and innovation have ranged from a computer model that predicted New Zealand's future energy needs to an investigation of the claustrophobic effects open and closed MRI scanners have on patients.

The annual report is a key accountability document that North-West produces in terms of formal reporting to its stakeholders. The annual report sets out the progress made towards meeting the commitments outlined in its strategic documents. The 2005 annual report had emphasised that it records the contributions to the region and to the wider economic, social and cultural development of the nation. Interviewees commented that the role of the annual report was to provide information to the general public and to provide benchmarking opportunities within the sector. A key research centre Director commented that the annual report is a *"concise summary of everything ...and all the research we do*

wouldn't show up in the annual report." Another Head of School commented that when all the Schools are asked to write something, *"...we always put our big projects in. We made sure we got it in and made sure people were aware of what we were doing."* Similar comments were made by the External Contracts Manager:

"External reporting is where you start looking at the stakeholders expectations, and how we report to them, so it is not just the financials, it is how (North-West) *serves the community, and they want to know what the exciting stuff is....It is more to do with the profiles, building the profile for the university structure."* (PU: External Contracts Manager)

North-West has been at a very early stage of development of its research commercialisation initiatives. A review of its annual reports for the period 2003-2008 indicated that it has not formally set any specific commercialisation objectives and reported on success in terms of any outcome measures. However, the narratives in the annual reports have generally been compiled as success stories in terms of developing a strong research culture and capability and creating a strong research profile for the institution. An example from North-West's 2004 annual report emphasises this point:

"The School has achieved a strong profile as a leading-edge tertiary provider ... We pride ourselves on having established a vibrant learning environment with a strong community of ...passionate educators and industry practitioners who work with expertise, commitment and vision to provide a supportive, 'high-end' programme for our students. ..The School has a strong research culture and over the years, staff and students have contributed to a wide array of research outputs. Staff have scored strongly on PBRF ratings systems and the School has proved excellent at encouraging a broad spectrum of research activity." (NW: Annual Report 2004)

Annual reporting strategies have also been compiled as success stories in terms of awards and international recognition and research grants received. The following examples from North-West's 2007 annual report emphasise these points:

"Award-winning research results, staff and student achievements recognised by outside parties, and significant offshore partnerships all testify to the success of the institution ...The year's record of achievement at a broader level also saw many externally recognised awards for individuals and units, including: $2.2 million of funds for research contracts..." (NW: Annual Report 2007)

From the formal document analysis of the annual reports for the period 2003-2008, it seems obvious that reporting at North-West has taken the form of generating positive publicity regarding its research activities.

6.8 *Chapter Summary*

This chapter presented the results of data analysis of Case North-West to help explain the institution's accountability practices towards enabling commercialisation of research. A review of North-West's strategic documents illustrates that research commercialisation is at a very early stage of development. Although the TEI has made a strategic commitment to the research commercialisation mission, it remains largely a marginal activity pursued by only a limited number of schools and key research centres. As with Premier, North-West operates in a wider institutional environment, and an analysis of the institutional drivers of research commercialisation helped identify its key stakeholders and the factors that impose accountability obligations towards enabling commercialisation of research. Government is a major stakeholder and provides funding support to North-West to respond to the innovation needs of the region and nation. North-West collaborates with industry to give effect to its applied research strategy. It has professional accountability obligations to researchers as well as a cultural-cognitive obligation to contribute responsibly to applied technology development to meet the needs of the wider community it serves.

North-West has struggled to maintain a vibrant research culture and recognises that it needs a highly developed research capability and capacity to manage expectations for enhanced commercialisation of research. It needs to provide strong leadership and direction to help address the organisational challenges of research commercialisation. Finally, in terms of accountability discharge, North-West does not set specific objectives and performance measures for research commercialisation activities in its strategic documents. The objectives and performance measures against which it formally reports are largely influenced by PBRF assessment requirements that potentially undermine the commercialisation agenda. The voluntary reporting undertaken by North-West is largely publicity information aimed at raising the research profile of the institution and its key research centres. A summary of the case findings of North-West is presented in Table 6.2. The next chapter presents an analysis of data pertaining to Case Universal.

Table 6.2 Summary of Case Findings of North-West

Mission & Strategy	• To be the most innovative and exciting university within its region • Discover and apply creative potential to contribute responsibly to societies and cultures • Focus is on applied research that serves educational, social, economic and environmental goals • Pursue government's tertiary education priorities • Foster an institutional culture of innovation • Increase evidence-based technology development and transfer • Collaborate and offer technology development services
Institutional Drivers (stakeholders and factors imposing accountability)	**Government** • Provides funding support to assist with innovation projects • Expects contribution towards the national innovation goals • Expects support of innovation system at a regional level • Provides funding support to assist with innovation projects **Industry** • Links underpin contribution to the national innovation system • Helps keep up to date with developments in industrial innovation • Provides opportunities for student work placements • Provides opportunities for research and consultancy • Needs commercially significant inventions that provide benefits • Helps create high profile and build reputation • Provides funding **Researchers** • Obligation to develop research capability - encourage, support and recognise their contributions • Need opportunity to engage in national and international research collaboration to build profile, reputation and credibility • PBRF culture dictates – disincentive to commercialisation • Some top researchers have normative and professional peer pressure to engage in commercialisation • Expect to work alongside nationally and internationally recognised researchers • Students need a learning environment marked by innovation and creativity • Require exposure to latest cutting-edge technology and tools **International Partners** • Has a commitment to meet international standards of excellence in research • International collaboration helps increase profile and reputation, secure external research funding • Enables staff and student exchanges **Wider Community** • Obligation to meet the needs of communities it serves • Expectation that research and technology transfer will add real value • Corporate citizenship role offers public relations opportunity • Community engagement is expected to raise profile, reputation, and help develop research capability

	Funding • Obligation to funding providers to ensure their research outcomes achieved – provide a return on investment • Commercialisation may not generate sufficient funds but may provide indirect benefits • Income streams yet to be realised, are few and long-term
Managing Expectations	**Research & Innovation Culture** • Has struggled to maintain a strong research culture • PBRF research culture is recognised as a vital component of staff inspiration and motivation • Small pockets of a culture of innovation are emerging • Research commercialisation culture is weak **Research Capability & Capacity** • Committed to develop research capability and capacity to improve research position • Develop staff capability, maintain industry and business links, strengthen postgraduate research programmes, increase external research income, develop policies and processes, and infrastructure **Developing Structure** • Helps build a community of researchers and develop formal research linkages with industry and community • Helps develop critical mass and provides legitimacy for funding • Helps bring together the fragmented and decentralised approach of letting individual researchers undertake commercialisation • Does not have a separate commercialisation company – no single point of entry with systems, processes and talent to support commercialisation initiatives • Structure needs to reflect complexity and risk associated with commercialisation **Systems & Processes** • No centralised research commercialisation system - processes are still under development • Lack of institute-wide systems and processes have contributed to inconsistent practice among some schools **Managing IP** • Institute-wide policy provides guidance for ownership, protection, and exploitation of IP **Rewards & Incentives** • Funding • 20% research workload allocation • Gaining recognition and reputation - having name on a patent • Sharing of benefits – third/third/third split **Governance** • Institute council has the governance role • Not at a stage where it needs a separate commercial company with an independent board • Need to become more proactive and establish frameworks for risk **Risk Management** • At a very early stage of commercialisation – as such, has no clear risk management strategy **Leadership** • Senior management has remained committed to development of an applied research culture • Leadership in terms of development of commercialisation activities left

	to individuals within schools. • Senior management leadership somewhat lacking
Measuring Performance	• Investment plan (previously charters and profiles) sets out goals and objectives, strategies, and performance targets • No specific objectives and outcome measures for research commercialisation have been set • Uses PBRF measures with reservations • KPIs chasing an objective that potentially undermines research commercialisation agenda • Research objectives focussed on increased research outputs and funding, achievement of international standards of research excellence, and building research capability • Input/process based metrics used to measure research performance

CHAPTER 7: CASE STUDY RESULTS

CASE UNIVERSAL

7.1 *Introduction*

This chapter presents the results of analysis of data of Case Universal to help explain how the TEI identifies and renders accountability for research commercialisation. As with the two earlier cases, the real name of the TEI has been disguised and data that may identify the interviewees have been withheld to maintain their anonymity. The case study results are presented in a format similar to the previous two cases and roughly correspond to the four research questions posed in the study. After a brief case description, the institute's mission, strategy, and institutional drivers that provide an understanding of the accountability obligations towards enabling commercialisation of research, are discussed (Research Question 1). Specific themes used in the case analysis involve the influence of government, the engagement with industry, researcher perspectives, international partnerships, the role of the wider community, and financial considerations. This is then followed by a discussion of the institutional processes and mechanisms employed to help manage accountability expectations (Research Question 2). The thematic structure used in the case analysis involved an assessment of the research and innovation culture, efforts aimed at building research capability and capacity, structures, systems and processes, management of IP, rewards and incentives, governance mechanisms, risk management strategies, and leadership. To help determine appropriate levels of accountability discharge, performance measures and results of commercialisation are reviewed (Research Question 3), and the reporting strategies used by the TEI are critiqued (Research Question 4). This format is consistent with the conceptual dimensions and key theoretical elements of literature presented in Chapter 3, Table 3.1 and Figure 3.1. At the conclusion of the case, an analytical summary is tabulated and presented, thus allowing for a multiple case analysis from which cross-case issues and emerging themes are further explored in Chapter 8, and theoretical conclusions drawn in Chapter 9.

7.2 *Case Description*

Universal is a fast-growing contemporary university with about thirty schools and academic units organised into five major faculties across three campuses. Emerging from a tradition of over 110 years of technical and vocational education offering industry-relevant education, Universal has continued to enhance its contribution to the tertiary education sector through a growing portfolio of undergraduate and postgraduate programmes, and enhanced research activity. In 2009, over 26,000 students were enrolled in a wide range of programmes in many disciplines ranging from Arts & Design, Business, Computing, and Engineering, Health, and Applied Science. In the past decade, Universal has undergone considerable changes aimed at strengthening its research and postgraduate education. It has been positioning itself as a world-class university and has placed major emphasis on fostering of research applicable to the external world. Universal's 2008-2011 Investment Plan describes it as a "vibrant and energetic university focused on research-led teaching" and making a distinctive contribution to the social and economic advancement of New Zealand through innovative approaches to teaching, learning and research. Its defining characteristics stem from a history of engagement with industry, trades and professions and it remains committed to meeting the needs of its communities, business and industry with a major focus on both independent and collaborative research. Universal has been engaged in research commercialisation activities for over a decade. In recent years, it made a renewed strategic commitment to the development and commercialisation of its research and intellectual property. It has established fourteen research institutes within faculties to encourage research and development and help forge research alliances with business, industry and other research institutions. The central research office provides the overall administration and support for all research activities including postgraduate research, contract research, and consultancy services. Universal has also established a Business Innovation Centre that houses a business incubator to help start-up company formations and existing businesses. It also has a separate commercialisation company with a primary responsibility to help facilitate all commercialisation of research and technology transfer activities. Universal's strategic documents emphasise that its research must not only be at the leading edge but must also be practically useful.

7.3 *Mission and Strategy*

Universal's charter defines the mission, guiding principles, goals, distinctive characteristics and governance of the institution. The charter was refined in 2005 to reflect the requirements of the Education (Tertiary Reform) Amendment Act 2002. As the guiding document, the charter had directed the development of the strategic plans, profiles and investment plan for the institution. The mission of the institution is to foster excellence in learning, teaching, research and scholarship, and, in so doing, serve its regional, national and international communities. In 2006, Universal developed a new strategic plan for the period 2007 to 2011.When setting its current strategic direction; it carefully considered its record of performance, the changing demographics of its communities, the social and economic needs of its region, and the national priorities identified by the government for the tertiary education sector. Universal's 2007-2011 Strategic Plan document has five key strategic themes to guide the future development of the institution. Among these, a key strategic theme is to conduct excellent research to advance knowledge and practice in its areas of expertise. This key strategic theme is supported by objectives and development priorities. The stated objectives are to increase research activity, enhance research reputation, and ensure research activity is sustainable. To increase research activity, Universal identified its key priorities in its strategic documents as actively pursuing new interdisciplinary research initiatives; collaborating with other universities, research organisations, businesses, industry, government and community organisations both nationally and internationally; increasing research-based revenue; and providing encouragement and support for staff to enhance their research capability. The key priorities to enhance research reputation were identified as conducting research that advances knowledge and professional practice, and contributes to the social and economic development of the nation; improving the public profile of its renowned researchers and their research; participating in international research networks and collaborations; and recruiting and retaining more high achieving international students and staff in key research areas. The key research areas of specialisation that allow Universal to achieve high standards of research excellence within the context of constrained resources have been identified in its strategic documents as Information and Computer Sciences, Biotechnology, Environmental Science, Public Policy and Economic

Development, Communications, Tourism, Rehabilitation and Public Health. In terms of commercialisation of research, Universal has specifically stated its key strategic priority in its Strategic Plan 2007-2011as:

"Ensuring that our commercialisation activities enhance our reputation as an applied and engaged university."

Universal has made a strong commitment to research commercialisation but it seems that it recognises its research success in terms PBRF research outcomes and income generating activities. Universal's Strategic Plan 2007-2011 notes its strategic objectives and priorities as follows:

"There will be a self-evident relationship between the University's research, consultancy and commercialisation. Our success in increasing research activity will result, inter alia, in a research-rich environment for learning and teaching, an improved Performance-Based Research Funding (PBRF) rating, increased consultancy contracts and more commercialisation of intellectual property."

To ensure research activity is sustainable, Universal's key strategic priorities have a focus on increasing external research revenue; operating a robust infrastructure to support research and development of an enhanced critical mass of research capability in key areas; and ensuring that key research institutes and centres provide a foundation for postgraduate teaching and learning.

7.4 *Institutional Drivers*

Universal has placed great importance on its stakeholders to influence and guide the university's research activities leading to commercialisation. It has identified some of its key stakeholders as government and funding agencies, staff, students, industry, business, community and professional groups, and international partners.

"...we serve a great big regional population, a national population and international community. And within that there are lots and lots of varying interests". (UU: Director)

"...the University's research is strongly integrated with the needs and aspirations of its stakeholders." (UU: Investment Plan 2008-2011)

The following subsections provide a discussion of the institutional drivers of research commercialisation.

7.4.1 Government

The government, through the Ministry of Education and the Tertiary Education Commission (TEC), determines and maintains the policy and funding environment in which Universal operates. As a public-funded institution, Universal has operated in accordance with the statutory provisions of its charters and profiles (now replaced by investment plans) prepared and negotiated with TEC. The government provides substantial investment funding necessary for Universal's sustainability and development. Universal acknowledged this significant commitment in its Investment Plan 2008-2011 and commented that it was *"...the Government's desire to see a strengthening of the University's research culture and capability, thereby enhancing the ability of* (Universal) *to deliver high quality research-led teaching at undergraduate and postgraduate levels."*

The government expects Universal to make a significant contribution towards the strategic priorities for tertiary education, achievement of its investment plan goals, and research outcomes for which funding was granted. These views were shared by senior government tertiary education policy managers when interviewed. Universal recognises the constraints on government funding and the competitive nature of research grants and expects that investment in developing the research culture and capability will boost its commercialisation efforts and provide much-needed external income. As the General Manager commented:

"We are a university that is very heavily dependent on government and student funding, and it would be really nice to have an alternative".

Over the past decade, government has provided significant research funding to Universal to help develop its research capacity and capability. Further evidence of this is presented in section 7.5.2.

7.4.2 Industry

Universal recognises that for commercialisation to occur there must be industry uptake of research and technology. As such, it has made a strong commitment to "connectedness" with business and industry and this relationship has been emphasised in the institution's Investment Plan 2008-2011 as follows:

"The University has a longstanding research engagement with industry and the professions, and strong emphasis is placed upon the practical, social and economic utility of research undertaken at the University." (UU: Investment Plan 2008-2010)

Interviews revealed that Universal consults widely with external industry, business, and professional bodies to determine their needs and collaborates with these stakeholders to deliver commercial outcomes. It has established industry advisory committees with relevant industry, community and professional groups to help maintain close relationships and optimise the opportunity to contribute effectively to the new knowledge economy. Business and industry expectations are for good research that will lead to innovative solutions to meet their needs. According to the Commercialisation Manager:

"It's our job to get the research and IP ready for a business to pick up or for an investor to invest in a start-up business...It's not the university's job to do run-of-the mill stuff or drop everything to respond to a commercial customer. They will come to a university where the university has a unique set of skills they can't find anywhere else, where it can add value beyond what other people can. In that case you have to be careful, as a university, not to under-sell our value. (UU: Commercialisation Manager)

Through fostering partnerships with industry, Universal has successfully developed a range of commercial products that has been applied across a variety of industries in New Zealand. Some recent examples reported on the institute's website and newsletters include biometric technology, cancer gene discovery, neuro-computing systems, and medical devices. Interviewees emphasised that much of their research has direct links with industry to help create solutions for the real world.

"We have very strong industry links. Our research is focussed on industries from the first moment I started research at the university. ...we have 25 companies.... We work on different projects and are very successful but in this institute we focus on a limited number of companies, companies dealing with medical applications." (UU: Researcher)

It was also emphasised by interviewees that effective partnerships are established on trust.

"They trust us. We have really done good work for them. They come to us." (UU: Director of Research Centre)

Building effective partnerships and trust have been further helped by the fact that some of Universal's top researchers and research professors have first-hand experience of the local industry. Some had previously held senior positions in companies that have now become key research partners of Universal. Another company that is now well

191

established with an international profile was specially formed by one of Universal's top research scientists to develop innovative new technologies based on his discoveries in biomedical research conducted over 10 years. This provides an interesting example of the importance of industry uptake of technology. Since the company's formation in 1996, Universal has worked in collaboration with this company and provided infrastructural support and laboratories to help develop technologies that now have both diagnostic and therapeutic applications in the fields of embryology, transfusion, transplantation, and immunology and disease diagnosis. As has been reported in Universal's 2006 Annual Report, the company works closely and is collocated with Universal's research institute. This strong partnership, developed over many years, has provided Universal's PhD students with the opportunity to develop and apply their academic skills in a commercial environment. As was explained by the CEO of the company:

"So, we at our peak had 7 PhD students working here, the research to do with biotechnology costs around about $15-$20,000 in consumables, per student, in biotech. The university can only pay $3,000, so what happens is, the university and the (Company) *relationship is we can give our students absolute cutting-edge, very expensive research, as part of their PhD programmes. So the university now gets cutting-edge research, which they can't even get close to paying for it, and we end up with that, plus every publication generated by* (the Company) *goes out under the name of* (the) *University."*(CEO Private Company).

Research closely linked to industry needs and conducted in a collaborative environment helps forge new research alliances, build research capability, and create a high profile for the institution. It also helps secure much needed funding from industry and government sources to help further develop the research and technologies. As was reported in Universal's 2008 Annual Report, and explained by a Director of a large research institute:

"For most of our work we get external funding. We got $2m funding from Fisher & Paykel HealthCare to develop lung support devices."

Universal has also licensed some of its research technologies or sold off its patents to companies that specialise in the development of such technologies, ensuring that a range of products are developed for commercial applications. A recent example reported on Universal's website and newsletter includes the sale of a patent to a biometric company to develop commercial products that could end up as security solutions for airports, governments and large corporations. Initial research was funded through FRST's new

economy research fund. The company has also contracted three staff and student researchers from Universal to develop the commercial products based on the patented material.

7.4.3 **Researchers**

Universal's research staff and students are among its most important stakeholders. All research and commercialisation efforts are dependent on researchers' active participation. In terms of the TEI's charter obligations, Universal has been actively seeking to appoint leading national and international researchers to support and lead the development of research. International links and staff and student research exchanges have been encouraged and fostered. In the past decade, Universal has made key strategic appointments of professorial staff to strengthen research and postgraduate capabilities in faculties. The institution's Strategic Plan 2007-2011 has made a strategic commitment to continue to attract and retain excellent staff and maximise their contribution. Universal also has a number of emerging researchers and it has undertaken major initiatives with the support of targeted government funding to develop their research capability and help achieve their full potential. Its strategy is to provide researchers with the time, resources and infrastructure, and skills to conduct research. On initiatives undertaken by Universal, a research professor who was the founder of one of the largest research institutes commented during the interview that:

"The university has made an investment in me, and that's a personal obligation to repay that investment many, many, many fold."

Universal has maintained a consistent research strategy aimed at increasing the number of research students each year and increasing student engagement with research. It regards student research to be at the centre of the institution's research aspirations and activities, as the following comment by a Director of a large research institute indicates:

"You cannot start any research at any university without postgraduate students."

Universal has actively sought to develop its research programmes to help build its research profile and capabilities as well as provide much-needed funding for the institution. By placing students at the centre of its research aspirations, Universal has an

obligation to create a research culture which encourages direct involvement of students in research projects. As some discoveries have emerged from student projects, Universal remains hopeful that increasing student engagement with research will help accelerate research activity that could lead to an increase in successful outcomes with commercialisation potential. Research Centre Directors commented during interviews that Universal recognises its obligation to provide students with the opportunity to work and learn alongside some of New Zealand's most innovative and creative researchers, utilising cutting-edge technology and tools. It seeks research projects with commercialisation potential to provide exciting employment opportunities for students interested in further developing and applying their academic skills in a commercial environment.

Staff interviewed also had very high expectations that Universal will provide a research culture that would have a significant impact on the direction and quality of their research projects. Some of Universal's top researchers have dedicated many years to their research projects and would like to see a commercial outcome. These high ranking researchers, a majority of whom are also the founders of Universal's high performing research institutes, have become the "institutional entrepreneurs" driving much of the research and development efforts in their respective disciplines. For successful outcomes to emerge, these institutional entrepreneurs (researchers) have expressed the need for a great deal of professional autonomy to pursue their research interests, as is evident from the following comments:

"The university is smart enough to know that a person like me will not stand up to interference. If you give me the field I will run it, and I will run it in a way that the university will get everything they want from it, they will get high profile, they get money, they get research outputs, if they let me run it. The moment people start interfering is the day that I disappear, and that's why I am at this university and not with any of the other universities. I will be able to attract a better quality of PhD student." (UU: Researcher)

Some of Universal's top researchers who have been actively involved in research commercialisation efforts have received international recognition from peers for their discoveries. Opportunities have also been provided for collaboration in national and international research projects that would enhance the reputation of the institute and provide substantial funding benefits. However, from the following comments, it appears

that not many academics have shown a keen interest in research commercialisation initiatives.

"I am an old professor. My targets are students." (UU: Researcher)

"People regard research as an end on its own in universities, and there are a few researchers who are very keen on pushing commercialisation, but a lot of them are really looking at it as a means of progressing their own advancement through the university, I think." (UU: Researcher)

Interviews with researchers confirmed that many were primarily driven by the PBRF measures to advance their careers. They also commented that the PBRF focus has dominated the research culture of the institution.

7.4.4 International Partners

For over a decade, Universal's charter and strategic plans have emphasised fostering international links and partnerships to help develop the institution's research capability considered essential towards the enhancement of its research commercialisation efforts. Its 2008-2011 Investment Plan goal is: *"To expand international collaborative relationships that enhance the University's profile."*

Universal has appointed some leading international researchers to support and lead the development of its research including the establishment of research institutes. As was commented by the Director of a high profile research institute:

"..in my view, a legitimate, internationally-renowned research institute and to be that, you can't have beginning and start-up researchers all muddling around, you know, starting up but not world experts in that area".

Universal's international research strategy has been focussed on the advancement of its international standing through collaborative international partnerships, staff and student exchanges and visits with prestigious institutions overseas. Amongst its research goals is the development of international benchmarks with higher education institutions with similar values in other OECD countries. According to the institute's 2005 Annual Report, participation in prestigious international research projects, all serve to illustrate the *"vibrancy, creativity and innovation"* of the University. Some benefits from international research collaboration have already started to emerge. In 2008, Universal's Annual Report reported successful collaboration with leading universities and agencies across the

globe on various research projects in biotechnology, computer science, engineering, radio physics and biomedical devices. Two research institutes in particular led the way and now have an established international reputation for information and knowledge engineering. The Director of a research institute recently was recognised by international peers for his work developing computing systems which emulate the human brain to analyse data and make predictions. The following comments from interviewees help capture the importance placed on international partnerships:

"To do research you need a network. You need all the players ... usually its overseas. ...Our real relationship is overseas, and we are most famous overseas... your networks are something you grow and they give you the rewards and recognition that nothing here could ever provide." (UU: Director of Research Institute).

The Director went on to comment further that once you get an international profile, people in New Zealand start noticing you. Similar views were shared by another research scientist involved in commercialisation:

"We are very, very much international in profile. The international profile will give us a NZ profile. And that profile is starting to come out in bits and pieces...Yes, massive".

According to this researcher, the international profile of his research has enabled him to recruit PhD students internationally, collaborate with universities in Moscow, France, and Australia, as well as academic units that are not universities but are associated with universities such as the New York Blood Centre. Interviewees also emphasised that building international partnerships also benefits the business and industry involved with the university research commercialisation initiatives. The CEO of a private company closely involved with Universal's research commercialisation efforts made the following comments:

"Interestingly, we have a far better global profile than we do a national profile. [His phone rings] *That telephone conversation was NZTE in Washington. NZTE acts for us in a very good way of finding licensees and so we work in with them and they set up deals and breakthrough the front door often and try and get us high level communication with potential licensees."*

Interviewees also commented that successful commercialisation depends on the absorptive capacity in industry, and New Zealand industry has poor capacity to absorb

university-generated research because of its small size and low R&D. For this reason, developing international linkages is important.

7.4.5 **Wider Community**

Universal's charter obligations to the community are to create, extend and apply knowledge to inform society. As such, it has placed heavy emphasis on supporting, participating and partnering with its wider community. It has made a strategic commitment to contribute to the social and economic advancement of its region. It recognises that strong connections with its community stakeholders will help shape the development of its research and bring substantial benefits to the community. With community investment and social responsibility becoming increasingly important for Universal, it aspires to build and maintain strategic, cross-sector partnerships with key organisations. As reported in its 2007 Annual Report, Universal employs a number of specialists to build and manage relationships with international communities and community organisations. It has established a collaborative forum of business, government, local authorities and community representatives to lead the development of business community investment in New Zealand. Through its community-based research projects, Universal has received several large research grants from government, especially related to the study of health and well-being issues. Several interviewees shared their views on Universal's strategic commitment to community-based research projects.

"It is driven on commercial principles but the purpose is not to make money whatsoever, once again, community come in and use the service and we provide training to students. It's commercial but the purpose is not to make money. Not to lose money either." (UU: Director).

"I was an engineer and I believe in applied research. I think it is useless if you work on research that has no advantage to the community. I think the university should be accountable to the community. If they don't produce good students and good research, it would be useless." (UU: Researcher)

A senior research scientist actively involved in research commercialisation commented that a commercially-driven model exists for business reasons, and underpinning such a model is a philosophical position that for research to be for the public good, you have to make something. He went on to comment further that he would prefer to see his research

turned into something physical so people can use it, and that there is actually a public good from it rather than just being published in academic literature. Universal's Investment Plan 2008-2011 notes that its community engagement has moved away from a traditional philanthropic approach to a more strategic engagement to address issues of mutual interest and benefit to each partner.

7.4.6 Financial Considerations

Financial considerations have become an important driver of Universal's commercialisation efforts. Its 2007-2011 Strategic Plan has emphasised increasing revenue from external research and commercialisation activities to help undertake investments in areas of strategic priority. Universal has been actively seeking investment funding and establishment of joint ventures internationally to develop and commercialise its research ideas. The Commercialisation Manager explained that Universal does not necessarily go straight to venture capitalists but, instead, may licence to an existing company that then has existing capital to invest. Alternatively, it may hand over to someone who will raise capital on its behalf. Initially, that may be angel capital or venture capital but, in the early stage capital markets in New Zealand, there is not always a lot of money and the money is not always smart money. On accountability for funding, the Commercialisation Manager further commented that:

"When you are getting investment you are not just trying to get the cash and run, you are trying to get an investor that knows the sector and is able to add value to your business beyond the monetary amount, and finding that magical mix of right expertise and willingness to fund is more difficult to find here than it is overseas in, say, Silicon Valley. People are sitting on their money there, saying – "Good Lord, I wish I had something to invest in"; and here it is – "we've got these great ideas, I wish we had the right person to come and invest in it". So, again and again, you see that issue of retaining value for NZ rather than just making a quick buck."

Universal has accountability obligations to its funding providers who expect a return on their investment. So far, Universal has relied primarily on government and industry funding for support. In past years, it has received significant funding from FRST, HRC and from research and commercial partners such as Fonterra and Telecom. Interviewees commented that funding providers require in their grants that the research that they are funding works towards an avenue of commercialisation of IP. As such, researchers are being asked to come up with commercialisation strategies for their proposed research so

198

that they can get funded. There were also concerns expressed by interviewees that while a lot of money goes into research, not enough is going into commercialisation. This is forcing Universal to spend more money on getting ideas into a commercialisable state, where it can be offered to an investor. Universal's commercial company has not yet generated sufficient revenue and relies on Universal to fund its operations. There appears to be some optimism regarding commercial outcomes:

"...one would hope something would come out of it at some point, but I can't see anything major really. I think it is quite hard to actually make universities commercial entities anyway, it is not their raison d'être, and it is a different psyche." (UU: Director)

Universal's strategic plans have emphasised building reputation and strong performance that would lead to growth in research and commercialisation of intellectual property revenue. It has remained confident that the depth and diversity of its research will increase with a substantial increase in externally funded research.

7.5 *Managing Expectations*

7.5.1 **Research and Innovation Culture**

Universal's strategic priorities for research have been based on fostering a strong research and innovation culture that is appropriate for a new university, with an emphasis on interdisciplinary research that is applied in nature and informed by engagement with stakeholders. The Director of Commercialisation commented during the interview that the biggest issue for Universal is to develop within the university an understanding and a culture around innovation and commercialisation and entrepreneurship. He emphasised that:

"When universities come from traditional academic institutions, you have to understand that staff within those environments are focussed, and rightly so, on certain areas around research, teaching and learning, and commercialisation is out here, it is not really part of the environment that we've been operating in up until now."(UU: Director of Commercialisation)

Looking back at the development of the commercialisation culture, another interviewee commented that there needed to be a culture change from teaching to research and commercialisation. In his view, the university, having been a teaching-based institution until recently, meant that the commercialisation culture was less prevalent at Universal. Interviewees generally agreed that there were compounding factors which are now

changing significantly and there has been an active move to promote a research commercialisation culture. As is common in most institutions, interviewees also pointed out the inherent clash of culture often based on the fact that what was interesting to academia was not interesting to the commercial world, and vice versa. As was explained by the Commercialisation manager:

"One of the most fundamental [differences] is between the academic approach to things and the commercial approach. That clash manifests itself in the researchers' drive to publish research, and the commercial drive to keep things secret and proprietary and that is one of our jobs to reconcile these viewpoints. As it turns out, when you get down to an operational level it's not hard. In fact, that conflict is often not really there... you often find that both the commercial side and the academic side want to achieve the same outcomes, they just don't agree on how those outcomes are achieved. That outcome is generally application of the research 'to the benefit of humanity'."

In the past decade, Universal has been working towards the establishment of a serious culture of research and commercialisation throughout the institution. It has been engaged in fostering a research and innovation culture that encourages research excellence and is core to many of the research commercialisation activities. According to statements in its strategic and investment plans, a strong research-led culture helps promote cohesiveness by developing a community of staff and student researchers, and promotes the interdisciplinary research synergies that help position it as a leading-edge institution. Universal has been investing in structures which facilitate research, such as the research institutes and clusters, and has been providing staff with the opportunity and encouragement to conduct research. However, it appears from interviews in this organisation that there is a large degree of contradiction between corporate aims and spin, and actual reality in the corridors. While there is a statement of corporate strategy on research commercialisation, actual staff may not have got the message.

7.5.2 **Research Capability and Capacity**

Developing the research capability and capacity of the institution has been a major strategic priority for over a decade. In past years, Universal had made concerted efforts to develop its research capability and capacity with professorial staff appointments, increasing research outputs and external research income, improvements in the scope and quality of research programmes, the expansion of postgraduate research and the application of research to major aspects of regional and national development. It was

explained by the CEO of the Commercialisation Company that there were many strategies focussed around developing the research capability of the institution:

"There was a lot of investment of resources early on in lifting that research capability. Out of that there were lots of professors appointed; there was lots of development on postgraduate programmes, PhD programmes. So, when you put a lot of resource into that and lift that capability, and there are lots more research activities going on, out of that bubbles to the top the commercial opportunity that comes from the research." (UU: CEO Commercialisation)

In 2007, an institute-wide review of Universal's research capabilities reported substantial progress with steady improvements in key areas of research performance, including research outputs and postgraduate enrolments and completions. The review also identified major areas of research capabilities in biotechnology; engineering technologies; knowledge engineering and discovery; public health and mental health; radio physics and space research; creative industries; and earth and oceanic sciences. Universal recognises the ongoing challenges of developing its research capabilities and has continued to set targets to further develop its research capability and capacity. The institution's Strategic Plan 2007-2011 states:

"We will continue to develop our research reputation and capability. We will further develop our reputation for postgraduate study and increase enrolments in master's and doctoral qualifications. This will require enhancements in our research capability and capacity. We will provide opportunities for staff to engage in research. We will work with businesses and the professions we serve to assist the development of leading practice. We will work with our communities to conduct research that is relevant to the social and economic development of New Zealand and is of an international standard. We will provide opportunities for commercialising research." (UU: Strategic Plan 2007-2011)

Interviews with government officials confirmed that the government has a desire to see a strengthening of Universal's research culture and capability and areas reinforced where the institution has particular expertise. Government has made a significant investment of funds to advance Universal's research capability and performance. Over the next three years, Universal has made a strategic commitment to continue to invest in the development of its research capabilities. It has made a commitment in its investment plan to upgrade its research facilities, build its research infrastructure, enhance the resources available for research, and provide both staff and postgraduate student researchers access to appropriate facilities in which to conduct research.

Interview with senior management revealed that Universal is committed to providing a research profile that would be distinctive from the other TEIs in terms of its applied research and professional focus, combined with its strong links to business and industry. Its 2008-2011 Investment Plan priorities emphasise the development of its potential to conduct excellent research, advance knowledge and practice in its areas of expertise, actively engage with the communities it serves, and contribute to the economic transformation goals of government. Interviewees from faculties and research institutes engaged in the development of research capability in terms of commercialisation have stated their desire to see their research not "ivory-towered", meaning that it will not be used just to get their PBRF quality scores up, but the focus will be more on leading-edge and practically useful research. There was general acceptance that this will be a difficult challenge given that most researchers are largely motivated by PBRF goals. Some research institutes' Directors have commented that their genuine strengths and research depths lie in the interdisciplinary array of research fields. As such, building research capacity has become their key goal, helped by the appointment of research professors in many schools.

7.5.3 Developing Structures

Universal has made an ongoing commitment to develop its research activities and performance that includes investment in research structures. According to its Investment Plan 2008-2010:

"The university is investing in structures which facilitate research, such as the research institutes and clusters, and it is providing staff with the opportunity and encouragement to conduct research".

Universal has a complex structural configuration comprised of a central research office, various research institutes, units and centres in faculties and schools, a separate commercial company, and a technology park. In past years, various reviews of the institution's research activities have added to the complexity of its structural configurations. Universal's central research office has an important role in supporting the development of research and commercialisation at the institution. It promotes a strategy for applied, interdisciplinary, policy-informed and connected research that advances knowledge and professional practice. Its major focus is on enhancing the research culture,

growing capability and capacity in key research areas, and promoting effective relationships between university researchers and external stakeholders that are mutually beneficial. Universal currently has fourteen research institutes hosted by its faculties and schools to bring focus to research activity and foster a strong research-led culture that would lead to the development and commercialisation of innovative products.

"One could argue that for a young university, it's a hell of a lot of institutes to be popping up and to be credible internationally, I mean to have the word institute, I personally think that it has to hold up internationally... Everybody had freedom to do whatever they wanted and they just grabbed the name institute. .., we could do with a bit of a review." (UU: Director of Research Institute)

It was explained by a founding Director of one of the earliest research institutes established at Universal:

"So, within the institute, the target was to expand and give chance to other staff from engineering to work and develop and I started the Engineering Research Institute. ... We have done work for more than 25 companies ... So, we had a good market, good relationship with industry, good publications."

Initially, Universal through the provision of seed funding, established research centres within faculties to provide institutional support for research. As stated in Universal's 2003 Annual Report, the research centres were increasingly expected to be involved in collaborative projects to increase research reputation. The centres eventually developed into larger research institutes. Interviewees also emphasised that having research institutes ensures that research activity and resources are concentrated into the areas of research capability, and within these institutes, centres of research activity are also developing. Research institutes and centres also have an important training role for postgraduate students. The largest research institute has stated that its key objectives are to encourage and foster cross-disciplinary collaborative research; act as a champion in the collection of funding from a variety of sources; and attract industry projects and funding. Another key research institute has stated its main objectives are to become established internationally as a high profile research institute and attract significant research funds, both in New Zealand and internationally. The following comments made by the Director of a large research institute reflect its importance in terms of building profile and generating funding.

"I have the accountability to the university to generate profile and funding for the university. I've got academic freedom."

He went on further to explain that the research institute structure serves not only as an important mechanism to attract funding and build profile, but it also helps bring together professionals through research collaborations, provides them with resources and much needed autonomy that helps build research capacity.

"Structure also helps build the critical mass and enhances the research culture". (UU: Director of Research Institute)

Universal has reported in its annual reports that its research institutes have produced significant results in terms of research outputs, external research income and postgraduate supervision. It has worked in partnership with a range of national and international organisations, particularly with regard to commercialising their research, and three research institute directors were selected as finalists in the 2007 Bayer Innovators Awards. Following a recent review of research performance, Universal has placed a very high importance on the development of appropriate structures to manage accountability expectations towards enabling research commercialisation. In 2006, considerable emphasis was placed on building and refining the research infrastructure due to the continuing expansion of research activity and the challenges posed by a rapidly increasing postgraduate enrolment. Universal *"merged some of its administrative divisions supporting research and commercialisation to ensure that emphasis is not only on commercialisation but also on the contribution of commercialisation to the support and development of research capacity at the university"* (UU: Annual Report 2006).

Universal has adopted a hybrid model of commercialisation with some of the functions located within the central research office to help facilitate commercialisation. It also has a separate commercialisation company, headed by a CEO housed within its technology park (now business innovation centre), to enable a unique collaborative environment with established businesses. Universal established a commercial company with the aim to strengthen research capability within the university; to facilitate the commercialisation of university research and development; and to provide practical support for entrepreneurial activity. Originally, when it was first established, the commercialisation function had a Pro Vice-Chancellor (PVC) Commercialisation, to whom both the CEO of the technology

park and the CEO of the commercial company reported. The reporting then changed to PVC Research, and just recently, the reporting is to Deputy VC of the university. According to interviewees, frequent changes to reporting lines and reassignment of commercialisation responsibilities created instability in terms of research commercialisation priority. It was explained by the Director of Commercialisation that the hybrid model has probably more to do with the development of IP, as it is not advanced to the stage where everything is run through the external company.

"We are very new, we're very early stage so we still have a hybrid model, where part of our commercialisation is run through the research office and part is run through the company...., the ones that are fully independent and successful run it through the commercial company. Probably, in a few more years' time, with the deal flow, the structures and that sort of thing coming through, we might change to a different, custom model rather than a hybrid model." (UU: Director of Commercialisation).

He went on to further explain that a good part of the process of commercialisation is sitting with researchers and teasing out the ideas, as some of the researchers do not realise that they might have commercial potential in what they are doing. So, the rationale for relocating the Commercialisation Manager to the central research office was to enable him to work closely with researchers and identify key elements of their research that have commercialisable value and bring them out:

"Our job is about identifying potential, bringing it out, developing it to a stage where we can protect any IP, we have validated the science, we have validated the market potential, and we have got a strategy around how it might go to market. We package that up then we take it to investors or bring investors in to look at it." (UU: Director of Commercialisation)

The centre for Universal's research commercialisation has been the technology park. It has been described in Universal's 2008-2011 Investment Plan as a "one-stop" collaborative commercialisation environment housing the commercialisation directorate, research institutes, a business incubator, a conference centre and several established businesses. Universal regards this structure as providing a vibrant environment and an innovative approach to commercialisation. It also brings together legal and business expertise not found elsewhere in the institution. It was explained by interviewees that the benefit is that the technology park will bring technologies into Universal to which both

staff and students can apply their research capability. So Universal gets the opportunity to work with real live companies and their technologies, and the opportunity for the companies is to take their technologies to new levels that they would not normally have the resources to do. Universal has an independent private company situated on its campus in a symbiotic relationship with one of its larger research institutes. It was explained by the CEO of this private company that:

"Universities are the 'seed incubators of the ideas'. Once the idea looks like it is going to be commercial, it needs to be removed from the university as soon as possible and brought into commercial alignment. If the university wants to hang onto it too long, or wants to take all the research through too far, it will die. The universities must only incubate the idea, they should apply commercial principles, as we do, to managing that research during that process otherwise it will become difficult or impossible to patent." (CEO, Private Company)

It was further emphasised during interviews that knowledge transfer must involve a two-way exchange with universities able to understand industry needs and requirements, and vice versa. While it was acknowledged that the above arrangement signifies a more structured and strategic partnership between business and universities, potential tangible benefits are yet to be realised.

7.5.4 Systems and Processes

Universal has developed and implemented systems, policies and processes to effectively manage its commercialisation expectations. Interviewees explained that the biggest challenge has been to develop policies and processes that would provide an understanding and help steer the culture from teaching towards research, innovation and commercialisation and entrepreneurship.

"... it is more about the culture of entrepreneurship, innovation, commercialisation, that is the issue, how do you filter that sort of process, that sort of culture? So, the recognition ...promotion – those sorts of structures isn't in place yet, and we need to look at that, and how we can incentivise staff to look at some commercial opportunities that might be involved with their research. Those sorts of things need to be put in place..." (UU: Director of Commercialisation)

Interviewees explained that there was an active move to promote commercialisation through implementation of IP policies that would seek to identify, protect and explore commercialisation opportunities. It was explained during the interviews that an advantage of adopting an integrated model of commercialisation structure is that Universal does not

have to maintain separate accounting, budgeting, financial management, and human resource systems and processes. There are cost savings and greater transparency when all commercialisation activities continue to utilise the central systems and processes. According to the Commercialisation Director, the commercialisation function is also supported by working closely with the central research office, central governance and legal support structures, and the faculties. They help provide vital support in terms of contract preparation, risk management, and systems for rewards and recognition of staff. Universal has also implemented an active education programme on commercialisation for research staff and students. This programme outlines the processes leading from IP identification and notification to actual commercialisation of IP.

7.5.5 **Managing IP**

Universal recognises that successful commercialisation requires early identification, protection and management of IP. It has implemented an IP policy which states the ownership and benefit sharing. In line with standard New Zealand employment law, Universal claims ownership of IP generated by staff in the course of their employment, but does not claim ownership over any copyright in books or journal articles. Universal has also committed to sharing the profits from any IP commercialised with the creators, according to its policy on ownership of IP. Generally, students own their own IP, unless Universal's involvement goes beyond the teaching of courses. Interviewees explained that IP ownership is not always clear cut and will be determined on a contract-by-contract basis, depending on who would own the work, and the degree to which they are paying for the work. Ideally, Universal would be trying to maintain as great a portion of the IP as possible, and also the right to publish the results of research. There are times when, for various commercial sensitivities, the funding agent may be looking to retain ownership of the IP, so Universal undertakes a negotiation phase. The central research office has people with expertise in IP who can check the contracts to appropriately protect the university from an IP standpoint, and also to ensure that the university position is as advantageous as possible. According to the CEO of the Commercial Company, the IP management and policies have worked well. Now the staff ring up directly when they are faced with IP they think might have commercial value. It is considered important to start work early with the researchers and put mechanisms in place so Universal can protect the

part of the research that has commercial opportunities. The Commercialisation Manager revealed that many researchers were not aware of the long-term consequences of not protecting IP and, in general, it is true there is a reluctance to invest in technology where the IP is not protected.

"Owning the proprietary rights to the intellectual property is probably the strongest most valuable form of competitive advantage. If that advantage is absent there is always the threat of somebody else with other unfair competitive advantages (e.g. bigger marketing budget, better distribution channels) picking up the idea once the risk has been removed by the initial investor, and benefiting from that initial investment instead. That is the inherent reason why IP is being protected." (UU: Commercialisation Manager)

Apart from who owns and who shares the benefits, decisions relating to who commercialises the IP are very important. Universal manages its IP by giving access to investors through a licence with exclusionary rights or by outright sale. It was explained by the Commercialisation Manager that:

"It was kind of like acting as the guardians or custodians of the IP. We don't just sell it, get our money and leave ... We then monitor the licence."

At Universal, research institute Directors have taken different viewpoints and approaches towards positioning, protection and exploitation of their IP rights. According to a key research institute Director, the only way you will get somebody to invest millions of dollars, even in the simplest product, is to give them exclusionary rights:

"...the last thing they want to do is have someone come in and copy it. So, you underpin everything with IP rights. So, if there are exclusionary rights, someone will manufacture it; if they manufacture it, it will turn into something, and if it turns into something there will be a public good." (UU: Director of Research Institute)

A somewhat different position was taken by another research institute Director.

"Our goals are to develop novel information processing methods and tools, to protect them as IP for New Zealand, and to transfer them to other organisations for teaching, research and commercial applications."

It seems that the positioning and protection of IP rights is affected by different goals of the research institutes themselves. Given this flexibility, the IP ownership is not clear cut. Interviewees explained that success is not associated with one model but whether the commercialisation objectives are being achieved.

7.5.6 **Rewards and Incentives**

Universal realises that, basically, it can not do anything unless the researcher is motivated to commercialise. Therefore, it has to make sure that whatever commercialisation plans are proposed there is buy-in from those involved. For technology transfer, the benefits are more direct. Universal is dedicated to sharing one-third of the net benefits with the researcher after the costs of the commercialisation have been covered. The remaining two-thirds go to the university, ideally, in large part back to the department of the researcher to re-invest in research as an incentive. Interviewees expressed concern that, at the moment, promotion within academic institutions is around research, PBRF, teaching and learning.

"Staff don't get promoted if you have got patents registered; they don't get promoted if they have got a couple of spin-out companies associated with their technologies. So, the recognition around that needs to come into play in some way, so that staff then have a driver there...and we need to look at that, and how we can incentivise staff to look at some commercial opportunities that might be involved with their research." (UU: CEO, Commercialisation Company)

While there are a few researchers who are very keen on pushing commercialisation, a lot of career-minded academics are only interested in basic research as a means of career advancement. According to one high profile research professor:

"For the university, that's the only game that is going to reward us and you better play it. If you don't play it then you don't get rewarded, simple as that." (UU: Researcher)

For some of the top researchers who have dedicated years to their discoveries, getting a sense of accomplishment is the key incentive. As was explained by one research scientist involved in commercialising his discoveries:

"I love it, that's all that motivates me. I am certainly not motivated by money. Money does not motivate me at all. I am passionate about (Universal). I have been with (Universal) right from the beginning days. I am one of the four original Professors; I was Associate Professor at first. And I believe that we will become the premier biotechnology company in NZ, and (Universal) *will get that association and that's what they deserve. And I am happy to help drive* (Universal) *into this, because it comes down to relationships. They have looked after me; we're going to look after them."* (UU: Researcher)

For some of the top researchers, making discoveries and disseminating results to the wider community to solve societal problems, and gaining recognition by peers around the globe, are much greater motivations and incentives.

7.5.7 **Governance**

Universal's highest level engagement with stakeholders occurs through the auspices of its council, established under the Education Act 1989. The council is the governing body of the institution, ultimately responsible for its effective management and operations. The council has a broad representation of members nominated by the government, community groups, commerce, industry, staff and students, and includes the Vice-Chancellor. To enable Universal to participate in commercialisation and undertake commercial investments in spin-off and joint venture companies, a subsidiary company with an independent board of directors has been established. The board consists of the Vice-Chancellor (VC), Deputy Vice-Chancellor (DVC) and three external business executives with extensive commercial experience. According to the CEO Commercialisation, it provides a source of commercial advice and governance, and is a vehicle for Universal to participate in commercialisation activities.

"It gives the university an opportunity to put commercial projects in front of an independent board that has a commercial umbrella, rather than an academic umbrella. These are businessmen who can look at a project and say, well, from the commercial potential, we believe this or that and make recommendations on how that project could be developed, and commercial potential extracted, and leveraged out of those technologies. That gives the university an independent commercial umbrella. It also separates the risk a little bit from the university. That's another function of the board." (UU: CEO of Commercialisation)

The board members are the opinion leaders in the process of technology transfer. They receive monthly reports and are actively influenced as directors of the company. The CEO, Commercialisation, reports to the board and the DVC. For each of Universal's research institutes, development boards have been established to provide strategic advice to its Directors pertaining to the overall direction and performance of the institute. Board members, who include relevant key external stakeholders, are nominated by the research institute Director. According to Universal's 2008-2011 Investment Plan, boards are a key means by which external stakeholders are able to influence and guide research development and capability at Universal. Strong governance ensures strong alignment

with industry, with the public and private sectors, and with national and international individuals and agencies that are strategically placed in relationship to the future development of the respective research institute and Universal.

7.5.8 Risk Management

According to the CEO of Commercialisation, the separate commercial company of Universal provides an independent commercial umbrella. This separates the risk a little bit from Universal, which is another function of the board. It also enables risk-taking when dealing with investors, business people and commercial people as they understand the limited liability structure of the company they are dealing with.

"It can hold risky assets like IP that have value. If it is inside an academic institution, they find it is very difficult to understand who do I deal with, what's the structure I am dealing with, is it a charitable trust, or what is a university as a structure; whereas, they understand a company structure very well. It makes it easier to deal externally with the investors and business people. So those are some of the main reasons why it was established". (UU: CEO, Commercialisation)

While this seems to be the official line, the commercial company is firmly embedded within Universal's structure. It relies on Universal's financial, human and physical resources including use of its systems and processes. Given the high degree of dependence on Universal, there remains considerable doubt whether, in reality, the commercial company has the capacity to take risks at the level it claims it can.

7.5.9 Leadership

Universal has made a strategic commitment to the research commercialisation mission. It has established structures to provide senior management support for commercialisation with a direct reporting line to the DVC. However, the management structure has been constantly changing in recent years with the TEI's drive to enhance its research activities. As such, reporting lines for research and commercialisation have also changed and this has created some confusion in terms of commercialisation and its repositioning within the top management structure. From interviews with researchers, it became clear that Universal's top management has given priority to research that improves its PBRF rating, whereas research commercialisation has not received the same level of attention and is viewed as a marginal activity. Interviewees stated that for commercialisation to be successful, senior management leadership needs to be more responsive and deal with the

motive gap, barriers, obstacles and organisational challenges of research commercialisation. It also became clear from interviews that only a few research institute Directors embraced the commercialisation mission and provided strong leadership to their research teams to undertake commercialisation initiatives. There was general belief among researchers that to make commercialisation a reality, a strong committed leadership that fully embraces an innovative and enterprising culture supporting commercialisation was required.

7.6 *Measuring Performance*

Universal prepares a five-year strategic plan that sets out the institution's long-term goals, objectives and key strategic priority areas of development in terms of the government's tertiary education strategy and funding. The strategic plan also outlines the critical success factors indicating particular areas of focus for the institution to ensure that the plan is being successfully implemented. Universal's strategic plan goals and objectives are operationalised in its investment plan (previously profile), negotiated and approved by TEC, and the plan becomes the contractual document on which government delivers its funding. Universal develops and monitors specific targets for key indicators, to ensure that the intent of the strategic plan is being fulfilled. These are detailed in the investment plan (profile) and other key planning documents, reviewed annually, and updated as required. For the past decade, Universal's key objectives and performance measures have focussed on increasing its engagement with research throughout the institution, increasing student engagement with research, and increasing its research quality and research reputation. As explained in its 2007-2011 Strategic Plan:

"Our success in increasing research activity will result, inter alia, in a research-rich environment for learning and teaching, an improved Performance-Based Research Funding (PBRF) rating, increased consultancy contracts and more commercialisation of intellectual property."

Table 7.1 below, provides a list of research and commercialisation-related objectives and performance measures Universal had set itself and publicly reported in the seven-year period from 2003-2009. It is interesting to note the considerable emphasis placed on increasing research revenue which seems to be heavily reliant on research activity and research reputation. Universal's strategic plan had also emphasised that reputation and

212

strong performance was necessary to lead to growth in revenue, whether from additional students, increased research revenue, commercialisation of intellectual property, or other streams of revenue, which would be used to invest in areas of strategic priority. It has been widely published by the larger research institutes on its web pages that, ultimately, the most important measurable outcome for them was to increase Universal's standing as a world-class university, to be achieved, principally, through an increase in tangible research outputs. Universal's research performance is strongly focussed towards improving its PBRF ratings, as basic research funding from government is determined by PBRF quality scores. As was explained by a Research Professor:

"For the university, that's the only game that is going to reward us and you better play it. If you don't play it then you don't get rewarded, simple as that."

This comment reinforces that government policy on research funding largely dictates which performance measures are used at Universal. Interviewees explained that while PBRF was the only game in town, they certainly have got to live up to that.

"*The problem with PBRF is that it doesn't necessarily value much of these* (commercialisation) *and that's the problem, the academics play the game."* (UU: Researcher).

According to the researcher, the game says that if you work for too long in industry, the point is to try to get a paper out of it. Another research scientist commented that PBRF is slightly problematic from a timing perspective and, to protect patents, and patent information, and sometimes commercial secrets, you have to be totally silent about it for a period of time.

"However, we've done our silent time, but we have been here for 12 years, OK, and now we have an unbelievably massive commercial platform. It is quite huge, and we are getting major licensees out everywhere. All of a sudden we are starting to publish, and now our publications are really "Wow, this stuff is quite spectacular", but we are now getting people taking licences from us to do research on our products and we will be joint collaborators in publishing via that mechanism." (UU: Researcher)

Senior staff responsible for preparing the strategic planning documents explained that KPIs were arrived at by going through a process of what the strategies were and how best to achieve them. According to an interviewee, there was a lot of debate and input about what the theme was, how it would be achieved, what was the rationale, what were the critical success factors, and from there they flowed through into the KPIs. The process

also involved a lot of input from various key people throughout the institution. Universal also looks at what other institutions are doing and does some benchmarking as well. The Director of Planning commented that when you start getting absolutely down to the KPIs, some people would probably have more influence than others, for example, planners, the head of the VC's department, and then it goes through for approval to the Executive.

"So, anyone can have input and we go back to the university about it, but in reality, some of us that are responsible for writing them, would write them and then I don't know whether I should say this, but you actually when you are setting targets and things, we will then look at where we are currently, where the university might wish to go, and some of it will be heavily aligned with the strategic plan, over 5 years, and project out, and then look at what you would have to achieve annually to get there. Others, some of us, probably made some of the numbers up – an informed way of doing it." (UU: Director Planning)

In 2005 and 2006, Universal had set a formal objective to increase commercialisation of research activity. Its key performance indicator was to increase the total number of identifiable, commercialisable pieces of intellectual property by two each year. However, this objective was dropped from the new 2007-2011 Strategic Plan, which contained no specific objectives and measures relating to research commercialisation. It was interesting to note the different explanations and viewpoints expressed by senior managers:

"We are so new in terms of research, that there is just not a lot of product there, so I think we were just a bit over-optimistic in the early years really. Now we are probably focussing more on external research income itself, rather than commercialisation as a sub-set. I think it is quite hard to actually make universities commercial entities anyway, it is not their raison d'etre, and it is a different psyche." (UU: General Manager)

For this reason it was debatable whether there should be specific performance measures relating to research commercialisation. Some researchers said that they were only interested in measures that matter to them, namely, research dissemination basically through publication in normally high ranking journals for the good reputation of the university. A senior research professor felt that the performance measurement that mattered most was really about three things – student graduations and completions, publications, and grants. It was also pointed out during interviews that, recently, Universal had amalgamated research and commercialisation structurally and more emphasis was being placed on building the research capability of the institution.

"I will be honest with you, this is my opinion, some of it would be that the overall research capability became more important, I am not saying commercialisation isn't vital to that, ... we have got some other KPIs ..., they're more about building our staff capability, building our research capability overall. Maybe it is also because commercialisation at (Universal) *is probably in its infancy, so there's sort of a bit of a mix of KPIs that stretch us and ones that we know we can achieve and be seen to be achieving on."* (UU: Director Planning).

The CEO of the commercial company explained that setting performance measures for commercialisation was not easy because of the complex nature of activities, long time delays and uncertainty of outcomes:

"That type of area is not easy, you just don't know. You don't know until you actually get a deal together, whether it is a deal for licensing or whether it is a deal for spin-out or joint venture. You don't know about when you are going to have a spin-out. Developing from an idea in a university to a spin-out takes anything up to 10 or 15 years by the time you get it through the marketing, the time when a company is spun out, it has got its own management structure, its own investors - that can take years, so it is not something that can easily be reported." (UU: CEO, Commercialisation)

The CEO went on to comment further that the easier reporting is on the more basic nuts and bolts stuff like invention disclosures, patent filings, and licensing revenue. Some interviewees felt that commercialisation measures would become increasingly important as government funds get tighter. It was explained by the Commercialisation Manager that commercialisation is becoming increasingly important for the government's economic transformation agenda, so there is anticipation that commercialisation will be measured more heavily but it has not caught up*:*

"What is being done is that case studies/stories are being used as an approach to these things... I want hard numbers on these things, but the purpose of university case studies is mainly to create publicity, awareness and incentives." (UU: Commercialisation Manager)

He went on to emphasise that while Universal does not report on broader metrics, the commercialisation offices in New Zealand collectively measure and report on what is considered now world standard metrics such as invention disclosures, licences issued, licence fees generated, start-ups created, capital raised, etc., all weighted by the amount of research expenditure, to get a comparative metric. The commercial company Director felt that measuring collectively as they are doing, rather than on an individual university basis, gave a better idea of how the university commercialisation in New Zealand is

operating. He explained that the figures put together as a group probably mean a lot more especially in terms of international comparisons. It gives the government a better idea of how the industry/university commercialisation is performing with some of those measures. Interviewees also expressed concern that the government had a very myopic view as it was not looking at university commercialisation but was looking at return on its own investment.

"...it's not measuring the efficiency of universities, looking at it from a systems point of view, where you have got a value chain, students, researchers, universities, private sector, handover from fundamental research to applied research to commercial research, to licences to start-up businesses. Each component has inputs and certain outputs. ..So efficiency of that system needs to be measured by inputs vs. outputs." (UU: Commercialisation Manager)

Concerns relating to the performance measures used by Universal were also expressed by several interviewees who considered they were either inadequate or not measuring what mattered most. One research institute Director commented that the measurement problem is that the approach is not the right one and, from his experience, nobody had asked what they got out of the money they had invested. Another research institute director with a strong industry affiliation has commented that the way things are measured at the university creates instant conflict with the demands of industry because industry moves at clock speed whereas a university moves at calendar speed. The third institute director interviewed was of the opinion that it is all about measuring success, and people tend to measure success in the wrong way, which is in terms of the amount of research grant money they have raised. He went on to comment that:

"I measure success in terms of whether they have got a product in the market, are they making money, not they have got a one-off payment or they have raised a grant. Success is not measured properly in this industry – why? Because there are virtually no successes to measure in this industry, so they are measuring things that aren't successful." (UU: Research Institute Director)

The different and often contradictory views of the three research institute Directors and other interviewees on performance measures highlight some of the common problems and challenges faced by TEIs in terms of setting measures and reporting results of performance.

Table 7.1: Objectives and Performance Measures of Universal 2003-2008

Objectives	Key Performance Indicators
2003 Objective: **To increase the engagement with research throughout the University** **To increase the number of research students each year** **To increase the reputation of research centres**	2003 Key Performance Indicators Research outputs (per Academic FTE) Number of Research Students Research Centres are increasingly involved in collaborative projects
2004 Objectives **To increase the engagement with research throughout the University** **To increase student engagement with research** **To increase the reputation of research centres**	2004 Key Performance Indicators The number of research outputs increases each year The number of research students increases each year Increasing collaborative links
2005 Objectives **To increase the engagement with research throughout the University** **To increase student engagement with research** **To increase the quality of the research conducted by the University** **To increase the commercialisation of research activity**	2005 Key Performance Indicators Research outputs increase each year by 10% Postgraduate EFTS increase each year by 10% The number of collaborative research projects increases each year Total number of identifiable, commercialisable IP pieces increases by two each year
2006 Objectives **To build and redevelop new facilities and to support the development of research and postgraduate studies** **To enhance the University's international reputation** **To increase the engagement with research throughout the University** **To increase student engagement with research** **To increase the quality of the research conducted by the University** **The amount of external research funding increases each year** **To engage in research that addresses critical elements of New Zealand's development** **To increase the commercialisation of research activity**	2006 Key Performance Indicators Capital Development Programme Expenditure The number of distinguished visiting researchers and scholars increases each year Research outputs increase each year by 10% Postgraduate EFTS increase each year by 10% The number of collaborative research projects of strategic importance increases each year. External research funding To increase the number of significant research projects that focus on social, economic or environmental issues facing New Zealand Total number of identifiable, commercialisable pieces of IP increases by two each year. To graduate two high growth companies from Technology Park each year
2007 Objectives **To increase external research revenue to 10% of external revenue**	2007 Key Performance Indicators Annual external research revenue as a percentage of total external revenue
2008 Objectives **To increase the proportion of academic staff on terms and conditions conducive to conducting research** **To increase external research revenue to 10% of external revenue by 2012**	2008 Key Performance Indicators No specific KPIs set To increase external research revenue Annual external research revenue as a % of total external revenue To increase the number of successful applications to contestable research funds each year

To increase the number of research outputs by 10% each year	To increase the number of research outputs by 10% each year
To expand international collaborative relationships that enhance the University's profile	No KPIs set
To ensure each Research Institute has a development board with external stakeholders	No KPIs set

7.7 *Reporting Strategies*

Universal's charter, strategic plans, profiles and investment plans are formal communicative mechanisms that clearly lay out the institution's intent and commitment to research and commercialisation. These public documents have been largely framed in terms of the efforts made towards building the research capability and capacity of the institution. The reports are also a formal construction of positive narratives largely aimed at enhancing the research reputation and providing legitimacy for Universal's continued involvement in various research projects. They also help in negotiating and obtaining ongoing government funding support for various research activities. The following example from Universal's Strategic Plan 2007-2011 demonstrates its emphasis on enhancing its reputation for research:

"Our reputation will be enhanced by the quality of the research undertaken by our staff and postgraduate students. There will be a self-evident relationship between the University's research, consultancy and commercialisation...The University's reputation for research in key areas will lead to increased research collaborations, both nationally and internationally..."

Universal's web page provides an extensive range of narratives about the activities and events relating to research and commercialisation. The web pages are also linked to the separate web pages of the institutes and research centres giving details relating to the mission, objectives, partnership arrangements, and key staff members with international affiliations, etc. They are mainly to build profile and help establish identity and to provide legitimacy. For example, one research group has put on its web site its vision as having**:** *"Recognised world leading facilities, expertise and profile via a unique portfolio and network of multi-disciplinary groups".* In addition to the website information, Universal and its individual faculties also publish research newsletters, and information

bulletins on research and commercialisation activities. As was commented by a research institute Director:

"...the most value will come to the university in the form of profile, as in mentioning and being in the press and the media…"

Universal prepares an annual report that is used to formally report to stakeholders the financial performance and progress made towards the achievement of its strategic and investment plan objectives. The annual report has been widely regarded as the key accountability mechanism to discharge its accountability obligations. According to the Planning Director, annual reporting *"is quite a structured process because there are absolute legal requirements on what we report on... And they are structured in relationship very much to the themes in the strategic plan"*. She went on to explain that it serves the purpose of a report on the strategic plan, some of it is marketing of the university, its current achievements and where it might be heading, and major issues that the university might be facing in that year. An interesting comment made by the Finance Director was that "*If you looked at all the university reports they are all pretty much the same."*

For the past decade, Universal has dedicated a section of its annual report to providing a narrative on research and commercialisation activities. The narratives appear to be largely focussed on reporting success in terms of building research capability, funding and promotional aspects. The focus on building research capability and capacity has continued to emphasise the improvements made in research performance and outputs produced. Some examples from recent annual reports highlight this point:

"Substantial progress has been made in building research capability at the university, with 2007 showing steady improvements in key areas of research performance, including research outputs and postgraduate enrolments and completions". (UU: Annual Report 2007)

"The research capability and capacity of the University has grown significantly, as illustrated by the increase in the number of Professors and the rise in the number and quality of research outputs..." (UU: Annual Report 2006)

The motivation for such reporting seems to stem from its desire to enhance its reputation and provide a measure of confidence in the research capability of staff. An example from the 2008 annual report narratives demonstrates this point:

"Although these standout performances have characterised research and commercialisation in 2008, as always they emanate from the diverse research activities of experienced and emerging researchers, postgraduate students and support staff across the Schools, Faculties, Institutes, Centres and Directorates of the University."

Universal has placed a very strong emphasis on consistently reporting funding as a measure of its research success. For example, in its 2006 and 2007 annual reports, it reported that the high rate of external research income had continued the trend of the past five years and external research funding increases underlined the strong progress the university was making in developing its research profile. Positive narratives were constructed in the 2008 annual report of research institutes that had achieved funding success and continued to apply and commercialise their research discoveries in 2008. For example, the narratives emphasised that the contract secured with industry was "the largest contract negotiated by any university" with this particular company. Another research institute worked in close association with a commercial company to develop and commercialise a novel biotechnology platform. Universal also promotes its research culture and the activities of the research institutes to help raise its reputation and profile. For example, in its 2007 annual report it stated that:

"The university's research culture has continued to flourish. The research institutes have produced significant results in terms of research outputs, external research income, and postgraduate supervision, and three research institute directors were selected as finalists in Bayer Innovators Awards 2007."

Universal also reported in the 2008 narratives that it joined a consortium of commercial entities made up of other universities with funding support from FRST to maximise the commercial benefits to New Zealand from publicly-funded research. The construction of positive reporting narratives seems to be cognisant of the government's strategic priorities and, thus, has placed special emphasis on Universal's desire to engage in research that addresses critical elements of New Zealand's development and to increase the number of significant research projects that focus on social, economic or environmental issues facing New Zealand. For specific commercialisation activities, Universal reported in the narratives section of its 2006 annual report that its technology park had launched, in total, twenty successful companies, and three high growth companies "graduated" from the technology park in 2006, marked by a function at which the Prime Minister officiated. Its commercial company took shareholdings in two

companies, and began a systematic programme of assessment of dozens of commercialisation proposals from the university. Two technologies developed by Universal's research groups and assessed as having high growth potential were to be jointly developed by Universal and FRST to the next stage of commercialisation. In 2007, the annual report provided a commentary that Universal had extended its networks, accessed the expertise base of other universities and benchmarked its performance both nationally and internationally. The above examples of positive construction of reality are largely aimed at what Universal states in its 2008 annual report narratives as demonstrating an "*... integration of its research and commercialisation activities, developing patents, consultancy activities and commercial products from its research and development platform.*"

Up until 2006, Universal had set specific performance objectives and measures to increase the commercialisation of research activity and reported on those objectives. However, from 2007 this was discontinued. The reasons provided by the General Manager were that: *"...if it is not in the investment plan then we don't actually have to report on it in the annual report..."* The Commercialisation Manager commented that it's the Planning Directorate that decides that and, *"really, in the larger scheme of things, commercialisation is not important to a university and it's not reported heavily".* He went on to comment that *"... government gets these figures but the government reports on commercialisation in a very microscopic way."*

The Commercial Company CEO explained that they report on fairly basic things like identifiable IP, disclosures, patents, and licensing as standard measures that most commercialisation offices would report. However, now they are reporting as a collective group of New Zealand universities which allows them to benchmark to international standards on university commercialisation with Australia, US, UK, and Canada. He explained that it was more applicable in terms of understanding where they sat in relation to international standards, as trying to compare New Zealand universities one against another internally, does not give enough of an idea of how they are progressing unless it is at an international standard. He went on to explain further that:

"When we put the first lot of data together, NZ came out very well in terms of comparison of benchmarking internationally on a per dollar research basis. We don't get as big a budget as US, with billions of dollars going into the research environment but, in terms of spin-out companies, licensing deals, per dollar, we actually are a lot more efficient with what we have and I think that is just because we don't have as much, so we are a lot more focussed on how we have to spend it. So when you compare us on a dollar research basis, and we have done that now to benchmark, we come out very well, across the universities...So, internationally, we know as a benchmark, we do really very well. This is contrary to some people's belief that NZ universities don't do well, but we actually do very well. So that was good to know."

Universal's commercial company does not run its own separate accounting system and is subject to the internal financial reporting and monitoring requirements of the university. Similarly, all research institutes and centres have their budgets to operate with and the university generates monthly financial reports on performance. A faculty Finance Manager with responsibility for a large research institute commented that there are strict internal accounting and accountability requirements that are managed centrally and not by the research institute. Research institutes have effectively decoupled themselves from these technical reporting requirements. On external reporting to funding agencies, he commented:

"Normally, the enormous progress report is focussing on the research content and how we are managing the research per se, as opposed to financial reporting. The control is within the individual researchers and the schools with which those researchers are associated. They have a more detailed day-to-day, or month-to-month management reporting going on."(Faculty Finance Manager).

Comments by a high profile researcher on accountability and reporting were:

"Well, if we chase money through the research institute, the accountability is to the funder – they send in auditors. I have no accountability to the public that they have the right to know what we are doing. However, I have accountability to (Universal) *to generate profile for* (the) *university so the only reason I publish is to generate profile for* (the) *university. ... The second reason, of course, is for validation of the product, validation of the science and for expansion of it."* (UU: Researcher)

The above discussion points to the clash between different reporting agendas aimed at satisfying funders, public relations and generating profile, lobbying for funding support and accountability to government.

7.8 *Chapter summary*

This chapter presented the results of data analysis of Case Universal to help explain how it identifies and renders accountability towards enabling commercialisation of research. Universal's strategic documents frame the TEI's commitment to research commercialisation activities in terms of enhancing its reputation as an applied and engaged university. Data analysis on the institutional drivers of research commercialisation has identified its key stakeholders and factors that impose accountability obligations. Government is a key stakeholder that provides substantial funding support and Universal has developed effective partnerships with industry to help deliver commercial outcomes. Although a majority of its researchers have a PBRF focus, Universal has some of its top researchers keen to push the commercialisation agenda and have expressed a desire for greater professional autonomy and support. In regard to its obligations to the wider community, Universal seems to be moving away from research for public good and into corporate citizenship and strategic corporate philanthropy to address issues of mutual interest.

Universal has a research culture that has been largely influenced by the TEI's desire to improve its PBRF rankings. To enhance research commercialisation, Universal needs to build its research capability and capacity and develop a research commercialisation culture. Currently, given the emphasis on PBRF goals, research commercialisation seems to be a marginal activity. Universal needs to remove bureaucratic obstacles and organisational challenges to help make research commercialisation a reality. Finally, in terms of accountability discharge, Universal does not set specific objectives and performance measures for research commercialisation activities in its strategic documents against which it formally reports. Research evidence also points to the clash between Universal's reporting agendas in terms of accountability, lobbying government for funding support, satisfying funders, and generating publicity. A summary of the case findings for Universal is presented in Table 7.2. The next chapter presents a cross-case analysis of research findings.

Mission & Strategy	• Undertake commercialisation to enhance reputation • Foster excellence in research to serve regional, national and international communities • Undertake research activity in terms of the government's national priorities • Conduct excellent research that advances knowledge and practice • Ensure research activity is sustainable by increasing external research revenue, operating a robust research infrastructure, and developing critical mass of research capability
Institutional Drivers (stakeholders and factors imposing accountability)	**Government** • Determines policy and funding • Desire to see strengthening of research culture and capability • Provides substantial investment funding and expects contribution towards its strategic priorities for tertiary education **Industry** • Longstanding research engagement – some top researchers have first-hand experience with industry • Needs good research that leads to real-world innovative solutions • Partnership has led to development of some commercial products • Provides staff and student opportunity to collaborate in research • Helps build research profile • Provides funding – licensing fee, development funds, sale of patents **Researchers** • Key to commercialisation • Many are driven by PBRF measures • Require time, resources, infrastructure to conduct research • Expect to see a commercial outcome after years of dedicated research • Institutional entrepreneurs – drivers of research and development efforts • Require professional autonomy • Seek collaboration in national and international projects • Students at centre of institution's research aspirations - require opportunity to work alongside innovative and creative researchers utilising cutting-edge technology and tools **International Partners** • Fostering partnerships help develop research capability • Helps advancement of international standing, profile, and reputation • Provide opportunities for staff and student exchanges • International research projects illustrate the vibrancy and creativity • Grows international networks - international profile gives NZ profile • Benefits business and industry • NZ industry has low absorptive capacity **Wider Community** • Universal is expected to create, extend and apply knowledge to inform society for its health and well-being • Obligation to contribute to their social and economic advancement • Government has provided large research grants for community projects • Community engagement has moved away from a traditional philanthropic approach to a more strategic engagement **Financial Considerations** • Investment fund providers and joint venture partners expect return on their investment • Fund providers expect that funding works towards an avenue of commercialisation

Managing Expectations	**Developing Research & Innovation Culture**
	• Change culture from teaching to research – emerging research culture
	• Needs to promote commercialisation culture
	• Strong research culture necessary to promote research synergies
	• Building culture through investment in structures
	Building Research Capability and Capacity
	• Professorial appointments, increasing research outputs, income, improving scope and quality of research, application of research
	• Enhance research reputation - active engagement and contribute to nation's goals
	• Invest in research facilities and infrastructure
	• Advance interdisciplinary research
	Developing Structures
	• Invests in structures which facilitate research
	• Research centres and institutes to bring focus and foster research culture
	• Research institutes ensure research activity and resources are concentrated in areas of research capability
	• Larger research institutes foster cross-disciplinary research
	• Helps attract funding, create research profile, encourages collaboration, provides autonomy, builds critical mass and enhances research culture
	• Commercial company facilitates commercialisation and has a symbiotic relationship with research institutes
	Systems & Processes
	• Required to change culture to research commercialisation
	• Has IP policies to identify, protect, and explore commercialisation
	• No separate accounting, budgeting, and HR systems maintained
	Managing IP
	• Negotiated on contract-by-contract basis though Universal tries to maintain as great a portion of the IP as possible
	• IP licensed with exclusionary rights or outright sale
	• Success not associated with one model but whether commercialisation objectives are being achieved
	Rewards and Incentives
	• Universal shares one-third of the net benefits with the researcher
	• PBRF seems to be only game for most researchers
	• For top researchers, a sense of accomplishment and international recognition is a much greater incentive
	Governance
	• University council has ultimate responsibility
	• Independent board provides commercial advice and governance to commercial company
	• Development boards with key external stakeholders established to provide strategic advice to research institute directors
	Risk Management
	• Independent commercial company structures intended to separate risk from the university
	• High dependency on university systems creates doubt whether commercial company has capacity to manage risks
	Leadership
	• Senior management commitment to commercialisation
	• Changing management structure does not provide much certainty
	• Senior management leadership needs to be more responsive and deal with motive gap, obstacles and embrace commercialisation culture
Measuring Performance	• Strategic documents provide goals, objectives and performance measures.

	Specific commercialisation objectives and measures not set
	• PBRF influences research performance goals and measures
	• Government policy largely dictates performance measures
	• KPIs based on strategies, themes and how best to achieve them
	• Collective action by commercial companies in measuring performance
	• Input/process KPIs indicate no real attempt to measure commercialisation outputs. Common measures are number of research outputs, students, collaborative links and external research income
Reporting Strategies	• Strategic documents are formal construction of positive narratives to provide legitimacy for ongoing government funding
	• Positive narratives in annual reports emphasise funding success, collaboration, and commercial outcomes.
	• Web pages - to build profile, establish identity
	• Annual report structured to themes in strategic plans
	• Narratives focussed on promotional publicity and enhance reputation
	• External research income underlines progress and research profile
	• Positive reporting narratives aligned with government's strategic priorities
	• Commercialisation is not reported heavily

CHAPTER 8: CROSS-CASE ANALYSIS AND THEORETICAL INTERPRETATIONS

8.1 *Introduction*

The preceding three chapters presented the findings of within-case analysis for each individual case. This chapter presents the cross-case results obtained through comparing and contrasting the within-case results of the three cases. The cross-case results are themes and issues resonating among the multiple cases. Major findings of the cross-case analysis are integrated into the NIT and the conceptual models of accountability and institutional elements previously discussed in Chapter 3. The resulting theoretical interpretations, arguably, provide a richer basis for the research conclusions to be drawn in Chapter 9. To be consistent, this chapter maintains a similar set of headings as used for the individual case analyses so that findings are presented in a format that, ultimately, leads to answering the central research question and the four inter-related research questions.

The chapter begins by presenting common themes and differences in the three case TEIs' mission and strategies and institutional drivers to help explain the primary rationales that underlie their accountability obligations towards enabling commercialisation of research. This is then followed by a cross-case analysis of the institutional processes and mechanisms employed to manage accountability expectations. Next, cross-case findings on how the case TEIs measure performance and report the results of commercialisation are presented, followed by the cross-case analysis of the scope, purpose and modus operandi of voluntary reporting strategies. At the conclusion of each section, a summary of theoretical interpretations using the explanatory power of NIT is provided to help inform the findings. Finally, the major findings across the three cases are summarised and theoretical synthesis provided in relation to the conceptual model. In Appendix 7 an analytical summary that facilitated the cross-case comparisons is tabulated and presented.

8.2 *Mission and Strategies*

There are several areas of commonalities but also significant differences between the TEIs in regards to strategies employed in their efforts to commercialise their research. First, each TEI's strategic document outlines its commitment to research commercialisation despite varying levels of engagement mainly arising from institutional differences and extent of research activity. A second common theme is that all case TEIs have recognised that through engagement with research and commercialisation activities, they could make a vital contribution to the nation's goals of innovation and economic and social development. However, their contribution would depend on high quality and high value research. With this in mind, all three TEIs have committed to conduct excellent research that advances knowledge and practice. Arising from this commitment to research excellence, the third common theme is that all TEIs have placed greater emphasis on building research capability and fostering an institutional research culture. There was a strong commitment to develop appropriate infrastructure, develop staff capability, enhance research links and research collaboration, and provide appropriate resources to support research. Fourth, the case TEIs' strategic documents recognise that strategies need to be consistent with institutional strengths and competencies and pursued within the framework of the government's strategy on tertiary education and priorities if they were to receive government funding and support. All TEIs rely heavily on government funding and research grants for the development of their research capability and capacity.

There were also significant differences between the institutional strategies employed by the three TEIs in pursuit of their research commercialisation mission. The first major difference in institutional strategies is the degree of focus upon curiosity-driven versus applied research. This arises from the distinctive characteristics of the institutions. Premier, a leading research institution with well-developed research capability is engaged in curiosity-driven basic research and has made some major ground-breaking discoveries that have led to commercialisation. Both Universal and North-West have an applied research focus largely aimed at solving industry and business problems, with strategies to develop their research culture, build a critical mass of research capability and enhance

research reputation. The second major difference is that both Premier and Universal have adopted organisation-wide strategies to build their research capability, whereas North-West has relied on individual schools to develop their own research capabilities. The third major difference in institutional strategies is the degree of development and sophistication achieved. This arises from the extent to which research and commercialisation activities have developed at these institutions. Premier was one of the earliest institutions in New Zealand to engage in research commercialisation and has well-developed systems, processes, and structures in place. It has more ambitious strategies for further development of research commercialisation activities that enhance its international research profile as well as serve its local and national communities.

Universal recognises that commercialisation requires well-developed structures and systems and, to some extent, has been experimenting with different organisational configurations. It has recently merged some of its administrative divisions supporting research and commercialisation to ensure that emphasis is not only on commercialisation but also on the contribution of commercialisation to the support and development of its research capacity. Universal's strategy is also focussed on increased commercialisation and ensuring that commercialisation activities enhance its reputation as an applied and engaged university. North-West has no established entity such as a separate commercial company to undertake the research commercialisation process. It relies on individual schools to pursue commercialisation activities. North-West's strategy is based on increased involvement in evidence-based technology development and transfer, mainly through association with the local industries and the regional communities it serves. It appears that a variety of models exists depending on where the TEI is on the evolutionary continuum of commercialisation.

8.3 *Institutional Drivers*

8.3.1 **Government**

The Government is the major stakeholder and it sets the regulatory, policy and funding framework within which public TEIs are obligated to operate. TEC, the policy and funding agency of government, approves TEIs' investment plans and provides research funding. All three TEIs, as recipients of public research funding, recognise their

accountability obligations to contribute to the nation's innovation goals of social and economic development in terms of their approved plans. While funding imposes major accountability obligations, the nature and extent of the accountability obligations differ in institutional context and constraints. Universal, a new and emerging institution in terms of research activity and previously under research funding constraints, has received a substantial research investment grant from government. It has an obligation to build its research culture, capability and capacity. North-West, an institution with a strong regional focus, has an obligation to develop the innovation system at a regional level through building a shared understanding of the needs of local communities and industries.

Premier, a leading research institution, has been recognised for research excellence and has an obligation to fulfil a central role in research commercialisation. As a central player, it is often called upon by government to perform critical advisory roles and inform policy making. It is an important collaborative partner of government sponsored CoREs and, with industry, it has an obligation to undertake world-class research that could lead to ground-breaking discoveries with commercialisation potential. With well-developed research capability, Premier recognises that it has an obligation to undertake collaborative, value-adding research and commercialisation initiatives that would make a vital contribution to the government's innovation strategy of economic development and transformation. All the institutions appear to have a strong inclination towards viewing accountability related to funding, and if activities are not funded, then there is a strong perception that no accountability arises. This seems to imply that TEIs view research mostly in terms of funding levels. While TEIs recognise that they have a central role in the commercialisation of research, government has not been explicit in articulating its expectations from TEIs. It is important to note that there is some government encouragement, but there is no government requirement for TEIs to make follow-on investments in research outcomes that have commercial potential.

8.3.2 Industry

A common theme that emerges is that all three TEIs recognise that for commercialisation to occur there must be industry participation in the research process. This places an

obligation on the institutions to understand industry's needs and requirements and develop relationships that would allow for successful commercialisation. All institutions have made a strategic commitment to maintain strong links with industry and recognise that they have an obligation to engage in research that is of high value and relevance to the technical problems facing industry that could also lead to innovative solutions for the real world. This helps enhance reputation and build a good research profile. The TEIs' institutional characteristics, research strengths and capability, and mission and strategies have largely influenced their engagement with industry. All TEIs also have an obligation to maintain strong links with industry to provide opportunities for staff and student development. Premier's curiosity-driven basic research with a strong medical science, engineering and technology base, has helped cultivate strong relationships with large global industry partners through joint commercial research projects, engagement in research consortia through its CoREs, and collaboration that has enabled adoption, further development and commercialisation of research and technology.

Where TEIs have an applied research focus with a longstanding engagement with local industry partners, they appear to have an obligation to provide commercially-significant inventions and technologies that benefit the industries they serve and to keep up-to-date with recent trends and developments in industrial innovation. Most TEIs now rely on industry for funding, research opportunities for staff and students, to help build research capability and capacity, and to enhance research reputation and profile. With this comes the challenge by local industry sources to become more accountable in terms of willingness to share IP and to co-operate with industry. Where TEIs feel that local industries are small size and have low absorptive capacity, combined with lack of R&D funding, this could result in the likelihood of going offshore seeking large global industry partners to commercialise its discoveries.

8.3.3 **Researchers**

Staff participation is integral to the success of research commercialisation initiatives but staff culture at all three TEIs is largely driven by PBRF measures that do not appropriately reward and recognise commercial outcomes. A majority of researchers at all TEIs are largely driven by PBRF performance and, as a result, have no commitment to

any commercialisation plan as it challenges their focal PBRF-driven academic values. They recognised that even though commercial engagement had gained increased institutional legitimacy, it was something that did not bring academic credentials and benefit to help advance their academic careers. However, despite research commercialisation being viewed as a marginal activity by most researchers, all TEIs have some dedicated researchers keen to push the commercialisation agenda. For these researchers, commercialisation appeared to have acceptance at a deeper normative and cultural-cognitive level that has led them to become institutional leaders and entrepreneurs to help drive the research commercialisation initiatives.

All TEIs had recognised their role as "professional" research organisations with an underlying normative obligation to develop research capability of staff; provide professional autonomy, time, resources, and infrastructure to conduct research; and encourage, support and recognise their contributions. However, their priority was largely in terms of developing a strong PBRF culture which did not extend to the development of an innovative and enterprising research commercialisation culture among staff. At North-West, the institutional obligations to staff in terms of advancing their research projects towards commercialisation were not very clear as it did not have established institutional structures and mechanisms to facilitate research commercialisation. It was left to individual heads of schools and departments to decide how they would encourage and support commercialisation initiatives from staff research projects. However, both Premier and Universal had established commercialisation structures recognising their obligations to researchers who had an expectation to see a commercial outcome after years of dedicated research. It was observed that where there is more highly-developed research commercialisation structures, systems and processes, these TEIs have also reported more research commercialisation success.

A common theme that emerges is that all three TEIs recognise that students are at the centre of their research aspirations. There is an obligation to provide students with a rich and meaningful experience by enabling them to work alongside excellent researchers utilising the latest cutting-edge technology, tools and techniques. All three TEIs remain obligated to students in terms of providing research and employment opportunities based

on links with industry. Commercialisation is not deemed to be possible without an active cohort of postgraduate students and therefore TEIs intent on commercialisation exhibit a deliberate strategy to recruit the brightest students locally and internationally to help enhance its reputation. TEIs with active commercialisation had a higher number of postgraduate research programmes, students, and well-established research infrastructure to support postgraduate research students. This is based on the recognition that many new discoveries with commercialisation potential emerge from student projects; hence, TEIs remain obligated to retain, manage, and inspire students for the duration of their projects. These TEIs also provide opportunities to some of their top research students to work for the spin-off companies they have created. TEIs will be encouraged to develop postgraduate programmes, increase student enrolments in these programmes, and develop research infrastructure to help build the institution's research profile, capability, and provide much-needed research funding. North-West, with an applied research focus, has stated its obligation to students in terms of providing opportunities to learn in an environment marked by innovation and creativity.

8.3.4 International Partners

As normative organisations, all three TEIs have stated their obligation to establish international research collaboration that helps share best practice, meet international standards of research excellence, promote synergies, and gain access to relevant expertise. At the same time, all three TEIs have stated their obligation to provide international opportunities to staff and students through exchange programmes, participation in international research projects, and to help grow international networks. Another common theme that arises is that international collaboration helps attract international recognition, build research reputation and profile, and helps provide attractive funding opportunities. North-West's efforts are primarily directed towards fostering international partnerships to seek research expertise to help build its research capability. Universal believes that an international profile will give it a New Zealand profile. Premier has aspirations to become a world-class, research-led international university and participation in international research projects illustrates the vibrancy, creativity and innovation of the institution. With world-class researchers, it already incorporates in its authority system formal representatives of the wider world cultures

233

dealing with research commercialisation. TEIs with developed research capability feel obligated to create opportunities for business and industry through their international networks.

8.3.5 **Wider Community**

A common theme that emerges is that all institutions recognise their social and cultural-cognitive obligations in terms of wider community needs. There is a general acceptance among all case TEIs that they have a corporate citizenships role to engage in research, innovation, and technology transfer to address the social, economic and cultural concerns of the wider community. Fulfilling their corporate citizenship role provides an opportunity platform by generating intangible assets such as reputational capital, commitment, loyalty, and legitimacy that helps enhance performance and accountability. Reputational capital not only helps enhance the research reputation but also increases the research profile and public image of the TEIs. At the three case TEIs, the trend towards self-interested corporate citizenship/strategic philanthropy has moved the focus more to the TEIs' benefit rather than the public good.

North-West has a regional role and has a more intimate relationship with its regional communities that offer great public relations opportunities. Universal has received sizeable government research grants for community-based projects and, as such, it has an obligation to meet the research outcomes of specific projects that mainly require it to create, extend and apply knowledge to inform society for its health and well-being. Its community engagement has moved away from a traditional philanthropic approach to a more strategic engagement to address issues of mutual interest and benefit to each partner. Premier's role incorporates global corporate citizenship behaviour, with some of its top researchers involved in international research projects with clear social objectives such as reducing the spread of disease and reducing deaths in newborn babies. This helps provide global recognition and opportunities for further international collaboration. Years of dedicated research are also largely due to the strong cultural-cognitive obligation of its researchers and the institution to address wider community needs.

8.3.6 Financial Considerations

Financial considerations impose a much stronger accountability obligation on all TEIs. A common theme that emerges is that funding providers help advance research projects and expect that funds will work towards an avenue of commercialisation. All TEIs recognise that they have an obligation to funding providers to ensure their research outcomes are achieved, and that there is an adequate return on the funds invested on research. At both Universal and North-West, income from commercialisation of research is yet to be sufficiently realised and they have relied mainly on external funding providers. Premier has a successful commercial company that provides a sizeable portion of internally-generated revenue from its commercial projects. This has become a vital source of revenue for Premier to fund new research opportunities. Premier's commercial company has an expectation that the research projects it has funded will provide future commercial potential. The commercial company funds have also helped develop research infrastructure and capability, secured IP, and employed researchers to work on commercial projects. Universal's concern is that not enough money is going into commercialisation and willingness to fund is more difficult to find in New Zealand than it is overseas. Both Universal and North-West have perception of income streams that at this stage are few and long-term in nature.

8.4 *Summary NIT Interpretations of Accountability Obligations*

Linking back to NIT, it is observed that the three case TEIs are subject to the influences of the wider social and cultural forces of the institutional environment in which they operate. Within the institutional environment are the regulative, normative and cultural-cognitive forces (Scott, 2001, 2003b) that interact in interdependent and mutually reinforcing ways, and place accountability obligations on the TEIs to enable commercialisation of research. In other words, these institutional forces help determine to whom, and for what, TEIs are accountable within a broader context of research commercialisation. According to Scott (2003a), each institutional force or pressure is associated with a different motive for compliance, evokes differing logics of action, has different indicators of presence, and offers multiple sources of legitimacy. The regulative pressures involve rules, surveillance mechanisms and sanctions to influence behaviour.

Within TEIs, the regulatory pressure is exerted by the regulatory institutions such as government policy, funding and audit agencies. These regulatory institutions also embody coercive pressures.

However, in the context of research commercialisation, the coercive power is only legitimated by normative processes that support and constrain the exercise of such power. In other words, existing government research policies and funding mechanisms in the form of regulative and coercive pressures are more properly seen as exercises in reinforcing the normative forces of TEIs to develop their research quality, capability and capacity. Research commercialisation has become an institutionalised global practice through normative convergence and integration, and government policy aimed at encouraging commercialisation reflects the standard global practice (Benner & Sandstro'm, 2000). In the global rise in research commercialisation, government is seen as a development-oriented social actor, and coercive pressures are unable to produce reactions or efforts leading to its adoption (Meyer, 2008). Government relies on the research profession as "receptor sites" for the local incorporation of wider rationalized models of commercialisation (Frank, Hironaka, & Schofer, 2000). On this basis, the TEIs through their network of researchers with professional linkages, facilitate the adoption of research commercialisation. Research commercialisation success may take a long time or even not happen at all. Given this uncertainty and risk factor, successful commercialisation would be largely dependent on normative elements such as TEIs maintaining a strong research culture and capability and developing a critical mass of IP. In such cases, the regulatory elements are seen to be only reinforcing the normative framework of TEIs' research development and commercialisation efforts.

The normative forces include norms and values and place emphasis on roles as prescriptive expectations, thus introducing an obligatory dimension into social life (Scott, 2003b). Values are the conceptions of the preferred or the desirable, whereas norms specify legitimate means to pursue valued ends (Scott, 2003b). Within the context of this study, the most deeply held value of research is the discovery and extension of knowledge. Commercialisation has become widely accepted as a norm specifying legitimated means to transfer knowledge for society's benefit. Knowledge discovery and

its incorporation with commercialisation represent the most profound normative change in science (Etzkowitz, 1998). According to Meyer and Rowan (1977), all institutions have normative obligations, and research and development is an institutionalised category of organisation activity for TEIs which has taken rule-like status. Norms confer rights, responsibilities and privileges that empower researchers. All TEIs recognise that the power associated with the normative roles of their researchers had granted them licences and mandates to conduct research and engage in new discoveries. It also imposes normative obligations to create value from research and to extend and apply knowledge so that the commercial potential of their research projects is fully realised. To ensure that researchers were well-supported, all case TEIs had recognised their normative obligations to place a strong emphasis on building a vibrant and innovative research culture, and to develop their research capability and capacity. Within this context, accountability obligations towards enabling commercialisation have a much stronger normative perspective.

Norms also evoke strong feelings of pride and honour in terms of research achievements. The researcher's high profile, professional recognition and reputation, and funding success appeared to be the legitimating themes through which normative pressure was exerted on TEIs to further develop research and disseminate knowledge for society's benefit. For TEIs, prestige and professional rating concerns were a strong factor in influencing their decision to provide professional autonomy and support to their researchers. As external normative pressures lead to normative behaviour that, to varying degrees, become the internalised social obligations of actors, the researchers engaged in commercialisation believed that it could allow them to be relevant and give something back to their community. New audiences and a better understanding of the needs of the industry could be reached, and a valuable contribution made to the economic and social goals of the nation. An improved research performance would lead to higher profile and reputation. Normative obligations also stress the importance of professional and collegial network ties that help find common ground for collaboration and knowledge sharing. Normative pressures have placed obligations on TEIs to collaborate with people from outside the TEIs, from government agencies, international networks, businesses and industry, and from colleagues from other disciplines. Benefits by way of access to

expertise, new contacts and partnerships, funding assistance, and stronger research relationships leading to possible research discoveries and commercialisation opportunities could be achieved.

All TEIs in this study have a normative role which is simply the conception of their appropriate goals and expectations based on their specified social positions. There is a prescriptive normative expectation from society that TEIs take a central role in fostering research commercialisation to help drive the nation's innovation and productivity. Society's expectations have been clearly framed in all TEIs' missions and strategic documents to emphasise their normative obligation to the nation's goals of innovation and economic and social development. As research objectives have shifted towards more pragmatic goals of innovation and growth through value adding activities, all TEIs have come under enormous normative obligation to satisfy the needs of the economy and society by improving their ability to create and transfer knowledge, so that full social and economic benefits could be realised. However, the normative framework also emphasises the logic of appropriateness within the given demands of the situation, which perhaps helps explain why the level of strategic commitment to research commercialisation at all TEIs has been dependent on the distinctive characteristics of the institutions, government priorities, and available funding.

Cultural-cognitive pressures are based on taken-for-granted beliefs and shared conceptions that constitute the nature of social reality and provide the symbolic frames that support social sense-making (Scott, 2003a). Here, the internal interpretive processes are shaped by external cultural frameworks. Since commercialisation has become powerfully adapted by the institutional environment as a standard global practice, TEIs' conformity is taken for granted. In the cognitive paradigm, TEIs' efforts towards enabling research commercialisation are a representation of their environment, and accountability obligations are shaped by socially constructed rules derived from the institutional environment. Cultural-cognitive pressure also provides conceptions of situations shared by collectives of individuals, and compliance occurs because other types of behaviour are inconceivable. Within the cultural-cognitive framework, academic research was no longer seen as an isolated "ivory tower" activity. Cognitive changes require closer

integration between research and technology development arising from researchers' strong interest in the practical implications of their research findings.

8.5 *Managing Expectations*

8.5.1 **Research and Innovation Culture**

It has been recognised in the strategic documents of the three case TEIs that a vibrant research and innovation culture is a prerequisite to their engagement in research and commercialisation initiatives. At all TEIs, initiatives directed towards the development of a strong PBRF culture have become a key strategic priority. As a result, a research commercialisation culture based on innovation and entrepreneurship has become less prevalent and has not received much attention. The PBRF culture seems to be counter-productive to commercialisation initiatives and the placing of greater emphasis on PBRF performance has made research commercialisation a marginal activity. Although each institution is at a different stage of development, they all seem to have adopted a similar strategy by placing greater emphasis on building a research culture through investment in research infrastructure and staffing. Figure 8.1 below provides a simple illustration of the different stages of development of the three TEIs leading to commercialisation goals.

Figure 8.1: Staged Model for Enabling Commercialisation of Research
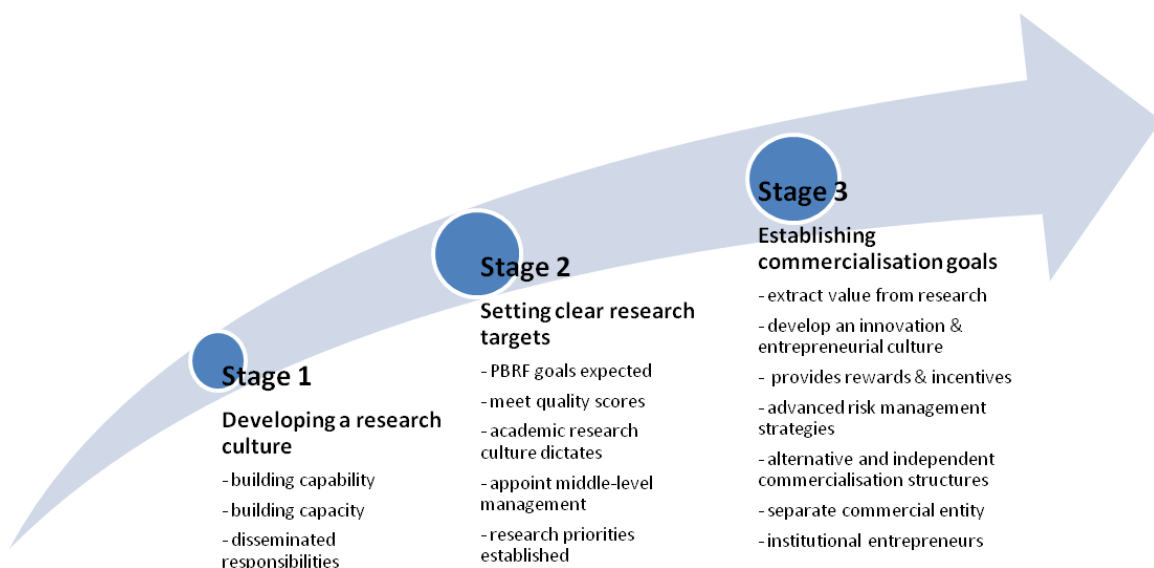
(Source: Developed by the Author)

Premier is an example of a stage 3 research institution that recognises the need to continue to build a vibrant research culture which is an important characteristic of the world-class research-led university that it aspires to become. Its strategy has been aimed at recruitment and retention of high quality research staff and students, to develop capabilities and generate critical mass of research excellence, and to upgrade its research facilities and structures to world-class status. Both North-West and Universal are teaching-led institutions with an applied research focus. Universal is clearly at stage 2 as it recognises that a strong research-led culture with research targets has become necessary to promote cohesiveness and interdisciplinary research synergies. Its strategic priority over the past decade has been to change from a strong teaching and weak research culture to a much stronger research culture through investment in structures to facilitate research and encourage staff and students to engage in research. North-West is at stage 1 and has struggled to maintain a strong research culture mainly through lack of resourcing and restructuring decisions and unlikely to move to the next stage without additional investment.

8.5.2 Research Capability and Capacity

It is well understood by the three TEIs that a commitment to the development of research capability and capacity will help build a critical mass of research activity that is so crucial to their commercialisation success and their research position in future years. The key areas of strategic importance placed on the development of research capability and capacity are generally determined by government strategy and priorities, and the PBRF research evaluation criteria used to deliver research funding to TEIs. It comes as no surprise that all TEIs are concentrating their efforts on developing staff capability, maintaining industry and business links, strengthening their postgraduate portfolio of research programmes, increasing external research income, and building research infrastructure and support systems. Even though Premier has a strong research capability compared to the other two institutions, it recognises that its challenge for the future is to build from this strong base and to establish itself firmly among the world's leading universities. Its major emphasis has been on developing its international research capacity and profile. It recognises that building research capability is a continuous process requiring long-term strategies with explicit objectives and a clear focus. It has stated its

priorities in terms of building high performance research groups and programmes and establishing collaborative links with multi-disciplinary research groups, industry and international researchers.

For TEIs at stages 1 and 2, such as North-West and Universal, that do not have highly developed research capability and capacity, their short-term efforts are largely directed at meeting the government's strategic priorities on which government research grants are based. For the stage 2 TEI, Universal, the major strategic priority for over a decade was to increase its research and professorial staff numbers with an expectation that its research outputs and external research income would increase, and the scope and quality of its research would improve. Initiatives to further develop research capability and capacity were undertaken by an expansion of postgraduate research programmes, application of research to major aspects of regional and national development, and active engagement with business and community, thus contributing to the economic transformation goals of government. At stage 1, North-West's research capability development is largely dependent on industry and business links, strengthening postgraduate portfolio of applied research programmes, increasing external research income, developing policies and processes, and building its organisational infrastructure.

8.5.3 Developing Structure

All three TEIs have created structures in the form of research institutes, centres and units to advance research of interest to staff, industry, government, and the wider community. A number of common themes have emerged in relation to the structural configurations adopted by the three institutions to manage accountability expectations of stakeholders. First, research structures of multiple and variegated forms have been developed by the institutions to bring together a community of researchers to advance innovative research. Research centres and units have been largely created and shaped by the researchers themselves to provide an organisational framework and flexibility to explore emerging research fronts. Second, their research structure has helped in the pooling of resources considered essential to the development of a critical mass of IP. It has helped ensure that research activity and resources remain concentrated in areas of research capability, thus bringing a focus to research activity as well as fostering a strong research culture. It has

also increased the visibility of campus research activities by bringing them under an umbrella of either research institute or centre. Third, research centres and institutes have been strategically created by researchers who had assumed the role of the institute director or institutional entrepreneur to exploit external research and funding opportunities.

As the research institutes and centres developed their unique identity, they became a significant source of funding. It seemed obvious that the legitimacy for the research structures appears to be derived from the resources they control, student and faculty talent, and prestige and reputation. Fourth, structure has helped provide autonomy to researchers enabling greater control over resources. Fifth, all TEIs appear to have made very distinct choices about how to organise their research centres, considering their size and control over resources. The much smaller research centres and units are generally hosted by schools and faculties to foster integration among centres and academic units. These centres have been given central funding and resources to promote collaborative activity across the institution with an expectation to be self-sustainable over time. In most instances, the school and faculty norms and priorities have overtaken those of the centre. Sixth, research centres and units compete for credit and recognition and their survival and growth depends on their reputation and profile. Stage 3 TEIs, such as Premier, have developed some large-scale research institutes as autonomous multi-disciplinary units independent of the faculty structure, providing greater autonomy to research institute directors. Novel conditions for research have been created, quality researchers attracted and successful research programs built.

Key differences were also noted in terms of the structures established to manage the actual commercialisation of research. Inexperienced TEIs, such as North-West, commonly do not have a separate commercialisation company with a single point of entry and systems, processes and talent to support commercialisation initiatives. In contrast, TEIs with a separate commercial company, such as Universal, tend to perform better even though it has been firmly embedded within its institutional structure and shares the institution's facilities, systems and processes. Its role is to facilitate commercialisation within the institution and has a symbiotic relationship with the

research institutes. Having an autonomous commercial company with a business focus that provides flexibility and financial independence is most conducive to encouraging commercial activities. A separate commercial company creates a separation between its normative academic structure and the commercial company structure. This is deemed essential to ensure that the commercialisation opportunities associated with IP discoveries are progressed appropriately, by resourced and skilled staff, to achieve the best commercial outcomes and timelines. A commercial company acts as a boundary spanning unit that brings together the academic and commercial worlds to realise business opportunities. This is usually done through sponsoring of some units, and ensuring that sufficient skills, expertise and resources are available to turn good ideas into commercial reality. Over the past decade, Premier, an example of a stage 3 TEI has aggressively targeted new government funding to develop large-scale autonomous research institutes. Through industry and government funding, it has established CoREs that provide an extensive network of national and international researchers to support world-class research. Funding success is clearly a prerequisite to the creation and survival of research structures.

8.5.4 Systems and Processes

Academic organisations are bound by NPM requirements that have imposed bureaucratic systems, process and control mechanisms largely aimed at achieving efficiency and effectiveness goals that are not necessarily responsive to commercialisation. All three TEIs are in general agreement that systems and processes need to be responsive to the expectations of the commercial behaviour. TEIs that are most effective have all of their systems and processes decoupled from their commercial operations and with commercial companies maintaining a separate accounting, budgeting, financial management, and human resource management systems. Where TEIs run their commercial operations through the central system of the organisation, it is evident that their commercialisation activities are still at the development stage.

8.5.5 Managing IP

With the growing importance placed on research commercialisation, the three TEIs have implemented institute-wide policies to provide guidance for ownership, protection, and exploitation of IP. At both Universal and North-West, all IP developed by staff is

negotiated on a contract-by-contract basis and assigned to the institution. Premier requires all IP developed by staff to be assigned to its commercial company which has a track record in successful commercialisation. All three institutions use different strategies to manage IP. Universal manages its IP by giving access to investors through a licence with exclusionary rights or outright sale. It regards success as not associated with one model but whether commercialisation objectives are being achieved. Premier manages IP through protecting mechanisms such as filing a provisional patent, forming a spin-out company, or through licence arrangements. Its commercial company invests in IP development and promotes its use world-wide. It has implemented mechanisms to ensure its IP is managed properly and that commercialisable IP is progressed within reasonable timelines and expectations and outcomes are clear. There is a firm belief that commercialisation is not about who owns the IP but is largely affected by the level of commitment and management of IP. At all TEIs, the willingness to develop IP reflects the broader process of institutional change, where both public and private science have become integrated into a common domain (Colyvas & Powell, 2006; Owen-Smith, 2003).

8.5.6 **Rewards and Incentives**

All case TEIs shared a common view that reward systems recognise a narrow band of PBRF-related activities which was driving the behaviour of most researchers and the research culture of the institution. Meeting their PBRF target was a major incentive for most career-minded researchers, as PBRF was viewed to more appropriately reward them in terms of meeting promotion criteria. As PBRF requirements do not fully recognise the value of engagement with commercialisation work, career academic researchers felt that they have little incentive to be involved with commercialisation activities. Some, in fact, consider commercialisation as a diversion from their core activities. The incentive for big dollars is generally not the greatest incentive at all TEIs because of the rarity of such events; commercialisation has a long timeframe and there is no certainty of outcomes that may lead to financial success. Most academic researchers are not prepared to take this risk which may, in fact, jeopardise their career.

However, researchers who were involved in commercialisation indicated that the greatest reward and incentive for them was getting professional and peer recognition and a sense

of accomplishment in the value they create in their research projects. These researchers are largely driven by normative (professional) and cultural-cognitive obligations. Some have achieved their academic career goals and now place high value on solving societal problems and disseminating their results to the wider community. They often place high value on more intrinsic rewards like seeing an outcome for the cure for a disease. Most researchers appear not to be primarily motivated by potential to make money for themselves even though financial rewards were welcomed. At all case institutions, financial rewards were mainly viewed as necessary for further research development efforts such as securing research expertise and access to leading-edge research facilities and infrastructure. TEIs at stage 3 of commercialisation development tend to view financial rewards and incentives as an indicator for research commercialisation success.

8.5.7 Governance

All TEIs are governed by a council which has ultimate responsibility for research commercialisation. Both Universal and Premier also have independent boards that set strategic direction, provide commercial guidance, and overall governance to the commercial companies. North-West has stated that it was not at a stage where it needed a separate commercial company with an independent board.

8.5.8 Risk Management

Commercialisation presents considerable risks and, generally, academic organisations are risk-averse. Academic organisations have a culture of managerialism with NPM accountability that places high value on what is produced, observed, and measured (Codd, 2005; O'Neill, 2002). However, the uncertain context and long-term nature of research commercialisation projects presents considerable difficulty and is at odds with the risk-taking nature of commercial operations. TEIs who wish to manage their risks commonly create a limited liability company structure to separate the business risks of commercialisation activities from academic operations. The commercial company structure also ensures that commercial ideas that have some element of risk are not overlooked. For example, Premier's commercial company manages a portfolio of businesses such as research contracting, consultancy, licensing deals, joint-ventures, and spin-off companies to minimise the risks involved in commercialisation. In contrast, TEIs at stage 1 and 2 have a high dependency on university systems that limits their capacity to

manage commercial risks. For example, North-West is at stage 1 of commercialisation and, as such, has no clear risk management strategy in place.

8.5.9 **Leadership**

It is observed that senior management of all three TEIs have made a commitment to research commercialisation in their strategic documents. However, this does not always translate into reality. As there is an expectation that TEIs must contribute to the nation's innovation goals, this was aimed at providing legitimacy. However, to make commercialisation a priority, proactive leadership that fully embraces an innovative and enterprising culture and addresses the bureaucratic obstacles and organisational challenges of PBRF is required. What characterises stage 2 TEIs is the appointment of middle management leadership for commercialisation. Universal has appointed a CEO to lead its commercialisation activities, although the changing management structure and reporting lines have created some uncertainty regarding who the CEO reported to. Premier, at stage 3 of commercialisation, has maintained a strong leadership with the CEO of the commercial company holding an executive position on the senior management team. There is also an executive level support to the CEO from Deans and research institute Directors. At Premier and Universal, some pioneering researchers are the institutional leaders and entrepreneurs driving research commercialisation initiatives. Stage 1 has a more disseminated responsibility, for example, at North-West, senior management involvement in the development of commercialisation activities is lacking. Individuals within schools, with some support from central research office staff, are responsible for the development of commercialisation projects. This perhaps explains previous low levels of commercialisation happening at the institution.

8.6 *Summary NIT Interpretations of Managing Accountability Expectations*

Effective management of accountability relationships is crucial as it would help shape the TEIs' responses to select and use appropriate mechanisms to enable commercialisation of research. In this study, the TEIs' responses varied in terms of strategic action with the scope for strategic action influenced by the institutional context and the TEIs' distinctive characteristics. Institutional context refers to the rules, norms, and ideologies that become

rationalised myths and accepted practice models of the wider society (Meyer & Rowan, 1983). According to NIT, these broader institutional contexts facilitate the cultural-cognitive, normative, and regulative elements of organisations that, together with associated activities and resources, fundamentally shape organisational behaviour and practices (Scott, 2001).

All TEIs in the study placed strategic importance on the development of research capability and capacity to meet their normative obligations and, in doing so, they purposefully aligned their research development efforts with the prevailing government strategy, PBRF research priorities and requirements. This seemed logically appropriate given the demands of the situation, with significant research funding based on compliance with government research goals and requirements. TEIs coerced into exhibiting conformity to government strategy and priorities gained legitimacy and funding support that also helped them meet their normative obligations. In other words, accountability obligations arising from the regulatory and normative elements were mutually reinforcing, since the coercive power was legitimated by a normative framework that both supported and constrained the exercise of this power (Phillips & Malhotra, 2008; Scott, 1987).

TEIs not only operate in a complex institutional environment, they are complex institutions per se, particularly in relation to interactions with multiple stakeholders – government, oversight and funding agencies, industry and business organisations, communities they serve, staff, and students (Codd, 2005; Lapsley, 2008). For complex and mature organisations, structures represent the core mission, norms, values and beliefs that are firmly embedded in the cognitive frames of the organisation, its members, as well as its routines and processes (Greenwood & Hinings, 2006). However, TEIs have heterogeneous organisation forms split by an array of sub-cultures that have perceived them as bureaucratic organisations, normative organisations, and professional organisations, among other classifications (Harman, 1989). TEIs are normative organisations in the sense of shared commitments, norms, and common ideals. TEIs are professional organisations based on the professional norms of members who value a large degree of autonomy and authority based on their knowledge and expertise (Harman,

247

1989). As bureaucratic organisations, TEIs are bound by standardised rules and regulations.

To manage accountability expectations, all case TEIs created research institutes and centres due to pressure to conform in order to win the support of key agencies in the institutional environment (Rowan, 1982). They adopted similar structural configurations because they have to conform to norms, beliefs, and rules within the institutional environment in order to achieve legitimacy, acquire resources, and improve their chances of survival (DiMaggio & Powell, 1983). The coercive, normative, and mimetic pressures initially led to the formation of some research centres and research institutes. Some research structures appear to be merely symbolic while others are more substantively developed and staffed. In all cases, change and reproduction of research structures became a dynamic, ongoing process in which actions and institutions were seen to be recursively related (Barley & Tolbert, 1997; Oliver, 1991). Coercive pressure resulted mainly from invitations to join government, industry and other organisations in research collaboration that would provide legitimacy and funding support. A good example is the formation of CoRES at Premier and some larger research institutes at Universal and North-West. All TEIs used mimicry as an attempt to portray themselves as modern, innovative, high ranking and reputable institutions. Mimetic pressures led to Premier modeling top research-led international universities to fulfill its mission. Both Universal and North-West were also under mimetic pressure and adopted research strategies, practices, systems and processes, and structural configurations to enhance their own legitimacy. At all TEIs, normative pressures mainly arose through the growth of professional research networks that led to the formation of research centers and institutes mainly to provide autonomy to researchers and to help facilitate research collaborations. Here, the TEIs' response is a function of internal dynamics (Greenwood & Hinings, 1996) as well as being strategically based on organisational conditions (Greenwood et al., 2002). Normative obligations led all TEIs to demonstrate a commitment to research excellence and prestige, and professional rating concerns were a strong factor in influencing their decision to provide professional autonomy to their researchers.

<u>Institutional entrepreneurs</u>
This study takes account of the strategic role of actors, namely, the researchers themselves, in interpreting and shaping change. Institutional entrepreneurs play an influential role in creating and transforming research centres and institutes in an effort to build research culture and capability leading on to commercialisation initiatives. Both Universal and Premier have some top research scientists who have become institutional leaders and entrepreneurs after many decades of active engagement in ground-breaking research discoveries that have led to commercial products. Initially, they created smaller research centres and pioneered their development into larger multi-disciplinary research institutes. The professional boundaries and tension between research with a PBRF focus and research with a commercialisation focus have also caused "normative fragmentation" (Oliver, 1992, p. 575) at all TEIs. At stage 3, for example Premier, the tension was diffused with the establishment of large multi-disciplinary research institutes with a focus on commercialisation. Also, as some institutional leaders and entrepreneurs (research scientists and professors) became established in their "subject positions", they became legitimated identities within their "field" to enable commercialisation (Oakes et al., 1998). Fields are "structured systems of social positions within which struggles or manoeuvres take place over resources, stakes and access" (Oakes et al., 1998, p. 260). The subject positions allowed institutional leaders and entrepreneurs to exercise power and access resources to develop a research culture and build research capability and capacity to enable commercialisation. They secured dominant positions in their field and were able to use their superior status to mobilise resources, rationales and relations in creative ways (Fligstein, 2001). According to Hardy and Maguire (2008), institutional entrepreneurship tends to flourish in emerging fields, or fields under conditions of uncertainty, crisis, problems, tensions and contradictions. Fields create a limited number of subject positions that legitimate identities from which institutional entrepreneurs can take action with respect to diverse stakeholders; and also bridge stakeholders in ways which facilitate access to dispersed resources (Hardy et al., 2004). At Universal, given the deeply embedded norms, values and practices of a teaching institution, institutional entrepreneurs had to mobilise support by involving researchers with common interests and share ideas through collective sense-making processes. At stage 3 TEI, institutional

entrepreneurship also became a collective action (Hardy & Maguire, 2008) of other actors, by forming research alliances and collaboration with government, industry and international partners that led to the establishment of large scale CoREs.

<u>Decoupling and Bridging Mechanisms</u>
The research evidence presented in this study shows that all TEIs have responded strategically by employing buffering or decoupling and bridging mechanisms to manage accountability expectations towards enabling commercialisation of research. Initially, Universal and North-West decoupled for 'sagacious conformity' which meant adopting structures and technologies but not implementing them in practice (Meyer & Rowan, 1977). All case TEIs used research centres and institutes as legitimising devices to secure both internal and external funding. More recent developments in the decoupling literature have broadened its scope by suggesting that decoupling could be a result of heterogeneous organisational fields with multiple and often contradictory pressures on the organisation, or it could be a strategic response (Boxenbaum & Jonsson, 2008). Organisations decoupling as a strategic response may do so for proactive reasons rather than defensive reasons (Boxenbaum & Jonsson, 2008).

It became evident that stage 1 and 2 TEIs had to decouple from well-established academic structures by creating and promoting research centres and institutes as autonomous units to give greater focus to development of research capability and capacity. In this manner, decoupling became a safeguarding mechanism in a heterogeneous field of conflicting demands to help develop a research culture and build the research capability. At all TEIs, decoupling was also a strategic response to create larger research centres to provide a critical mass of IP, provide autonomy to researchers, help attract much-needed funding, and build reputation and profile. However, Premier used decoupling for the more proactive creation of large-scale research institutes that operated as autonomous multi-disciplinary units to help create novel conditions of research, attract quality researchers, build successful research programs, develop external research networks, and to provide a high international research profile. At all TEIs, decoupling was also used in deliberate attempts at impression management and creation of powerful brand images (Boxenbaum & Jonsson, 2008). Through decoupling, research

institutes and centres developed a unique identity, increased the visibility of campus research activities, and became significant sources of funding, student and faculty talent, and prestige and reputation.

Stage 3 TEIs tend to have high commercial activity and establish an autonomous commercial company completely decoupled from the main organisation structure, including its own systems and processes to provide a business focus, flexibility and financial independence conducive to commercial activities. The separation between normative academic structure and the commercial company structure is essential to ensure that the commercialisation opportunities associated with IP discoveries are progressed appropriately, by resourced and skilled staff, for the benefit of commercial outcomes and timelines. For example, Universal's commercial company appears to be decoupled for 'sagacious conformity' and, at the same time, used as a legitimising device to attract commercial interests, facilitate industry collaboration, and build the reputation and profile of the institution. Unlike Premier, its business systems and processes are not decoupled and it relies on internal funding from the parent institution. Stage 1 TEIs are at an early stage of development of research commercialisation and, as such, have not decoupled their research commercialisation activities from the school structure. In contrast, stage 3 TEIs generally have a commercial company that also acts as a boundary spanning unit that brings together the academic and commercial worlds to realise business opportunities. This it often done through sponsoring of some research units, and ensuring that sufficient skills, expertise and resources are available to turn good ideas into commercial reality.

At all TEIs, research structures also served as bridging mechanisms that helped in building an innovative and enterprising research culture as the TEIs engaged in more collaborative research, especially with industry and international researchers. Premier's solid medical science, engineering and technology base has helped cultivate strong relationships with large global industry partners through joint commercial research projects, engagement in research consortia and collaboration that has enabled adoption, further development, and commercialisation of research and technology. Both Universal and North-West have an applied research focus with a long-standing engagement with

local industry partners. At all TEIs, bridging techniques helped secure legitimacy and support from the institutional environment. At Premier and Universal, the techniques helped develop larger research institutes with sufficient critical mass which was seen as essential for the development of commercialisation opportunities. Premier, through industry and government partnership and funding, successfully established CoREs that have provided an extensive network of national and international researchers to support world-class research. Evidence of the effectiveness of the bridging mechanisms could be found in the strategic planning and reporting documents of all TEIs.

8.7 *Measuring Performance*

A number of common themes have arisen from the approaches undertaken by the three TEIs to measure their research commercialisation performance. First, each institution prepares strategic documents that set out its goals, objectives and measures of performance. The goals and objectives are largely derived from government policy statements on tertiary education priorities. It seemed obvious that TEIs have been coerced into setting their goals and objectives in accordance with government strategies and priorities in order to qualify for government funding. Second, the research objectives and performance measures of the TEIs are largely influenced by government policy on research funding framed in terms of PBRF goals and measures. These relate to quality evaluation of staff, external research income, and research degree completions. The measures that mattered most were the PBRF performance measures used to determine the TEIs' basic research funding allocations. Third, all case TEIs rely mostly on input/process KPIs with no real attempt to measure knowledge outputs and outcomes. The KPIs are chasing an objective that potentially undermines the research commercialisation agenda.

Fourth, each institution has been subject to the influence of what the other institutions were doing in terms of their choice of performance measures. They all appear to have settled on a common set of performance measures that also serves as a good benchmark when comparisons are drawn among institutions. Following from this, the fifth common theme that has emerged was that none of the three TEIs studied had set any specific objectives and performance measures for research commercialisation activities in their

strategic documents against which they publicly report on a consistent basis. The major reasons given were that government does not fund research commercialisation initiatives so there was no obligation to measure and report on the outcomes. Also, the long-term uncertainty and complexity surrounding commercialisation outcomes made it difficult to quantify measures and report on research commercialisation initiatives.

Interestingly, stage 3 TEIs with a commercial company, have measures in place for research commercialisation revenue, patents filed, licences signed, spin-out companies formed, and new invention disclosures. However, these measures capture only a small portion of research commercialisation performance and have been decoupled from the TEI's strategic documents, although some of them have been reported in the TEI's annual reports as commercialisation success stories. Stage 1 and 2 TEIs experienced great difficulty in setting performance objectives and measures for commercialisation due to lack of priority being given to commercialisation. For example, Universal had set a specific performance objective in 2005 and 2006 to increase the commercialisation of its research activity, but this was discontinued from 2007 as it became difficult to implement commercialisation. As a consequence, Stage 1 and 2 TEIs find it easier to focus more on external research income, with commercialisation as a sub-set. All TEIs found that the uncertain and complex nature of commercialisation operations made it difficult to monitor and measure the results of research commercialisation performance. Both Premier and Universal's commercial companies gather commercialisation performance data on a regular basis as a collective group of New Zealand university commercialisation companies. This enables a collective action in measuring New Zealand-wide commercialisation performance using standard international metrics, which interviewees felt made more sense in terms of international comparisons. North-West does not set specific research commercialisation measures but has undertaken to identify KPIs for specific initiatives to actively support links with industry that focus on applied technological development.

While government policy on research funding largely dictates which performance measures are used by each TEI, there has been some flexibility in their use in terms of each institution's own research priorities and research development needs. Stage 3 TEIs

set measures that are strongly related to improving their ranking and enhancing international reputation. Stage 3 TEIs also set external research income as the key performance indicator to measure success of research institutes, centres and the commercial company. Stage 1 and 2 TEIs have set measures to reflect their research capability and capacity building efforts. They have also been subject to influences based on what other, more successful stage 3 institutions were doing. Some common metrics used by stage 1 and 2 institutions towards research development efforts have been stated in terms of the number of research outputs by staff, external research income, number of postgraduate students, and key research centre initiatives. Stage 1 and 2 TEIs generally have difficulties in setting performance measures. For example, while Universal's KPIs are based on its strategies, it has chosen specific themes and measures based on how best to achieve them to make reporting much easier. These measures and reports have been subject to senior management influence. The way things are measured at Universal is also seen to create instant conflicts with the demands of industry. The contradictory views highlight some of the common problems and challenges faced by TEIs in terms of setting measures and reporting results of performance.

8.8 *Summary NIT Interpretations of Measuring Performance*

New institutional theory posits that organisations adopt certain strategies, structures, norms, routines and practices of the broader institutional environment in which they operate (Meyer & Rowan, 1977; Scott, 2003b; Scott & Meyer, 1994). Annual reporting and performance measurement within TEIs are such routines and practices, and have become highly institutionalised in terms of NPM accountability requirements. Under the NPM model of public accountability, all TEIs must set objectives, measure performance, and report on outcomes of all public-funded activities. These requirements have placed an excessive focus on the bureaucratic process of formal compliance and control and are largely results-oriented based on efficiency and effectiveness measures (Zapico-Goni, 2007). The NPM accountability also relies on standardised accountability measures to satisfy the desires of particular stakeholders, often sources of funding (Oakes & Young, 2008). Perhaps, based on these requirements, the TEIs felt that they were under no

254

obligation to publicly set objectives and to measure and report on performance of research commercialisation activities if these activities were not taxpayer funded.

NPM also assumes a stable environment with conditions of certainty about expected results. However, the realities of research commercialisation at TEIs are characterised by uncertainty, complexity, interdependence, diversity, and instability and, under such conditions, NPM accountability seems weak (Zapico-Goni, 2007). For all TEIs, the discharge of accountability obligations under NPM requirements has become a taken-for-granted practice, with a rule-like status and attributes of exteriority and objectivity. By conforming to these institutional expectations, TEIs are regarded as legitimately discharging their responsibilities even if there are no specific technical notions of performance accomplishment in terms of measuring research commercialisation performance (DiMaggio & Powell, 1983; Scott, 1987). NPM accountability places high value on what is produced, observed, and measured and for knowledge, experience, and innovation to be valued and recognised, it needs to be reduced to some measurable performance outcomes (Codd, 2005; Hood, 1991). The results orientation of NPM accountability fails to fully recognise the long-term research processes and university efforts dedicated towards the development of research capability. Accountability is not only measuring the outcome while assuming the process. Much greater attention needs to be given to the normative perspective of accountability to help understand the long-term research development processes of TEIs. In this regard, the normative perspective of accountability has a learning dimension. NPM accountability is also at odds with the normative expectations of research professional groupings who prefer greater autonomy, flexibility, and a culture of trust to produce successful outcomes (Codd, 2005; O'Neill, 2002). Based on the conflicts and tension with NPM accountability, it seems logical that all TEIs had effectively decoupled from the technical requirements of measuring and reporting performance of their research commercialisation activities. NPM accountability requirements are largely seen as counterproductive to research commercialisation initiatives.

8.9 *Reporting Strategies*

Over the past decade, the three TEIs have produced a variety of strategic documents (charters, profiles, strategic plans and investment plans) to communicate and promote their strategies and intent relating to commercialisation of research. These strategic documents have been produced as formal constructions of positive narratives, not just to outline the TEI's commitment to research and commercialisation, but also to represent the specific requirements of government priorities on research and innovation. As government has been approving these strategic documents and delivering funding based on such approvals, all TEIs were coerced to utilise positive communication strategies to represent and imitate government priorities in their strategic documents. It became obvious during interviews that reliance on positive communicative strategies had assisted the TEIs to negotiate and obtain ongoing government funding support for various research activities. To help secure much-needed government funding, all TEIs also had a tendency to frame their strategic documents in terms of their particular research focus and efforts directed towards building their research capability and capacity. This helped demonstrate a firm commitment to research and commercialisation initiatives, thus promoting the TEI as making an important contribution to the nation's research and innovation goals.

Another common theme that emerged is that all TEIs rely on multiple reporting media and formats. A wide range of communicative mechanisms such as research newsletters, magazines, reports, publicity materials, and web pages provide extensive information on activities of research institutes, centres, and faculties. This includes details of their goals and objectives, staffing profiles, and research collaborations. The narratives used in the communications are all positive constructions of research activities, funding success stories, success stories in terms of staff and student achievements, and positive illustrations of how research had served the needs of industries, communities and professions. These are purposive strategies and techniques to help establish identity, promote activities to build a research profile and reputation, and provide legitimacy to help secure resources. There was a general belief among the institutions that most value

would come to them in the form of a high profile and reputation, hence the strong emphasis on enhancing research reputation and profile.

All TEIs also produce an annual report which is the key accountability document in terms of formal reporting to all stakeholders. The annual report sets out the progress made towards meeting the commitments outlined in the institution's charter, profile, strategic plans and investment plans. Although annual reporting was seen as quite a structured process in terms of reporting on goals, objectives and performance measures agreed in the strategic documents, there was greater flexibility in reporting in the narrative sections of the annual reports. A common theme that emerged was that the narratives in the annual reports have generally been compiled as success stories in terms of developing a strong research culture, developing research capability, improving research quality, and research collaborations entered into. Success stories were also compiled in terms of awards and international recognition, and the size of research grants received. The focus on building research capability and capacity had continued to emphasise the improvements made in research performance and outputs produced. Again, it became obvious that these were purposive strategies and techniques stemming from a desire to promote activities that would help build a strong research profile and reputation, provide a measure of confidence in the research capability of staff, and provide legitimacy to help secure resources. Another common theme that emerged was that all three TEIs have used the annual reports as a marketing document, to justify resourcing needs, and to voice concerns about obstacles and challenges in relation to government policy decisions and research funding levels.

Stage 3 TEIs provide more comprehensive annual reports on research commercialisation activities when compared to stages 1 and 2 TEIs, mainly due to the nature and scale of its operations. Premier has reported its commercial company's performance in terms of revenue generated, licensing and patent activities, spin-off creations, and the narratives are compiled as success stories on research events, activities, ground-breaking discoveries, staff awards and fellowships granted. Stage 1 and 2 TEI's have reported commercialisation to a much lesser extent mainly because these activities are largely integrated within schools and faculties where academic activities tend to override

commercialisation initiatives, unless there is something of a significant nature to report. In terms of specific commercialisation activities, reporting tends to be a construction of positive narratives. For example, Universal has constructed positive narratives on patents developed, consultancy activities, technologies developed, and networks and collaborations formed. North-West has constructed positive narratives in its annual reports to illustrate how its research has been applied to serve the needs of industries, communities and professions. Both stages 2 and 3 TEIs have a tendency to report heavily on the external research income they had generated. For Universal, the high rate of external research income underlined the strong progress the institution was making in developing its research profile. For Premier, the increase in external research income has been a strong indicator of its research capability and commercialisation success. Premier's commercial company also produces an annual promotional document for clients and research partners highlighting its achievements and challenges faced during the year. In summary, the above analysis points to the clash between the different reporting agendas which are variously aimed at satisfying funders, public relations and generating profile, lobbying for funding support and accountability to government.

8.10 *Summary NIT Interpretations of Reporting Strategies*

In terms of reporting, annual reports were regarded as the most accepted form conforming to institutional pressures from regulatory agencies, the profession, and general expectations of society. The organisation fields and institution logics had prescribed appropriate reporting behaviours and provided the archetypes or templates for annual reporting by TEIs (Greenwood & Hinings, 1993; Powell & DiMaggio, 1991). Through coercive, normative, and mimetic processes, all TEIs' annual reports increasingly resembled one another's. Thus, annual reports may have a ceremonial or symbolic and legitimacy role in TEIs. The findings of the study also suggest that because of the uncertainty and long-term nature of commercialisation outcomes, there was greater reliance on the use of positive communicative narratives by all TEIs to influence powerful stakeholders and enhance accountability relationships.

Positive communicative narratives of research and commercialisation activities in all of the TEIs' strategic documents, research newsletters and reports, and web-site based information appeared to be rationally constructed in order to help provide legitimacy, enhance research reputation and profile, and help secure funding. TEIs also used annual reports as coercive mechanisms to emphasise how much they all relied on government funding to build their research capability and deliver the research outputs. When the narratives are rationally constructed to enhance the organisation's legitimacy, communicative mechanisms simply serve as strategic devices to manipulate the perceptions of the organisation's activities and performance (Black, 2008). The organisation may alter the narrative if it does not make sense to itself or, alternatively, it may seek to decouple the activities requiring maintenance of formal legitimacy structures (Meyer & Rowan, 1977). All TEIs had effectively decoupled the technical reporting requirements of research commercialisation activities from their formal annual reports.

8.11 *Summary of Key Findings and Theoretical Synthesis*

This section presents a critical summary of the major findings emerging from the study. They are considered in relation to the theoretical framework and concepts identified in Chapter 3.

<u>Accountability has become a "representational faithfulness" to the rhetoric in the strategic documents</u>

The strategic planning documents of all TEIs are representations of their identity and agency to government. The TEIs' strategic documents lay out the intent and commitment to research commercialisation that mirror the dominant discourse from the government. For TEIs, the strategic documents are instruments of government negotiation and marketing statements strongly linked to funding. The rhetoric in the strategic documents of all case TEIs is very convincing. In a sense, it appears to be necessary and integral to obtaining legitimacy for their research commercialisation mission. All case TEIs appear to have been coerced into utilising positive communicative strategies to represent and imitate government priorities in their strategic documents to create favorable impressions to gain legitimacy, and for approval of government funding. TEIs rely on government funding to develop their research capability and capacity. Government relies on TEIs to

drive the nation's research and innovation goals against which they are accountable. So coercion seems to exist in both directions because of the reciprocal accountability relationship between government and TEIs. Research commercialisation appears to be legitimised in terms of nation-building activities by the rhetoric in the TEIs' strategic documents. As strategic plans are high level accountability documents, accountability seems to have become defined as a "representational faithfulness" to the rhetoric in the strategic documents (Oakes et al., 1998).

PBRF culture potentially undermines the research commercialisation agenda

In all case TEIs, PBRF has become the key strategic priority of the institution driving the behaviour of most researchers and the research culture of the institution. Meeting PBRF requirements is a major incentive for most career-minded researchers and is viewed as more appropriately rewarding in terms of meeting the promotion criteria. For the TEIs, increasing their PBRF quality scores and publication counts helps increase their government research funding. This has had the effect of making the research commercialisation culture less prevalent in all TEIs. The placing of greater emphasis on PBRF performance has made research commercialisation a marginal activity. The PBRF culture, therefore, seems to have been counter-productive to the research commercialisation agenda. In addition, because research commercialisation requires a much longer timeframe and there is no certainty of outcomes, most researchers are not prepared to risk involvement with commercialisation which may jeopardise their academic career. Further, some academic researchers see commercialisation as a diversion from their core activities. However, those researchers who are involved in commercialisation are largely driven by normative and cultural-cognitive obligations. Some have achieved their academic career goals and now place high value on solving societal problems and disseminating their results to the wider community. These researchers are largely driven by professional and peer recognition and a sense of accomplishment in the value they create in their research projects.

Being accountable is not simply accounting for the use of money allocated

TEIs strongly view accountability as being related to funding and, if activities are not funded, then no accountability exists. TEIs also view accountability simply as accounting for the money allocated to it by showing that it was spent on items for which it was allocated. Being accountable towards enabling commercialisation of research requires TEIs to fulfil their core mission and strategic commitments. The strategic commitments TEIs made were to see research in terms of economic contributions and value-added activities extending to new products and processes. This moves beyond seeing research simply in terms of funding levels. TEIs receive basic research funding and have accountability to return "value" as an obligatory part of accepting funding to support basic research (Hammerstedt & Blach, 2008).

Demands for NPM accountability has a narrow focus causing legitimating behaviour

Under NPM, TEIs are held accountable against a narrow set of expectations, stated as specific goals and measures in their strategic documents, against which accountability must be realised. TEIs do not appear to be held accountable for research commercialisation, as NPM accountability does not place much value on activities where goals, objectives and measures have not been specified (Codd, 2005; Hood, 1991). NPM accountability also seems weak as it places an excessive focus on the bureaucratic process of formal compliance on specified goals and measures (Zapico-Goni, 2007) to satisfy the desires of particular stakeholders, often the sources of funding (Oakes & Young, 2008). Accountability under NPM often assumes the process while measuring the results. It fails to fully recognise the uncertain, complex, and long-term nature of the research development processes and efforts dedicated towards the development of research capability. By conforming to institutional expectations of funded research activity, it seems that TEIs are regarded as legitimately discharging their research commercialisation responsibilities under NPM, even if there are no specific technical notions of performance accomplishment (DiMaggio & Powell, 1983; Scott, 1987). As such, demands for compliance with NPM accountability requirements are causing legitimating behavior (Lapsley, 2008) and diverting organisational priorities away from the TEIs' commercialisation mission. Hence, subjecting research professionals to strict

compliance with NPM accountability pressures seems counter-productive to research commercialisation.

TEIs are making no real attempt to measure research commercialisation performance

While recognising the NPM difficulties stated above, it seems fair to suggest that there is a low level of transparency by all TEIs in terms of demonstrating accountability, given that they have ignored the operationalisation of their broader commercialisation mission into goals, objectives and measures. The effectiveness of TEIs in enabling commercialisation of research is largely determined by the degree to which they realise their goals. Statements about TEIs' research commercialisation effectiveness are difficult to validate if goals are not specified.

Another major emerging theme is that performance measures used by all case TEIs are mostly input/process focussed and make no real attempt to measure knowledge outputs and outcomes. Some input measures, such as external research income received, were over-emphasised to demonstrate the TEIs' success. Statements made by TEIs that they have no obligation to set goals, objectives and performance measures for research commercialisation activities if the projects are not government funded, suggest that TEIs are accountable to no-one but themselves.

TEIs have a more self-interested corporate citizenship/strategic philanthropy focus

All TEIs clearly identify their corporate citizen role in terms of community, healthcare and socioeconomic activities, which even extends to global citizens in the case of Premier. However, the trend seems to be more towards self-interested corporate citizenship, and strategic philanthropy for the TEI's benefit as against the public good. The move to a more strategic philanthropic engagement helps address issues of mutual interest and benefit for each partner. More importantly, it produces long-term advantages by creating strategic intangible assets for TEIs that enhance the institutional contexts within which TEIs operate (Gardberg & Fombrun, 2006). Strategic intangible assets such as reputational capital, research staff commitment, loyalty, and legitimacy, help enhance the long-term performance and accountability of TEIs (Gardberg & Fombrun, 2006; Godfrey, 2005).

<u>Reporting is largely promotional and marketing rather than accountability/stewardship oriented</u>

A common theme that emerged from the study is that all TEIs rely on multiple reporting media, formats and strategies. There was an apparent clash between different reporting agendas, with information rationally constructed in order to help provide legitimacy, enhance research reputation and profile, and to lobby for funding support. In this manner, reporting mechanisms simply serve as strategic devices to manipulate the perceptions of the TEIs' activities and performance (Black, 2008). Rather than being accountability/ stewardship oriented, even the annual reports of all TEIs are effectively transformed into a marketing tool to promote their research activities.

8.12 *Chapter Summary*

This chapter presented the cross-case results of the data analysis of the three case TEIs. The cross-case themes and issues emerging from the multiple cases were discussed using theoretical interpretations to provide a richer basis for the research conclusions to be drawn in the next chapter. The chapter presented common themes and differences in the three case TEIs' missions and strategies and institutional drivers. The major themes that have emerged are that accountability seems to have become a "representational faithfulness" to the rhetoric in the TEIs' strategic documents, and that TEIs strongly view accountability as being related to funding. All TEIs have demonstrated a trend towards a more self-interested, corporate citizenship and strategic philanthropy focus. There is also a much deeper normative and cultural-cognitive accountability obligation among researchers keen to push the commercialisation agenda.

The study presented a three-staged model to illustrate their development towards enabling commercialisation of research. To manage accountability expectations, all TEIs have placed strategic importance on the development of research capability and capacity, and the resulting PBRF culture potentially undermines their research commercialisation agenda. TEIs have responded strategically by employing decoupling and bridging mechanisms to create research institutes and centres, largely due to pressure to conform and win the support of key agencies in the institutional environment. The performance measures used by all case TEIs are mostly input/process focussed and make no real

attempt to measure knowledge outputs and outcomes. There is a low level of transparency as commercialisation objectives and measures are not specified. The demands of NPM accountability which has a narrow focus are promoting legitimating behaviours. In terms of reporting strategies, all TEIs rely on multiple reporting media, formats and strategies and there is an apparent clash between different reporting agendas. An analytical summary that facilitated the cross-case comparisons is tabulated and presented in Appendix 7. The next chapter presents the research conclusions.

CHAPTER 9:   CONCLUSIONS AND IMPLICATIONS

9.1   *Introduction*

The growing accountability agenda towards enabling commercialisation of academic research not only provides important accountability challenges to public TEIs across nations, but has made accountability a major concern in most parts of the world (Dahlstrand, 2008; Demeritt, 2000; Fielen, 2007; Gauthier, 2004; Goldfarb & Henrekson, 2003; Salmi, 2009). In New Zealand, the low rate of commercialisation of research, and the underperformance of the nation's innovation system, have heightened accountability concerns as to whether academic research commercialisation opportunities are being appropriately enhanced and exploited by public TEIs (Ministry of Education, 2003; MoRST, 2008; OECD, 2007; Science and Innovation Advisory Council, 2002; TEC, 2003; World Economic Forum, 2000). This study was designed to provide rich and deep insights into the accountability challenges of enabling commercialisation of research in public TEIs in New Zealand. Chapter 1 presented the background to the study concerning the purpose and scope of the research, the research problem and justification for undertaking the research. Chapter 2 reviewed the literature and presented the key accountability concerns in the context of the study. Chapter 3 presented a theoretical framework and a conceptual model with key dimensions identified as a suitable lens through which to inform the study. Chapter 4 presented and justified the research paradigm, qualitative methodology and the selection of case studies as the appropriate research design strategy. Chapters 5, 6 and 7 provided, respectively, the results of the within-case analysis of each of the three cases studies. Chapter 8 provided the results of key findings and the presentation of a cross-case analysis and development of a three-stage model for enabling commercialisation of research.

This final chapter presents the study's conclusions on the overall research problem and research questions posed in Chapter 1. It draws together the findings of the within-case and cross-case analyses that emerged in the preceding chapters and outlines the implications and contributions of the study, as well as identifying the limitations of the

research. Finally, the prospective opportunities for further research and concluding remarks are presented.

9.2 *Conclusion to the Central Research Question*

The central research question posed in the study was:

> **How do public TEIs in New Zealand identify and render accountability towards enabling commercialisation of research?**

This study has revealed that public TEIs identify and render accountability in terms of their obligations to funding providers, normative obligations to research professionals, research partners and industry, and cultural-cognitive obligations to the wider society. However, the nature and extent of their accountability obligations differ according to their institutional context, distinctive characteristics and constraints. Public TEIs also have to comply with NPM accountability requirements that determine how they identify and render accountability. Under NPM, public accountability has become an institutionalised practice of giving account (Bovens, 1998, 2005b) to which the TEIs strictly comply by preparing strategic documents that specify the objectives and measurable performance outcomes of all their public-funded activities. The study has revealed that TEIs have identified their commitment to research commercialisation in their strategic documents but accountability seems to have become a "representational faithfulness" to the rhetoric in the strategic documents (Oakes et al., 1998). While this may have conferred legitimacy to the research commercialisation purpose, rendering accountability in terms of performance accomplishment seems difficult. The uncertain context of research commercialisation has made it difficult for TEIs to specify goals and objectives and to operationalise them into measurable outcomes in terms of NPM accountability requirements.

The study has revealed that TEIs identify and render their accountability obligations to funding providers strictly based on funding purpose and agreed objectives and outcomes, in terms of NPM accountability requirements. There is a strong perception within TEIs that no accountability arises under NPM for specific research commercialisation initiatives that are not clearly defined, agreed upon and externally funded. For TEIs,

government is the major funding provider of basic research which may have future commercialisation potential that needs further development. However, what is an interesting finding from this study is that TEIs strongly identify accountability to government only in terms of the funding received for basic research outcomes, as agreed in the strategic documents. TEIs do not identify their accountability extending into the future to include potential research commercialisation outcomes arising from basic research. Hence, identifying and rendering accountability in terms of NPM requirements is weak as it provides TEIs with a narrow conception of accountability obligations to funding providers. At the same time, government has no clear expectations from TEIs that they will identify and render accountability that extends beyond the basic research funding purpose and agreed outcomes for which the funding was granted.

The study suggests that NPM accountability is weak even if funding providers apply coercive pressure to reinforce the TEIs normative elements in terms of building research culture, capability, and capacity. For example, the government, as the major funding provider, has established the regulatory framework by formulating research policies and strategies, and provides funding incentives to encourage and support TEIs' innovation and research commercialisation efforts. In this manner, the regulatory pressure applied by government is largely oriented to reinforcing the normative obligations of TEIs towards enabling commercialisation of research. However, it seems that TEIs strongly identify accountability to government only in terms of short-term funding needs and not long-term research development needs. For TEIs, funding is an important determinant of accountability but, given the uncertain context of research commercialisation, it is time TEIs moved beyond identifying and rendering accountability in terms of funding levels. They need to see research in terms of economic contributions and value-added activities leading to commercial outcomes in terms of product and process development.

The cross-case analysis provides a number of common themes that suggest that TEIs identify accountability based on their normative and cultural-cognitive obligations, and rendering accountability goes beyond the typical accounting justification. Rendering accountability is not just being held accountable *ex post facto* by accountability forums. The purpose of accountability is to encourage learning and development towards

enabling commercialisation of research within TEIs. The focus of accountability is on the behaviour of TEIs to determine whether they have acted in ways consistent with their norms, virtues and societal expectations towards enabling research commercialisation. Given the long-term nature of research commercialisation projects, accountability assessment needs to consider progress made by TEIs towards their learning and development goals. Within this context, rendering accountability entails justification based on the normative development of TEIs. The next section presents the conclusions to the specific research questions that guided this study.

9.3 *Conclusions for Each Research Question*

To gain comprehensive insights into the accountability practices of public TEIs in the context of enabling commercialisation of research, four specific research questions were posed in this study. This section attempts to draw together the conclusions about the research findings of the preceding four chapters in relation to each research question.

9.3.1 **Research Question 1**

What primary rationales underlie the accountability obligations of public TEIs in New Zealand towards enabling commercialisation of research?

The study has demonstrated that public TEIs in New Zealand are embedded in a complex network of institutionalised relationships with multiple stakeholders. Within this institutional context, the normative and cultural-cognitive pressures emerge as the primary rationales that underlie the accountability obligations of TEIs towards enabling commercialisation of research. In other words, these factors determine to whom and for what TEIs are accountable. The normative and cultural-cognitive pressures are the taken-for-granted beliefs, norms and values of key institutional actors that impose accountability obligations on TEIs. In terms of cultural-cognitive pressures, all TEIs have accepted commercialisation of research as a taken-for-granted global practice that dominates the tertiary education organisational field. Resorting to such a practice seems to be the most logical option for TEIs as it confers legitimacy and helps secure research funding and resources. Through mimetic pressures, TEIs have incorporated the research commercialisation role in their mission statements and strategic documents in an attempt

to be portrayed as modern, innovative, high ranking and reputable institutions. However, this strategic commitment imposes accountability obligations on TEIs to act in ways that are consistent with standards of appropriate norms and societal expectations towards enabling commercialisation of research. Society's expectations have grown, with commercialisation becoming powerfully adapted by the institutional environment. TEIs' accountability obligations are derived from socially constructed rules and cultural frames of the institutional environment. Being recipients of substantial public research funding, society's expectations have imposed accountability obligations on TEIs to occupy a central role in enabling commercialisation of research to help contribute to the social, cultural, regional and economic development of the nation. Arguably, accountability has become a social contract with society.

Despite the dominance of a PBRF culture, TEIs also have a powerful grouping of professional researchers with strongly-held norms and values of research commercialisation. These researchers hold deep values that research is the discovery and extension of knowledge and commercialisation is a norm specifying legitimated means to transfer knowledge for society's benefit. To enable commercialisation, these high profile researchers establish professional network ties for research collaboration with industry, government, research organisations, and international partners. This imposes accountability obligations on TEIs to nurture, support, confer rights, responsibilities, and grant mandates and autonomy to these professional researchers to engage in new discoveries that may lead to a commercial potential. The normative pressures arising from the professional network of researchers have also placed accountability obligations on TEIs to develop a research commercialisation infrastructure, create a vibrant and innovative research culture, and build a critical mass of research capability and capacity. These elements are essential towards enabling successful commercialisation of research. A researcher's high profile, professional recognition and reputation, and funding success appeared to be the main sources of power through which they exert normative pressures on TEIs.

Research Question 2

How do public TEIs in New Zealand manage the accountability expectations of enhanced commercialisation of research?

TEIs manage their accountability expectations by exercising strategic choices and establishing priorities in ways reflective of their institutional context, distinctive characteristics, role expectations and circumstances. The research evidence presented in the study shows that TEIs place a strong emphasis on building a vibrant research and innovation culture, and concentrate their efforts on the development of research capability and capacity to generate a critical mass of research excellence. The TEIs have created research centres and institutes and adopted organisational structures and configurations that they considered to be responsive to their research commercialisation needs. Systems, policies and processes, governance mechanisms, and rewards and incentives to influence researchers' behaviour and facilitate research commercialisation expectations were implemented. TEIs used wide-ranging communicative mechanisms to inform stakeholders on commercialisation initiatives and performance.

The study also demonstrated that to manage accountability expectations, TEIs had to employ accountability mechanisms that conformed to institutional pressures in order to achieve legitimacy, gain support and endorsement of key actors, enhance reputation, and to acquire funding and resources (DiMaggio & Powell, 1983; Rowan, 1982). This was clearly evidenced by the use of varying forms of structural configurations and communicative strategies as key accountability mechanisms. Communicative mechanisms were used as strategic devices to alter the perceptions of the TEIs' commercialisation initiatives and performance (Black, 2008). Positive narratives were rationally constructed and transmitted through various communicative mechanisms to enhance research reputation and provide legitimacy for resources. Legitimacy is crucial to garnering resources from external stakeholders, and research structures were proactively created and used as legitimating devices to obtain research funding. TEIs also created structures that served as buffering mechanisms to manage multiple and often

contradictory accountability pressures that resulted from their heterogeneous organisational fields. In this manner, structures were used as buffering mechanisms to create professional boundaries for researchers and to preserve their autonomy and not subject them to the bureaucratic procedures of compliance and control. TEIs also created research structures to serve as bridging mechanisms to facilitate interdisciplinary research collaboration, especially with industry, government, and international research partners. The study has highlighted that TEIs tended to rely upon the power of institutional entrepreneurs to create and develop research centres and institutes, to mobilise support of other actors, to form research alliances and collaborations, and facilitate access to dispersed resources.

9.3.3 Research Question 3

How do public TEIs in New Zealand measure and report the performance of their commercialisation activities?

TEIs, like other public sector organisations, measure and report performance based on the NPM accountability requirements that have become a highly institutionalised practice. Under the NPM requirements, TEIs prepare strategic and investment plans that define their mission, goals and objectives, identify strategies, and establish performance targets against which they measure and report their actual performance. These strategic documents are approved by TEC, the government funding agency, and it becomes a binding contract for funding allocation as well as a template for measuring and reporting the results of the TEI's performance. NPM accountability has imposed a mandatory requirement on all TEIs to formally measure and publicly report on performance, at least annually, and produces an audited annual report to demonstrate accountability to stakeholders. TEIs conform to these institutionalised practices to gain legitimacy even if there are no specific technical notions of performance accomplishment (DiMaggio & Powell, 1983; Scott, 1987).

The study has demonstrated that TEIs have outlined their intent and commitment to research commercialisation clearly in their strategic documents. They have set goals and objectives in compliance with government strategies and priorities for research. In their

271

stated objectives, they have placed a strong emphasis on developing their research capability, capacity and infrastructure, which are considered to be the key elements of enabling commercialisation of research. The cross-case analysis suggests that TEIs mostly use input/process based performance measures. These measures have been largely framed in terms of standardised PBRF measures which appeared to be "the only game in town and TEIs had got to live up to that". Thus, it appears that TEIs have been coerced into setting objectives and performance measures that imitate government priorities to enhance their legitimacy, research reputation, and satisfy their desires for funding.

The study found that TEIs had effectively decoupled from the technical NPM requirements of measuring and reporting performance of their research commercialisation activities. Interestingly, none of the TEIs had set any specific objectives and performance measures for research commercialisation activities in their strategic documents against which they publicly reported on a consistent basis. The only reporting on research commercialisation was in the narrative sections of their annual reports. There were two key reasons for decoupling. First, TEIs felt that they were under no obligation to measure and report on research commercialisation if these activities were not funded by government. Therefore, the TEIs' annual reporting was on strategic objectives and key performance indicators that the government had negotiated and provided funding for. Second, accountability under NPM assumes a stable environment with conditions of certainty about expected results. However, the realities of research commercialisation are characterised by uncertainty, complexity, interdependence, diversity, and instability. Under such conditions, NPM accountability seems weak as policy logics, priorities, funding, and outcomes remain unclear and uncertain (Zapico-Goni, 2007). Performance becomes difficult to quantify and measure because of the long-term nature of the commercialisation projects, multi-stakeholder involvement, and inherent risks involved in transforming academic research into commercial outcomes. NPM places high value on what is produced, observed, and measured. It has an excessive focus on the bureaucratic process of formal compliance, control, audit and results-based measures of efficiency and effectiveness. This is at odds with research professional groupings that prefer greater autonomy, flexibility, and a culture of trust to produce successful outcomes (Codd, 2005; O'Neill, 2002). NPM accountability that relies on

standardised accountability measures to satisfy the desires of particular stakeholders seems counterproductive to research commercialisation initiatives.

The study also found that while TEIs had decoupled the research commercialisation objectives and measures from their formal NPM reporting requirements, their commercial companies measured and reported research commercialisation success in terms of revenue generated, patents filed, licences signed, spin-out companies formed, and new inventions disclosed. Some of these have been reported on briefly, on an ad hoc basis, as achievements in the narrative sections of TEIs' annual reports. As a result of decoupling, there seems to be a lack of publicly available, comprehensive commercialisation performance data on individual TEIs, in terms of measures used and actual results of performance. UCONZ, a collective body representing university commercialisation offices, compiles aggregate New Zealand research commercialisation performance data using standard international metrics of income measures, such as technology licensing revenue and contract research revenue, new invention disclosures, new patents applied for and patents granted, licences issued, new start-ups formed, full-time staff employed by start-ups, and capital raised for start-ups. This data is mainly collected as part of the annual survey on university research commercialisation performance.

9.3.4 **Research Question 4**

What are the scope, purpose and modus operandi of voluntary reporting strategies with the TEI setting?

The study has demonstrated that TEIs have considerable scope to utilise voluntary reporting strategies given that the realities of research commercialisation are characterised by uncertainty, complexity, interdependence, and diversity of operations. Under such conditions, mandatory reporting of performance based on NPM instruments becomes difficult as outcomes remain unclear, uncertain, and difficult to quantify and measure given the long-term nature of the commercialisation projects. The lack of measurable outcomes relating to research commercialisation performance has also created greater scope for the use of voluntarily reporting strategies. TEIs have voluntarily

constructed positive narratives using a variety of communicative mechanisms such as annual reports, research newsletters, magazines, research reports, publicity materials, and web pages to publicise and promote their research commercialisation activities, including the activities of their commercial company, research institutes, centres, and faculties. Voluntary reporting has been largely framed as positive constructions of narratives of research activities, funding success stories, success stories in terms of staff and student awards and achievements, and positive illustrations of how research had served the needs of industries, communities, professions, regions and the nation. Voluntary reporting has been used as purposive strategies to help establish identity, promote and publicise activities that helps create a positive research profile and reputation, and provide a measure of confidence in the research capability of the institution. Given the uncertain context of research commercialisation, voluntary reporting has become a key accountability mechanism that enables TEIs to rationally construct positive narratives to influence powerful stakeholders and enhance legitimacy and accountability relationships.

The study also suggests that voluntary reporting has become an important impression management and marketing tool largely aimed at projecting a positive image and help promote research commercialisation initiatives. Through voluntary reporting, TEIs have been motivated to present a self-serving view of their research commercialisation performance by constructing positive narratives that help provide legitimacy of purpose in terms of negotiating and obtaining ongoing government funding support for various research activities. TEIs have used voluntary reporting to justify resourcing and funding needs and to voice concerns about obstacles and challenges in relation to government policy decisions and research funding levels. While NPM's accountability focus is on measurement of results, in an uncertain context, the use of voluntary reporting strategies in the legitimisation of purpose has become more important.

9.4   *Implications for Theory and its Development*

The current research makes significant contributions to knowledge through the application of NIT to two demanding fields of research, namely, accountability and

research commercialisation. This is perhaps the first time NIT has been applied to examine public sector accountability within the context of enabling academic research commercialisation. This study makes a number of distinct contributions that have implications for theory and its development.

First, the study developed a conceptual model of accountability using theoretical concepts of NIT to help determine how TEIs identify accountability obligations, manage accountability expectations and discharge accountability. The conceptual model, illustrated in Figure 3.1, offers a comprehensive accountability framework to help examine *ex ante* and *ex post* accountability. Second, most studies are *ex post* the decision to commercialise and, as such, our knowledge of the very early stages of enabling research commercialisation is still scarce (Hindle & Yencken, 2004; Vohora et al., 2004). This study fills an essential early stage commercialisation knowledge gap by informing accountability processes and obstacles leading up to research commercialisation within TEIs.

Third, this study identifies the gap between the rhetoric and reality of accountability that seems to have become a characteristic of the accountability environment within which public TEIs operate. The study reveals that accountability for research commercialisation is strongly represented by the rhetoric in the strategic documents. The rhetoric in these high level accountability documents helps legitimise the research commercialisation agenda. However, the reality in terms of research commercialisation performance has been effectively decoupled from public scrutiny casting doubts on the adequacy of the accountability arrangements within TEIs. The findings also confirm claims by Romzek (2000) that the accountability practices themselves may not change as quickly as the rhetoric suggests unless accountability changes become thoroughly embedded, widely accepted and effective.

Fourth, there have been claims in literature that commercialisation has contradictory goals and will jeopardise the central mission and basic role of the university (D'Este & Patel, 2007; Dasgupta & David, 1994; Lee, 1996; Mazzoleni & Nelson, 1998; Owen-Smith, 2003). This study adds to this body of knowledge by demonstrating that contrary

to claims, TEIs have been more than willing to adopt the research commercialisation mission as it has become an institutionalised global practice that offers legitimacy and portrays them as modern and innovative institutions. Contrary to previous findings (Gulbrandsen & Smeby, 2005; Lee, 1996; Lockett et al., 2003; Louis et al., 2001; Powell & Owen-Smith, 1998; West, 2008), it's not so much the adoption but implementation of the commercialisation mission that leads to notable tensions between academic research and commercial activities. This research adds to knowledge by demonstrating that when accountability assessment for research is academically (PBRF) oriented, commercialisation becomes difficult to implement. In fact, it leads to a dominant academic (PBRF-oriented) research culture that potentially undermines the research commercialisation culture.

Fifth, there have been concerns expressed and calls for greater accountability from TEIs given the increasing recognition and importance placed on the central role TEIs occupy towards enabling commercialisation of academic research (Dahlstrand, 2008; Gauthier, 2004; Goldfarb & Henrekson, 2003; Gulbrandsen & Smeby, 2005; Salmi, 2009; Wessner, 2003). The study found that calls for greater accountability are, in fact, calls for a reliance on a 'different kind' of accountability with different expectations for performance. The study offers explanations that research commercialisation fulfils a much broader societal and economic need, and accountability is more than mere compliance with technical and procedural accounting requirements. TEIs identify accountability based on their normative and cultural-cognitive obligations and, hence, the focus of accountability also needs to be on the behaviour of TEIs to determine whether they have acted in ways consistent with their norms, virtues and societal expectations. This study provides new insights that add knowledge to much earlier work by Romzek and Dubnick (1987) that claimed that the appropriateness of accountability relationships is a function of the organisation's institutional environment, managerial strategy, and agency or individual task.

Sixth, this study confirms the inherent tension between NPM accountability and research management practices (Abernethy & Brownell, 1997; Bisbe & Otley, 2004; Davilla, 2000; Ditillo, 2004; Findlow, 2008; Oakes & Young, 2008; Zapico-Goni, 2007). It also

276

confirms that bureaucratic compliance with NPM requirements is causing legitimating behaviour (Lapsley, 2008). This research makes an important contribution to literature by demonstrating that the NPM tension is causing TEIs to decouple from technical requirements thus making no real attempts to measure research commercialisation performance. The legitimating behaviour is influencing reporting to be largely promotional and marketing rather than be accountability oriented. The long-term nature and uncertain context of research commercialisation projects requires a major shift in accountability focus to the research capability and capacity development efforts within TEIs. This suggests that the purpose of accountability needs to encourage learning and development towards enabling commercialisation of research rather than be NPM oriented with a focus on bureaucratic compliance. This study provides empirical support to claims that have emerged in very few studies that accountability purpose and assessment needs to promote learning in pursuit of continuous improvement (Aucoin & Heintzman, 2000; Bovens, 2007; Bovens et al., 2008). It also extends this claim to include accountability to promote learning in pursuit of long-term development needs in an uncertain context. Moreover, contrary to claims in literature that accountability is not only about *ex post* scrutiny (Bovens, 2007), this study has revealed that NPM accountability is largely *ex post* assessment that potentially contradicts with research commercialisation development.

Finally, recent concerns have highlighted the insufficient theoretical and empirical evidence on the underlying processes relating to the commercialisation of research across institutional types (Markman et al., 2008; Rothaermel et al., 2007). This thesis has addressed concerns that most studies are quantitative, and based on a single university and, therefore, lack the complexity in models or richness in data to understand the interdependent processes across many different actors, agents, and institutions involved in university entrepreneurship (Rothaermel et al., 2007; Van Looy, Ranga, Callaert, Debackere, & Zimmermann, 2004).

9.5   *Implications for Policy and Practice*

The research findings provide a number of important implications for policy and practice with recommendations to help overcome potential barriers to research commercialisation

and to enhance accountability relationships. The rhetoric in the TEIs' strategic documents highlights the need for government to become more explicit in articulating its research commercialisation expectations from TEIs. All TEIs have stated in their strategic documents that research commercialisation is an important mission alongside teaching and research. However, decoupling strategies and failure to establish clear goals and identify meaningful performance measures signifies a lack of an objective way of assessing research commercialisation performance. To demonstrate their commitment, TEIs need to set clear goals, objectives, and KPIs, so that commercialisation does not become a marginal activity. TEIs' research commercialisation goals and objectives also need to be made more transparent and recognised and reconciled with the government's commercialisation mission, goals and strategy, with an increasing focus on accountability and performance. Making research commercialisation an integral part of the TEIs' objectives and operations has important implications in terms of reworking of government policy and re-aligning it with government strategy and resource allocation criteria, including the development of output-based KPIs and incentives to support innovators and entrepreneurs. Strategy and policy, at both the government and TEI level, should be developed to provide the basis of regular performance reviews and evaluation of commercialisation activities to overcome the narrow focus of NPM accountability on bureaucratic compliance that is causing legitimating behaviour among TEIs. Policy and practice should be extended to recognise the uncertain, complex, and long-term nature of research commercialisation, thus allowing for an effective accountability framework to be established with a learning and development purpose and to appraise progress on an informed basis.

The culture clash between PBRF requirements and research commercialisation that undermines commercialisation efforts has important implications in terms of development of policy and practice. Current government policy on PBRF encourages TEIs to give priority to the development of research based on PBRF criteria. PBRF is also driving the behaviour of most researchers and the research culture of TEIs away from the commercialisation mission. Government policy needs to be re-framed to avoid this tension and to ensure that the research culture in TEIs remains sufficiently focussed on successful commercialisation outcomes. It needs to provide incentives to ensure that

TEIs move beyond identifying accountability simply in terms of PBRF funding levels and see research in terms of economic contributions and value-adding activities leading to commercial outcomes. To ensure that research projects work towards an avenue of commercialisation, government policy needs to tie funding to the commercialisation potential of research activities.

This study provides a three-stage model for enabling commercialisation of research that has important implications for policy and practice. The model illustrates that a paradigm shift is required to ensure that academic research and research commercialisation become two important roles of TEIs that complement and reinforce each other. PBRF policy needs to fully recognise and reward the value of engagement with commercialisation that includes the development of an innovative and enterprising commercialisation culture through cross-functional research teams, provides industry focus, and involves communities of practice. To leverage the intellectual abilities of academic research staff, research policy and reward systems, at both government level and within TEIs, need to provide opportunities and incentives to cultivate the commercialisation goals and objectives of the TEI simultaneously with the research goals and objectives of the individual researcher.

The study shows that some major challenges lie within the TEIs themselves, in their leaders, researchers and research programmes, organisational resources, in the ability of their systems and processes to exploit value-adding innovation, and in their corporate citizenship role. Primary importance is also placed on institutional leaders and entrepreneurs in terms of autonomy, strategic choice, and norms. TEIs have the freedom to pursue self-interested and self-determined institutional objectives but these need to be reconciled with research for the benefit of society. Reconciling all these issues and developing a comprehensive commercialisation strategy within TEIs will help deal with the bureaucratic obstacles and organisational challenges. The study also provides insights into the advantages of collaboration and networking between government, industry, researchers, and research partners, both locally and internationally. Systems and processes need to be developed to recognise and minimise any disconnect between TEI research and industry needs to help leverage their respective comparative advantages.

9.6   *Limitations of the Research*

The findings and conclusions of this study should be considered in light of the research limitations. As with all case study research, the main limitation of this study is that generalisation of findings and explanations to broader populations is limited because there are elements that are specific and unique to the cases being studied (Gillham, 2000). However, the purpose of the research was to generalise to theoretical propositions referred commonly as analytic generalisation (Firestone, 1993; Yin, 2009). This study provides rich contextual descriptions which place the onus of transferability on the reader rather than the researcher (Lincoln & Guba, 1985; Stake, 2005). Further, this study used multiple cases to provide more compelling evidence that adds credibility and confidence to the findings (Miles & Hubermann, 1994, p. 29; Yin, 2009).

The second limitation occurred as a result of some respondent sensitivity to disclosing commercially-related information despite assurances of confidentiality. To help overcome this limitation, documents considered to be rich in portraying the values and beliefs of participants were used to corroborate and augment evidence from interview data (Marshall & Rossman, 2006; Yin, 2009).

Finally, the focus of the research on enabling commercialisation of research limits the findings to this context. However, the study on enabling commercialisation provides a much deeper understanding of the accountability challenges faced by TEIs in early stage commercialisation. Also, given the uncertain context and long-term nature of research commercialisation projects, detailed examination of systems and processes of technology transfer, including patenting and licensing activities, spin-outs, and new firm formation, were beyond the scope of this study.

9.7   *Directions for Future Research*

Commercialisation of academic research is a fertile field of multi-disciplinary research and, as it develops beyond its embryonic stage, it poses considerable challenges to researchers in business, management, finance, economics, public policy, strategy, entrepreneurship, sociology, education, law, and technology (Rothaermel et al., 2007). A number of directions for future research arise from this study. First, many TEIs have

280

adopted the research commercialisation mission as an institutionalised global practice that has added a new dimension to their research management practices. There is an opportunity for future research to provide a deeper understanding of the integration of the commercialisation mission into the academic research mission and to test the effectiveness of the three-staged model developed in this study. Second, the extent to which TEIs align their commercialisation strategy with government's strategy on research commercialisation remains unclear. There is opportunity for further research to deeply investigate strategy-making within TEIs to help foster research commercialisation to contribute to the national innovation system. Opportunity for further research also exists to study the effectiveness of government strategy and policy decisions in the context of research commercialisation.

Third, the widespread use of standardised measures of commercialisation performance which are largely input based and NPM accountability fail to measure the complexity of the research commercialisation process. Future research agendas should explore acceptable measures of commercialisation performance that recognise the long-term, uncertain and complex nature of research commercialisation performance. This study suggests that accountability for research commercialisation has a learning and development dimension, which presents considerable scope for future research to undertake accountability assessment of research commercialisation within this framework. Research on the learning and development perspectives of accountability could also examine its effectiveness as a tool to make and keep governments, agencies, industry and other research partners effective in building research commercialisation capability and capacity.

Fourth, future research can contribute by addressing the challenge of how to effectively build and manage a commercialisation culture. There is considerable scope for further research to study different reward structures and incentive systems that explain certain behaviours and outcomes within TEIs. This could include a study of how well TEIs are recruiting, selecting, training, and retaining researchers. Finally, there is ample research opportunity to study power and politics in relation to gaming and positioning over

funding bids, and establishment of collaborative arrangements that potentially influence commercialisation performance.

9.8 *Concluding Remarks*

This study arose from major accountability concerns relating to commercialisation of academic research. The present research makes important contributions to address these concerns and provides rich and deep insights into the accountability challenges of enabling commercialisation of research in public TEIs in New Zealand. The study also makes a methodological contribution by going beyond the quantitative analysis of a single university and purposively selecting three different TEIs as case institutions, each with distinctive characteristics, size, and commercialisation experience. The in-depth, multiple case study approach enabled the researcher to bring together vital knowledge and the experiences of multiple stakeholders involved in the commercialisation process. The in-depth interview data from knowledgeable stakeholders, combined with documentary evidence, provided credible and valuable information on the underlying accountability processes across different institutional types. This research provided the ability to critique and enhance accountability theory, developed and tested a conceptual model of accountability for commercialisation of research, as well as provided a three-stage model for enabling commercialisation of research. The findings raise important implications and make recommendations for policy and practice. It provides a number of important directions for future research.

APPENDIX 1: LIST OF INTERVIEWS WITH DATES

For the purpose of confidentiality, the following list does not contain details sufficient to identify any interviewee. Full details are held by the author.

Interviewee	Affiliation	Date
CEO, Commercialisation	Premier	25 Sept 08
Director, Commercialisation	Premier	30 Sept 08
Business Manager, Commercialisation	Premier	22 Mar 08
CEO and Director, Commercialisation	Universal	16 April 08
Commercialisation Manager	Universal	22 Jan 08
Business Manager, Commercialisation	North-West	22 Mar 08
CEO, Spin-off Company	Spin-off Company	17 Sept 08
Deputy Director, Research Institute	Premier	24 June 08
Director, Research Institute	Premier	22 July 08
Director, Research Institute	Universal	15 June 09
Director, Research Institute	Universal	28 Sept 09
Head of Research Division	North-West	20 Aug 08
Director Research Centre	North-West	13 Aug 08
Director Research Institute	Universal	17 Sept 08
Executive Director	Industry	28 Oct 08
Company Director (informal conversational)	Industry	31 Oct 08
Market Leader (informal conversational)	Industry/International	31 Oct 08
Partner (informal conversational)	Professional/Industry	31 Oct 08
Investment Manager	TEC	11 Dec 07
CEO, Commercial Company	International University	4 July 08
Manager, TTO	International University	3 July 08
VP & CEO, Commercialisation	International University	11 July 08
Director, Research & Commercialisation	Research Institution	24 Nov 08
Manager, Research & innovation	Research Institution	24 Nov 08
Researcher	Research Institution	24 Nov 08
Manager, Tertiary Policy	Ministry of Education	11 Dec 07
Manager, Tertiary Performance & Research	Ministry of Education	11 Dec 07
Director, Finance	Premier	7 Oct 08
Director, Planning	Premier	7 Oct 08
Director , Policy	Universal	29 Feb 08
Faculty Finance Manager	Universal	19 Aug 08
General Manager	Universal	5 Aug 08
External Contracts Manager	North-West	20 Aug 08
Director Planning	Universal	1 Oct 08
Research scientist	Premier	24 June 08
Research Professor	Premier	22 July 08
Researcher & Professor	Universal	15 June 09
Researcher & Professor	Universal	28 Sept 09
Researcher	Universal	10 Dec 07
Head of School	North-West	11 Sept 08
Researcher 1 (informal conversational)	Premier	24 June 08
Researcher 2 (informal conversational)	Premier	24 June 08
Researcher/Assoc Professor	North-West	11 Sept 08
Professor/Researcher	North-West	20 Aug 08
Professor/Researcher	North-West	13 Aug 08
Researcher (informal conversational)	North-West	13 Aug 08
Research Professor/Scientist	Universal	17 Sept 08

Participant Information Sheet

Date Information Sheet Produced:

23 April 2008

Project Title

Accountability towards Enabling Commercialisation of Research in Public TEIs

An Invitation

Dear Participant,

I am a Senior Lecturer in the Business Faculty at AUT University and am currently undertaking research towards my PhD. I am writing to invite you to participate in my research. Please note that your participation is voluntary and you may withdraw at any time without penalty.

What is the purpose of this research?

The aim of this study is to gain valuable insights into the nature, extent and motivations behind commercialisation and reporting practices of public Tertiary Education Institutions (TEIs). External economic and political climate compounded by increasing commercialisation of public TEIs in New Zealand is forcing fundamental changes in accountability relationships between TEIs, government, and other stakeholders. The issues surrounding the complexity, transparency, relevance, quality, and breadth of reporting continues to challenge many TEIs and government. This study will explain attempts made by public TEIs to organise information about performance and resource use in their annual reports over a ten year period. The results of this research will contribute towards the development of best practice reporting guidelines necessary for meeting multiple challenges of accountability, demonstrating good performance and sound corporate governance. By examining reporting practices within the context of the overall TEIs corporate strategy and government strategy, this study will explain developments in reporting that will provide good guidance for future policy development at central government and institute level.

The results of this study will lead to research publications, conference presentations, and possible publication of a thesis.

How was I chosen for this invitation?

Participants for this study have been chosen based on their knowledge and responsibilities relating to commercialisation and the preparation of annual reports and other related

reporting documents. Your knowledge and experience is highly valued and will make a tremendous contribution in providing meaningful explanations of the commercialisation and annual reporting practices adopted by your institution.

What will happen in this research?

Annual Reports and related reporting documents such as charters and profiles for the past ten years will be systematically analysed to determine the changing patterns and contents. By way of semi-structured interviews you are invited to explain the commercialisation practices and reporting of results by your institution to help understand its overall purpose and role. You will be asked to explain the complexities of reporting and factors influencing reporting at your institution.

What are the discomforts and risks?

The interviews are designed to provide you with the opportunity to comment, clarify, correct, and add new knowledge to the research findings based on the document analysis of the annual reports and other publicly available documents of your institution. No discomforts or risks are anticipated during this process. However, if any discomforts and risks are experienced then you have the option of not responding to specific questions that cause the discomfort or risk. Alternatively you can withdraw from the interview.

What are the benefits?

The major benefits to participants will be that the research findings will contribute towards a better understanding of commercialisation practices at public TEIs. It will also lead to the development of best practice reporting guidelines necessary for improving accountability, demonstrating good performance and sound governance. The research findings will help explain the challenges of TEI reporting and find potential ways of managing such challenges that will lead to closing potential gaps between actual reporting and official expectations of stakeholders. By examining reporting practices within the context of the overall TEIs corporate strategy and government strategy, this study will explain developments in commercialisation practices and reporting that will guide future policy developments.

The major benefits to the researcher are that the research findings will lead to a publication of a thesis and award of a Doctor of Philosophy (PhD) qualification. The research findings will contribute to the theoretical knowledge and add to the academic literature. It will guide future research, publications and presentations.

How will my privacy be protected?

Participants will not be identified by name. Raw data comprising interview tapes will be kept secure under lock and key. The research data will be available only to me and my principal supervisor. Results of the research will be published in aggregate form. While all due care will be exercised to protect the privacy of the participants, given the nature of the research and the sample size of the study, it is not possible to guarantee absolute confidentiality.

What are the costs of participating in this research?

The cost in terms of the participant's time will be between 1.0 to 2.0 hours.

What opportunity do I have to consider this invitation?

You have three weeks time available to consider this invitation. You also have the opportunity to seek further information and clarification at any stage regarding your decision to participate. Please note that your participation is voluntary and you can withdraw from the interviews at any point without any adverse consequences of any kind. You will simply need to notify me by phone or email of you decision not to participate in the interviews if the

interview has been scheduled but not commenced .If you wish, a copy of any publications arising out of this study will be sent to you for comments prior to submission for publication.

How do I agree to participate in this research?

You will need to complete the attached Consent Form and send it back to me electronically or by post if you agree to participate in this research. My contact details are as follows given below.

As a follow up to this invitation, I will be contacting you over the next three weeks and will be happy to answer any further questions.

Will I receive feedback on the results of this research?

Participants will have the opportunity to verify the interview transcripts. A copy of any publications arising out of this study will be sent to you for comments prior to submission for publication.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, *Professor Keith Hooper, email address: keith.hooper@aut.ac.nz, work phone number: 921-9999 Ext 5758.*

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTEC, Madeline Banda, *madeline.banda@aut.ac.nz* , 921 9999 ext 8044.

Whom do I contact for further information about this research?
Researcher Contact Details:

Anil Narayan, Senior Lecturer, Accounting (EA) School, Faculty of Business, AUT University, Private Bag 92006, Auckland 1020. Phone (09) 921-9999 Ext 5121, email: anil.narayan@aut.ac.nz.

Project Supervisor Contact Details:

Professor Keith Hooper, Professor of Financial Accounting, Faculty of Business, AUT University, Private Bag 92006, Auckland 1020. Email address: keith.hooper@aut.ac.nz, work phone number: 921-9999 Ext 5758.

Approved by the Auckland University of Technology Ethics Committee on *8 December 2006***, AUTEC Reference number** *06/188***.**

APPENDIX 3: CONSENT FORM

For use when interviews are involved

Project title: ***Accountability Towards Enabling Commercialisation of Research in Public TEIs ****

Project Supervisor: **Professor Keith Hooper**

Researcher: **Anil Narayan**

○ I have read and understood the information provided about this research project in the Information Sheet dated 23 September 2006.

○ I have had an opportunity to ask questions and to have them answered.

○ I understand that the interviews will be audio-taped and transcribed and I will have the opportunity to verify the interview transcripts.

○ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.

○ If I withdraw, I understand that all relevant information including tapes and transcripts, or parts thereof, will be destroyed.

○ I agree to take part in this research.

○ I wish to receive a copy of the report from the research (please tick one): Yes○ No○

Participant's signature:

....……………………………………………………………

Participant's.name:

....……………………………………………………………

Participant's Contact Details (if appropriate):

………………………………………………………………………………………..

………………………………………………………………………………....……

Date: ***Approved by the Auckland University of Technology Ethics Committee on 8 December 2006 AUTEC Reference number 06/188*** *Note: The participant should retain a copy of this form. *Note: Title was amended during the course of the study.*

APPENDIX 4: INTERVIEW QUESTIONS

Interview format: semi-structured

Interview Questions:

1) What factors are prompting the increase in expectation for research commercialisation?

2) How responsive is the TEI to the pace of commercialisation?

3) What are the obstacles and challenges and how these are managed?

4) How commercialisation is actualised, that is, are there alternative models of commercialisation and if so, what are the different configurations of these models?

5) How are these models implemented? What factors influence its choice?

6) What are the outcomes of these models – both positive and negative aspects?

7) How are the outcomes measured and reported and possible incentives and disincentives attached to it?

   Questions on Accountability:

8) What are the primary rationales that underly TEI's accountability approaches to research commercialisation?

9) What factors determine to whom and for what TEIs are accountable?

10) Who are the opinion leaders and key stakeholders and what are their roles in fostering commercialisation?

11) What mechanisms do TEIs employ to manage the stakeholder expectations?

12) How is performance measured and reported? What is being measured and reported? Why?

13) What is the role of the annual report?

14) What is the scope, purposes and modus operandi of voluntary reporting strategies?

APPENDIX 5: DOCUMENT TYPE AND PERIOD COVERED

The following list provides the key documents analysed and the period covered. Confidential documents are not included in the list.

Document Type	Period Covered	Number of Documents	Institution
Annual Reports	2002-2008	7	Premier
Annual Reports	2002-2008	7	North-West
Annual Reports	2002-2009	8	Universal
Strategic Plan	2005-2012	1	Premier
Strategic Plan	2002-2004	1	Premier
Strategic Plan	2007-2011	1	Universal
Investment Plan	2008-2011	1	Universal
Investment Plan	2008-2010	1	North-West
Profile	2009-2010	1	Premier
Profile	2008	1	Premier
Summary Profile	2008-2010	1	Premier
Charter	2007-2009	1	North-West
Charter (Updated)	2005	1	Universal
Charter	2003	1	Premier
Operational Priorities	2004-5	2	Premier
Academic Audit Portfolio	2006	1	Universal
Profile (Parts a, b &c)	2005	2	Premier
Profile (Parts a, b &c)	2006-2008	2	Premier
Profile	2007	1	Premier
Profile	2007-2008	1	Premier
Key Directions	2008-2010	1	North-West
Academic Audit Report	2008-2012	1	Premier
Research Newsletters	2006-2010	Various	North-West
Research Newsletters	2004-2009	Various	Universal
Research Policy Manual	2009	1	Premier
PBRF Evaluation	2006	1	Premier
Web-pages	2004-2010	Various	North-West
Web-pages	2004-2010	Various	Universal
Web-pages	2004-2010	Various	Premier

APPENDIX 6:
PRESENTATIONS/SEMINARS/WORKSHOPS ATTENDED

Event	Topic	Location	Date
Presentation	US & global perspectives on biotech	Auckland	31 Oct 08
Presentation	Re-innovation and reinvention of biotech and pharmaceutical industries	Auckland	31 Oct 08
Workshop	Research commercialisation	Auckland	8 Aug 07
Workshop	Intellectual Property	Auckland	9 Aug 07
Seminar	The measurement of performance of NZ TEIs and the demand for their services	Auckland	4 Nov 08
Presentation	Professorial address on biotechnology commercialisation	Auckland	2 Oct 08
Inaugural Professorial Address	Research, development and deployment	Auckland	2 June 09

APPENDIX 7: SUMMARY CROSS-CASE ANALYSIS

Table 8.1: Cross-Case Analysis - Mission and Strategies

Premier	North-West	Universal
• Become a research-led international university • Contribute to the nation's innovation strategy • Undertake high quality research and develop areas of research excellence • Development and commercialisation of research • Promote value of research to the economy, society, and community • Attract, encourage and retain the best possible researchers • Provide appropriate infrastructure and other resources to support research • Develop an international research profile	• To be the most innovative and exciting university within its region • Discover and apply creative potential to contribute responsibly to societies and cultures • Focus is on applied research that serves educational, social, economic and environmental goals • Pursue government's tertiary education priorities • Foster an institutional culture of innovation • Increase evidence-based technology development and transfer • Collaborate and offer technology development services	• Undertake commercialisation to enhance reputation • Foster excellence in research to serve regional, national and international communities • Undertake research activity in terms of the govt's national priorities • Conduct excellent research that advances knowledge and practice • Ensure research activity is sustainable - by increasing external research revenue, operating a robust research infrastructure, and developing a critical mass of research capability

Table 8.2: Cross-Case Analysis- Institutional Drivers

Premier	North-West	Universal
Government • Provides the regulatory framework • Establishes the national innovation strategy and related policy • Regards Premier as having a central role in the achievement of governments goals in innovation and nation development • Provides funding incentives • Important collaborative partner and sponsor of CoREs	**Government** • Provides funding support to assist with innovation projects • Expects contribution towards the national innovation goals • Expects support of innovation system at a regional level • Provides funding support to assist with innovation projects	**Government** • Determines policy and funding • Desire to see strengthening of research culture and capability • Provides substantial investment funding and expects contribution towards its strategic priorities for tertiary education
Industry • Needs high value research with commercialisation potential • Important collaborative partner to leverage competitive advantages • Provides financial benefits through licence and purchase agreements • Joint commercial research projects helps build research capability • Linkages help create high profile research teams and culture • Helps cultivate relationships and provide job opportunities for researchers • Provides funding for CoREs and sponsors research consortia • Requires greater accountability in terms of willingness to cooperate	**Industry** • Links underpin contribution to the national innovation system • Helps keep up to date with developments in industrial innovation • Provides opportunities for student work placements • Provides opportunities for research and consultancy • Needs commercially significant inventions that provides benefits • Helps create high profile and build reputation • Provides funding	**Industry** • Longstanding research engagement – some top researchers have firsthand experience with industry • Needs good research that leads to real world innovative solutions • Partnership has led to a development of some commercial products • Provides staff and student opportunity to collaborate in research • Helps build research profile • Provides funding – licensing fee, development funds, sale of patents
Researchers • Participation is integral to the	**Researchers** • Obligation to develop research	**Researchers** • Key to commercialisation

291

success of commercialisation
- Majority are driven by the PBRF culture, not commercialisation
- Some pioneering researchers emerged as institutional leaders – driven by an expectation to see research commercialisation outcomes.
- Professional obligations – lot of pride and reputation involved
- Funding incentives for on-going research and to build research capability
- Student researchers require rich and meaningful experience working alongside excellent researchers utilising cutting edge technology

International Partners
- Requires effective international networks
- Collaboration helps share best practice, promote synergies, and gain access to relevant expertise
- Provides international opportunities for staff and students
- Attracts international recognition and reputation to build profile
- Creates opportunities for government and businesses
- Offers attractive funding opportunities and research infrastructure
- research infrastructure

Wider Community
- Expect research, innovation, and technology transfer to address their social, economic and cultural concerns
- Meeting public expectations helps enhance reputation and public image
- Fulfils global corporate citizenship role

Financial considerations
- Funding providers help advance commercialisation projects and develop research infrastructure and capability
- Commercial company provides a vital source of revenue to fund new research opportunities, invest in further research with commercial potential, secure IP, employ researchers, and build the research infrastructure.
- Funders need to target research with commercial potential

capability - encourage, support and recognise their contributions
- Need opportunity to engage in national and international research collaboration to build profile, reputation and credibility
- PBRF culture dictates – disincentive to commercialisation
- Some top researchers have normative and professional peer pressure to engage in commercialisation
- Expect to work alongside nationally and internationally recognised researchers
- Students need a learning environment marked by innovation and creativity
- Require exposure to latest cutting edge technology and tools

International Partners
- Has a commitment to meet international standards of excellence in research
- International collaboration helps increase profile and reputation, secure external research funding
- Enables staff and student exchanges

Wider Community
- Obligation to meet the needs of communities it serves
- Expectation that research and technology transfer will add real value
- Corporate citizenship role offers public relations opportunity
- Community engagement is expected to raise profile, reputation, and help develop research capability

Funding
- Obligation to funding providers to ensure their research outcomes achieved – provide a return on investment
- Commercialisation may not generate sufficient funds but may provide indirect benefits
- Income streams yet to be realised, are few and long-term

- Many are driven by PBRF measures
- Require time, resources, infrastructure to conduct research
- Expect to see a commercial outcome after years of dedicated research
- Institutional entrepreneurs –drivers of research and development efforts
- Require professional autonomy
- Seek collaboration in national and international projects.
- Students at centre of institutions research aspirations - require opportunity to work alongside innovative and creative researchers utilising cutting edge technology and tools.

International Partners
- Fostering partnerships help develop research capability
- Helps advancement of international standing, profile, and reputation
- Provide opportunities for staff and student exchanges
- International research projects illustrates the vibrancy and creativity
- Grows international networks- international profile gives NZ profile
- Benefits business and industry
- NZ industry has low absorptive capacity

Wider Community
- Universal is expected to create, extend and apply knowledge to inform society for its health and well being
- Obligation to contribute to their social and economic advancement
- Government has provided large research grants for community projects
- Community engagement has moved away from traditional philanthropic approach to a more strategic engagement

Financial Considerations
- Investment fund providers and joint venture partners expect return on their investment.
- Fund providers expect that funding works towards an avenue of commercialisation

292

Table 8.3: Cross-Case Analysis- Managing Expectations

Premier	North-West	Universal
Research & Innovation Culture • PBRF culture strong • Focus on critical mass of research excellence • Engage staff fully in commercialisation • Strategy to recruit high quality researchers and create research facilities to world class status • Commercialisation culture needs development	**Research & Innovation Culture** • Has struggled to maintain a strong research culture • PBRF research culture is recognised as a vital component of staff inspiration and motivation • Small pockets of a culture of innovation is emerging • Research commercialisation culture is weak	**Research & Innovation Culture** • Change culture from teaching to research – emerging research culture • Needs to promote commercialisation culture • Strong research culture necessary to promote research synergies • Building culture through investment in structures
Research Capability & Capacity • Development is a long-term strategic process • Strategy determined by government and PBRF results- staff, resourcing needs, organisation support systems and infrastructure development • Focus is to build high performance research, collaborative links with multi-disciplinary research groups, industry and international researchers.	**Research Capability & Capacity** • Committed to develop research capability and capacity to improve research position • Develop staff capability, maintain industry and business links, strengthen postgraduate research programmes, increase external research income, develop policies and processes, and infrastructure	**Research Capability & Capacity** • Professorial appointments, increasing research outputs, income, improving scope and quality of research, application of research • Enhance research reputation- active engagement and contribute to nation's goals • Invest in research facilities and infrastructure • Advance interdisciplinary research
Structure • Develop large scale research institutes of excellence, commercially focussed • CoREs –extensive network of researchers to support world class research • Autonomous commercial company – provides flexibility and financial independence. Sponsors research units, ensures sufficient expertise and resources available. • Provides organisational unit with identity and autonomy to researchers; enables collaboration, pooling of resources to develop critical mass and helps promote a strong research culture. • Provides legitimacy for funding – funding success is prerequisite to the creation and survival of these structures • Enhances reputation and raises research profile, forges international collaborations and enables to attract top research talent	**Structure** • Helps build a community of researchers and develop formal research linkages with industry and community • Helps develop critical mass and provides legitimacy for funding • Helps bring together the fragmented and decentralised approach of letting individual researchers undertake commercialisation • Does not have a separate commercialisation company – no single point of entry with systems, processes and talent to support commercialisation initiatives • Structure needs to reflect complexity and risk associated with commercialisation	**Structure** • Invests in structures which facilitate research • Research centres and institutes to bring focus and foster research culture • Research institutes ensures research activity and resources are concentrated in areas of research capability • Larger research institutes foster cross-disciplinary research • Helps attract funding, create research profile, encourages collaboration, provides autonomy, builds critical mass and enhances research culture • Commercial company facilitates commercialisation and has a symbiotic relationship with research institutes
Systems & Processes • Commercial company maintains separate systems and processes • Decoupling from centralized systems has led to inevitable tensions. • Still subject to bureaucratic control and compliance procedures of NPM	**Systems & Processes** • No centralised research commercialisation system - processes are still under development • Lack of institute wide systems and processes have contributed to inconsistent practice among some schools	**Systems & Processes** • Required to change culture to research commercialisation • Has IP policies to identify, protect, and explore commercialisation • No separate accounting, budgeting, and HR systems maintained

293

Managing IP • Has clear policy and strategy to protect, develop and exploit IP • All IP developed by staff assigned to commercial company • Commercial company ensures IP is managed properly and progressed within reasonable timelines and expectations and outcomes are clear. • Belief that commercialisation is not about who owns IP but is largely affected by level of commitment and management • Staff to contact commercial company before any disclosure made • IP protecting mechanisms used – file a provisional patent, spin-out company, or licence arrangements	**Managing IP** • Institute wide policy provides guidance for ownership, protection, and exploitation of IP	**Managing IP** • Negotiated on contract by contract basis though Universal tries to maintain as great a portion of the IP as possible. • IP managed through a license with exclusionary rights or outright sale • Success not associated with one model but whether commercialisation objectives are being achieved.
Rewards & Incentives • Provided to change researcher behaviour and encourage engagement • Major incentives are professional and cultural –cognitive, sense of accomplishment of an outcome, desire to secure additional funding • Longer timeframe and uncertain financial success is disincentive • Reward systems recognise a narrow band of PBRF related activities – disincentive to research commercialisation	**Rewards & Incentives** • Funding • 20% research workload allocation • Gaining recognition and reputation -having name on a patent • Sharing of benefits – third/third/third split	**Rewards &Incentives** • Universal shares one-third of the net benefits with the researcher • PBRF seems to be only game for most researchers • For top researchers, a sense of accomplishment and international recognition is a much greater incentive
Leadership • Strong commitment from senior management required. • Commercial company CEO is on the senior management team • Pioneering researchers also became the institutional leaders • Proactive leadership within faculties required.	**Leadership** • Senior management has remained committed to development of an applied research culture • Leadership in terms of development of commercialisation activities left to individuals within schools. • Senior management leadership somewhat lacking	**Leadership** • Senior management commitment to commercialisation • Changing management structure does not provide much certainty • Senior management leadership needs to be more responsive and deal with motive gap, obstacles and embrace commercialisation culture.
Governance • University council has ultimate responsibility • Commercial company has an independent board with 5 internal and 5 external members • Board approves policies, sets strategic direction, and provides guidance to management with reporting back to council. However challenged by structure, composition and authority system.	**Governance** • Institute council has the governance role • Not at a stage where it needs a separate commercial company with an independent board • Need to become more proactive and establish frameworks for risk	**Governance** • University council has ultimate responsibility • Independent board provides commercial advise and governance to commercial company • Development boards with key external stakeholders established to provide strategic advice to research institute directors.
Risk management • Commercial company structure ensures commercial ideas not overlooked or put at risk. • Managed as a portfolio of business to minimise risk	**Risk Management** • At a very early stage of commercialisation – as such has no clear risk management strategy	**Risk Management** • Independent commercial company structures intended to separate risk from the university. • High dependency on university systems create doubt whether commercial company has capacity to manage risks

Table 8.4: Cross-Case Analysis- Measuring Performance

Premier	North-West	Universal
• Strategic documents sets out goals, objectives and performance measures-largely influenced by PBRF goals • Use of input/process KPIs provides no real attempt to measure knowledge outputs - strongly related to PBRF and enhancing reputation • External research income is a key performance indicator to measure success of research institutes, centres and the commercial company • Does not set specific performance measures for commercialisation activities in strategic documents against which it reports • Commercial company captures a small portion of research commercialisation performance.	• Investment plan (previously charters and profiles) sets out goals and objectives, strategies, and performance targets • No specific objectives and outcome measures for research commercialisation has been set • Uses PBRF measures with reservations • KPIs chasing an objective that potentially undermines research commercialisation agenda • Research objectives focussed on increased research outputs and funding, achievement of international standards of research excellence, and building research capability. • Input/process based metrics used to measure research performance.	• Strategic documents provide goals, objectives and performance measures. Specific commercialisation objectives and measures not set • PBRF influences research performance goals and measures • Government policy largely dictates performance measures • KPIs based on strategies, themes and how best to achieve that • Collective action by commercial companies in measuring performance • Input/process KPIs indicate no real attempt to measure commercialisation outputs. Common measures are number of research outputs, students, collaborative links and external research income.

Table 8.5: Cross-Case Analysis- Reporting Strategies

Premier	North-West	Universal
• Strategic documents is a positive construction of commitment to research commercialisation • Website contains extensive publicity information of research activities • Annual report provides formal reporting to stakeholders • Narratives are compiled as success stories on research events, activities, funding success and staff and student achievements. • Annual reporting emphasis is on initiatives promoted towards building research culture, capability, research collaborations and PBRF • Annual report also used to justify resourcing needs and lobbying govt • Commercial Company produces annual report as a promotional document	• Investment plan (previously charters and profiles) sets out goals and objectives, strategies, and performance targets • No specific objectives and outcome measures for research commercialisation has been set • Uses PBRF measures with reservations • KPIs chasing an objective that potentially undermines research commercialisation agenda • Research objectives focussed on increased research outputs and funding, achievement of international standards of research excellence, and building research capability. • Input/process based metrics used to measure research performance	• Strategic documents are formal construction of positive narratives to provide legitimacy for ongoing government funding • Positive narratives in annual reports emphasises funding success, collaboration, and commercial outcomes. • Web pages- to build profile, establish identity • Annual report structured to themes in strategic plans • Narratives focussed on promotional, publicity and enhances reputation • External research income underlines progress and research profile • Positive reporting narratives aligned with govt's strategic priorities • Commercialisation is not reported heavily

REFERENCES

Abernethy, M. A., & Brownell, P. (1997). Management control systems in research and development organizations: The role of accounting, behavior and personnel controls. *Accounting, Organizations and Society, 22*(3-4), 233-248.

Abernethy, M. A., & Chua, W. F. (1996). A Field Study of Control System "Redesign": The Impact of Institutional Processes on Strategic Choice. *Contemporary Accounting Research, 13*(2), 569-606.

Adams, C. A., & Harte, G. (1998). The Changing Portrayal of the Employment of Women in British Banks' and Retail Companies' Corporate Annual Reports. *Accounting, Organizations & Society, 23*(8), 781-812.

Adcock, D., Bradfield, R., Halborg, A., & Ross, C. (1995). *Marketing Principles and Practice* (2nd ed.). London: Pitman.

Aerts, W. (1994). On the Use of Accounting Logic as an Explanatory Category in Narrative Accounting Disclosures. *Accounting, Organizations & Society, 19*(4/5), 337-353.

Agrawal, A. (2001). University-to-industry knowledge transfer: literature review and unanswered questions. *International journal of Management Reviews, 3*(4), 285-302.

Alvesson, M., & Karreman, D. (2004). Interfaces of control. Technocratic and socio-ideological control in a global management consultancy firm. *Accounting, Organisations and Society, 29*, 423-444.

Ambos, T. C., Makela, K., Birkinshaw, J., & D'Este, P. (2008). When Does University Research Get Commercialized? Creating Ambidexterity in Research Institutions. *Journal of Management Studies, 45*, 1425-1447.

Anderson, G. (2006). Carving out time and space in the managerial university. *Journal of Organizational Change, 19*(5), 578-592.

AUCC. (2001). *Commercialization of University Research* Ottawa: Association of Universities and Colleges of Canada. Retrieved from http://www.aucc.ca/_pdf/english/reports/2002/innovation/commercial_e.PDF

AUCC. (2002). *Framework of agreed principles on federally funded university research between the government of Canada and the association of universities and colleges of Canada*. Ottawa: Association of Universities and Colleges of Canada.

Aucoin, P. (1990). Administrative Reform in Public Management: Paradigms, Principles, Paradoxes and Pendulums. *Governance, 3*, 115-137.

Aucoin, P., & Heintzman, R. (2000). The dialectics of accountability for performance in public management reform. *International Review of Administrative Sciences, 66*, 45-55.

Ball, I., Dale, T., William, D. E., & Sacco, J. (1999). *Reforming Financial Management In The Public Sector: Lessons U.S. Officials Can Learn From New Zealand* (No. Policy Study No. 258). Los Angeles: Reason Public Policy Institute.

Barley, S. R., & Tolbert, P. S. (1997). Institutionalization and Structuration: Studying the Links between Action and Institution. *Organization Studies, 18*(1), 93-117.

Barzelay, M. (2001). *New Public Management: Improving Research and Policy Dialogue*. from http://site.ebrary.com/lib/unitech/Doc?id=10051526

Baxter, J. A., & Chua, W. F. (1998). Doing Field Research: Practice and Meta-Theory in Counterpoint. *Journal of Management Accounting Research, 10*, 69-87.

Becerra, M., Lunnan, R., & Huemer, L. (2008). Trustworthiness, risk, and the transfer of tacit and explicit knowledge between alliance partners. *Journal of Management Studies, 45*, 691-713.

Bell, E. R. J. (1993). Some current issues in technology transfer and academic-industrial relations: a review. *Technology Analysis & Strategic Management, 5*(3), 307-321.

Benner, M., & Sandstro'm, U. (2000). Institutionalizing the triple helix: research funding and norms in the academic system. *Research Policy, 29*, 291-301.

Berg, B. L. (2007). *Qualitative Research Methods for the Social Sciences* (Sixth ed.). Boston, MA: Pearson Education, Inc.

Berger, P. L., & Luckmann, T. (1967). *The social construction of reality*. New York: Doubleday.

Bisbe, J., & Otley, D. (2004). The effects of the interactive use of management control systems on product innovation. *Accounting, Organisations and Society, 29*, 709-737.

Black, J. (2008). Constructing and contesting legitimacy and accountability in polycentric regulatory regimes. *Regulation & Governance, 2*(2), 137-164.

Bloom, D. E. (2003). Mastering Globalization: From Ideas to Action on Higher Education Reform. In G. Breton & M. Lambert (Eds.), *Universities and Globalization. Private Linkages, Public Trust*. Paris: UNESCO Publishing.

Bloom, D. E. (2005). Raising the Pressure: Globalization and the Need for Higher Education Reform. In G. A. Jones, P. L. McCarney & M. L. Skolnik (Eds.), *Creating Knowledge, Strengthening Nations. The Changing Role of Higher Education*. Toronto: University of Toronto Press.

Bok, D. (2003). *Universities in the marketplace: the commercialization of higher education*. New Jersey: Princeton University Press.

Boston, J. (1991). Reorganizing the Machinery of Government: Objectives and Outcomes. In J. Boston, J. Martin, J. Pallot & P. Walsh (Eds.), *Reshaping the State: New Zealand's Bureaucratic Revolution.* (pp. 233-267). Auckland: Oxford University Press.

Boston, J., Martin, J., Pallot, J., & Walsh, P. (1996). *Public Management: The New Zealand Model*. Auckland: Oxford University Press.

Bovens, M. (2007). Analysing and Assessing Accountability: A Conceptual Framework. *European Law Journal, 13*(No. 4), 447-468.

Bovens, M., Schillemans, T., & Hart, P. T. (2008). Does Public Accountability Work? An Assessment Tool. *Public Administration, 86*(1), 225-242.

Boxenbaum, E., & Jonsson, S. (2008). Isomorphism, Diffusion and Decoupling. In R. Greenwood, C. Oliver, K. Sahlin & R. Suddaby (Eds.), *The SAGE Handbook of Organizational Institutionalism*. London: SAGE Publications Ltd.

Bozec, R., Zeghal, D., & Boujenoui, A. (2004). *The Effect of the Reform of Canadian State-Owned Enterprises on Major Corporate Governance Mechanisms*, 2004). Retrieved from

http://search.ebscohost.com/login.aspx?direct=true&db=anh&AN=13244981&site=ehost-live

Bozeman, B. (2000). Technology transfer and public policy: A review of research and theory. *Research Policy, 29*(4-5), 627-655.

Brignall, S., & Modell, S. (2000). An Institutional Perspective on Performance Measurement and Management in the 'New Public Sector'. *Management Accounting Research, 11*, 281-306.

Brown, N., & Deegan, C. (1998). The public disclosure of environmental performance information -- a dual test of media agenda setting theory and legitimacy theory. *Accounting & Business Research, 29*(1), 21-41.

Bryman, A. (1984). The debate about quantitative and qualitative research: a question of method or epistemology? . *The British Journal of Sociology, XXXV*(1), 75-92.

Burchell, S., Clubb, C., Hopwood, A., Hughes, J., & Nahapiet, J. (1980). The Role of Accounting in Organization and Society. *Accounting, Organizations & Society, 5*(1), 5-27.

Burke, J. C. (2005). The Many Faces of Accountability. In J. C. Burke (Ed.), *Achieving Accountability in Higher Education: Balancing Public, Academic, and Market Demands* (First ed., pp. 1-24). San Francisco, CA: Jossey-Bass A Wiley Imprint.

Burns, R. B. (2000). *Introduction to Research Methods* (4th ed.). London: Sage Publishers, Inc.

Burrell, G., & Morgan, G. (1979). *Sociological Paradigms and organizational Analysis*. London, UK: Heinemann.

Campbell, J., & Lindberg, L. (1990). Property Rights and the Organization of Economic Activities by the State. *American Sociological Review, 55*(5), 634-647.

Carroll, G. R., & Hannan, M. T. (1989). Density Dependence in the Evolution of Populations of Newspaper Organizations. *American Sociological Review, 54*(4), 524-541.

Carruthers, B. G. (1995). Accounting, ambiguity, and the new institutionalism. *Accounting, Organizations and Society, 20*(4), 313-328.

Castells, M. (1996). *The Information Age: Economy, Society and Culture. Volume 1. The rise of the Network Society* Oxford: Blackwell.

Chapple, W., Lockett, A., Siegel, D. S., & Wright, M. (2005). Assessing the relative performance of UK technology transfer offices: parametric and non-parametric evidence *Research Policy, 34*, 369-384.

Christians, C. G. (2005). Ethics and Politics in Qualitative Research. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage Handbook of Qualitative Research* (Third ed.). Thousand Oaks, CA: Sage Publications, Inc.

Clark, B. R. (1972). The organizational saga in higher education. *Administrative Science Quarterly, 17*, 178-184.

Clark, B. R. (1998). *Creating Entrepreneurial Universities:organisational pathways of transformation*. New York: Elsevier.

Clarysse, B., Wright, M., Lockett, A., Mustar, P., & Knockaert, M. (2007). Academic spinoffs, formal technology transfer and capital raising. *Industrial and Corporate Change, 16*, 609-640.

Codd, J. (2005). Teachers as 'managed professionals' in the global education industry: the New Zealand experience. *Educational Review, 57*(No. 2), 193-206.

Coffey, A., & Atkinson, P. (1996). *Making Sense of Qualitative Data: Complementary Research Strategies*. Thousand Oaks, CA: Sage.

Cohen, L., & Manion, L. (1994). *Research Methods in Education* (4th ed.). London: Routledge.

Cohen, W. M., & Levinthal, D. A. (1989). Innovation and Learning: The Two Faces of R & D. *The Economic Journal, 99*(397), 569-596.

Cohen, W. M., Nelson, R. R., & Walsh, J. P. (2002). Links and impacts: the influence of public research on industrial R&D. *Management Science, 48*, 1-23.

Colomy, P. (1998). Neofunctionalism and Neoinstitutionalism: Human Agency and Interest in Institutional Change. *Sociological Forum, 13*(2), 265-300.

Colyvas, J. A., & Powell, W. W. (2006). Roads to Institutionalization: The Remaking of Boundaries between Public and Private Science [An Annual Series of Analytical Essays and Critical Reviews]. *Research in Organizational Behavior, 27*, 305-353.

Commission of the European Communities [COM]. (2000). *Challenges for enterprise policy in the knowledge-driven economy, COM 2000/256. Commonunication from the commission*. Retrieved 18 May, 2007, from http://ec.europa.eu/enterprise/enterprise_policy/mult_entr_programme/doc/com2000_0256en.pdf

Commission of the European Communities [COM]. (2003). *The role of universities in the Europe of knowledge, COM 2003/58*. Retrieved 18 May 2007, 2007, from http://europa.eu/scadplus/leg/en/cha/c11067.htm

Considine, M., & Marginson, S. (2001). *Enterprise University*. Cambridge: Cambridge University Press.

Considine, M., & Painter, M. (Eds.). (1997). *Managerialism: The Great Debate*. Melbourne: Melbourne University Press.

Cooper, D. J., & Morgan, W. (2008). Case Study Research in Accounting. *Accounting Horizons, 22*(2), 159-178.

Cooper, D. J., & Sherer, M. J. (1984). The Value of Corporate Accounting Reports: Arguments for a Political Economy of Accounting. *Accounting, Organizations & Society, 9*(3/4), 207-232.

Cooper, S. M., & Owen, D. L. (2007). Corporate social reporting and stakeholder accountability: The missing link. *Accounting, Organisations and Society, 32*(7-8), 649-667.

Corbett, D. C. (1992). *Australian Public Management*. St. Leonard, NSW: Allen and Unwin.

Corcoran, P., Walker, K., & Wals, A. (2004). Case studies, make-your-case studies, and case stories: a critique of case -study methodology in sustainability in higher education. *Environmental Education Research, 10*(1), 7-21.

Covaleski, M. A., & Dirsmith, M. W. (1988a). An institutional perspective on the rise, social transformation, and fall of a university budget category. *Administrative Science Quarterly, 33*, 562-587.

Covaleski, M. A., & Dirsmith, M. W. (1988b). The Use of Budgetary Symbols in the Political Arena: An Historically Informed Field Study. *Accounting, Organizations and Society, 13*, 1-24.

Covaleski, M. A., & Dirsmith, M. W. (1990). Dialectic Tension, Double Reflexivity and the Everyday Accounting Researcher: On Using Qualitative Methods. *Accounting, Organizations and Society, 15*(6), 543-573.

Coy, D., Fischer, M., & Gordon, T. (2001). *Public Accountability: A New Paradigm for College and University Annual Reports*, 2001). Retrieved from http://search.epnet.com/login.aspx?direct=true&db=buh&authdb=epref&an=CPA.AB.A.COY.PANPCU

Coy, D., & Pratt, M. J. (1998). *An insight into accountability and politics in universities: a case study*, 1998). Retrieved from http://search.epnet.com/login.aspx?direct=true&db=buh&authdb=epref&an=AAAJ.AA.EDJ.COY.IAPUCS

Creswell, J. W. (1997). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, CA: Sage Publications Ltd.

Creswell, J. W., & Miller, D. L. (2000). Determining Validity in Qualitative Inquiry. *Theory into Practice, 39*(3), 124-130.

Currie, J. (2003). Australian Universities as Enterprise Universities: Transformed Players on a Global Stage. In G. Breton & M. Lambert (Eds.), *Universities and Globalization. Private Linkages, Public Trust* (pp. 179-194). Paris and Quebec: UNESCO Publishing.

Czarniawska, B., & Hernes, T. (2005). Constructing Macro Actors According to ANT. In B. Czarniawska & T. Hernes (Eds.), *Actor-Network Theory and Organizing*. Malmo, Sweden: Liber & Copenhagen Business School Press.

D'Este, P., & Patel, P. (2007). University-industry linkages in the UK: what are the factors underlying the variety of interactions with industry? *Research Policy, 36*, 1295-1313.

Dahlstrand, A. L. (2008). *University Knowledge Transfer and the Role of Academic Spin-offs*. Paris: OECD.

Dasgupta, P., & David, P. A. (1994). Towards a new economics of science. *Research Policy, 23*(5), 487-521.

Davilla, T. (2000). An empirical study on the drivers of management control systems' design in new product development. *Accounting, Organisations and Society, 25*, 383-409.

Davis, G. F. (1991). Agents without Principles? The Spread of the Poison Pill through the Intercorporate Network. *Administrative Science Quarterly, 36*(4), 583-613.

Dawkins, J. (1988). *Higher Education: a Policy Statement* Canberra: Commonwealth of Australia.

Dawson, P. (2003). *Reshaping Change: A Processual Approach* London, New York: Routledge.

Deegan, C., & Gordon, B. (1996). A Study of the Environmental Disclosure Practices of Australian Corporations. *Accounting & Business Research, 26*(3), 187-199.

Deem, R. (2001). Globalisation, New Managerialism, Academic Capitalism and Entrepreneurialism in Universities: is the local dimension still important? *Comparative Education, 37*(No.1), 7-20.

Deem, R. (2004). The knowledge worker, the manager-academic and the contemporary UK university: new and old forms of public management? *Financial Accountability & Management, 20*(2), 107-128.

Deem, R., & Brehony, K. J. (2005). Management as ideology: the case of 'new managerialism' in higher education. *Oxford Review of Education, 31*(No. 2), 217-235.

Demeritt, D. (2000). The New Social Contract for Science: Accountability, Relevance, and Value in US and UK Science and Research Policy. *Antipode, 32*(3), 308-329.

Denzin, N. K., & Lincoln, Y. S. (2005). Introduction: The Discipline and Practice of Qualitative Research. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage Handbook of Qualitative Research* (Third ed., pp. 1-32). Thousand Oaks, CA: Sage Publications, Inc.

DEST. (2002). *Best Practice Processes for University Research Commercialisation: Final Report, Department of Education, Science and Training*.

DEST. (2005). *Metrics for Research Commercialisation*: Department of Education, Science and Training, Australian Government

Di Gregorio, D., & Shane, S. (2003). Why do some universities generate more start-ups than others? *Research Policy, 32*, 209-227.

DIISR. (2009). *Powering Ideas: An Innovation Agenda for the 21st Century* Retrieved 9/9/2009. from http://www.innovation.gov.au/innovationreview/Documents/PoweringIdeas_fullreport.pdf.

Dilanchian, N. (2006). Defining commercialisation. Retrieved from www.dilanchian.com.au/content/view/47/36/

Dillard, J. F., Rigsby, J. T., & Goodman, C. (2004). The making and remaking of organizational context: Duality and the institutionalization process. *Accounting, Auditing & Accountability Journal, 17*(No. 4), 506-542.

DiMaggio, P. J. (1988). Interest and agency ininstitutional theory. In L. G. Zucker (Ed.), *Institutional patterns and organizations: Culture and environment* (pp. 3-21). Cambridge, MA: Ballinger.

DiMaggio, P. J. (1991). Constructing an Organizational Field as a Professional Project: U.S. Art Museums, 1920-1940. In W. W. Powell & P. J. DiMaggio (Eds.), *The New Institutionalism in Organizational Analysis*. Chicago: The University of Chicago Press.

DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review, 48*(2), 147-160.

DiMaggio, P. J., & Powell, W. W. (1991). Introduction. In W. W. Powell & P. J. DiMaggio (Eds.), *The New Institutionalism in Organisational Analysis* (pp. 1-38). Chicago: The University of Chicago Press.

Ditillo, A. (2004). Dealing wth uncertainty in knowledge-intensive firms: the role of management control systems as knowledge integration mechanisms. *Accounting, Organisations and Society, 29*, 401-421.

DIUS. (2008). *Innovation Nation*. Retrieved 9/9/2009. from http://www.dius.gov.uk/reports_and_publications%20HIDDEN/~/media/publications/S/ScienceInnovation_web.

Djokovic, D., & Souitaris, V. (2008). Spinouts from academic institutions: a literature review with suggestions for further research. *Journal of Technology Transfer, 33*, 225-247.

Dobbin, F., & Sutton, J. (1998). The Strength of a Weak State: The Rights Revolution and the Rise of Human Resources Management Divisions. *American Journal of Sociology, 104*(2), 441-476.

Drabenstott, M. (2008). Universities, Innovation and Regional Development: A View from the United States. *Higher Education Management and Policy, 20*(2), 1-13.

Droge, C., Germain, R., & Halstead, D. (1990). A Note on Marketing and the Corporate Annual Report: 1930-1950. *Journal of the Academy of Marketing Science, 18*(4), 355.

Easterby-Smith, M., Thorpe, R., & Lowe, A. (2008). *Management Research - An Introduction*. London: Sage.

Easton, B. (1997). *The Commercialisation of New Zealand*. Auckland: Auckland University Press.

Economist. (2002). Innovation's golden goose. *Economist December 14, 3*.

Education Review. (24 July 2009). Stop begging, start explaining, Gluckman tells scientists. *EDUCATION REVIEW*.

Einar, R., Oystein, M., & Magnus, G. (2006). Initiatives to promote commercialization of university knowledge. *Technovation, 26*(4), 518.

Eisenhardt, K. (1989). Building Theories from Case Study Research. *The Academy of Management Review, 14*(4), 532-550.

Engelbrecht, H. J., & Darroch, J. (1999). A Comparative Macro-Level Assessment of New Zealand's 'National Innovation System'. *Prometheus, 17*(3), 283-298.

Etzkowitz, H. (1998). The norms of entrepreneurial science: cognitive effects of the new university-industry linkages. *Research Policy, 27*(8), 823-833.

Etzkowitz, H. (2003). Research Groups as 'Quasi-firms': The Invention of the Entrepreneurial University. *Research Policy, 32*(No. 1), 109-121.

Etzkowitz, H., & Leydesdorff, L. (1997). Introduction to special issue on science policy dimensions of the triple helix of university-industry-government relations. *Science and Public Policy, 24*, 2-5.

Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations. *Research Policy, 29*(2), 109-123.

Etzkowitz, H., Webster, A., Gebhardt, C., & Terra, B. R. C. (2000). The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm. *Research Policy, 29*(2), 313-330.

Ferlie, E., Pettigrew, A., Ashburner, L., & Fitzgerald, L. (1996). *The new public management in action*. Oxford: Oxford University Press.

Fielen, J. (2007). *Global Trends in University Governance*, 2007).

Findlow, S. (2008). Accountability and innovation in higher education: a disabling tension? *Studies in Higher Education, 33*(No. 3), 313-329.

Firestone, W. A. (1993). Alternative arguments for generalizing from data as applied to qualitative research. *Educational Researcher, 22*(4), 16-23.

Fligstein, N. (1991). The structural transformation of American industry: An institutional account of the causes of diversification in the largest firms, 1919-1979. In W. W. Powell & P. J. DiMaggio (Eds.), *The new institutionalism in organizational analysis* (pp. 311-336). Chicago: University of Chicago Press.

Fligstein, N. (2001). Social skill and the theory of fields. *Sociological Theory, 19*(2), 105-125.

Fogarty, T. J. (1996). The imagery and reality of peer review in the U.S.: Insights from institutional theory *Accounting Organizations and Society, 21*(2/3), 243-267.

Fontana, A., & Frey, J. H. (2003). The Interview: From Structured Questions to Negotiated Text. In N. K. Denzin & Y. S. Lincoln (Eds.), *Collecting and Interpreting Qualitative Materials* (Second ed., pp. 61-106). Thousand Oaks, CA: Sage Publications, Inc.

Fox-Wolfgramm, S. J., Boal, K. B., & Hunt, J. G. (1998). Organizational Adaptation to Institutional Change: A Comparative Study of First-order Change in Prospector and Defender Banks. *Administrative Science Quarterly, 43*(1), 87-126.

Frank, D. J., Hironaka, A., & Schofer, E. (2000). The nation-state and the natural environment over the twentieth century. *American Sociological Review, 65*(1), 96-116.

Friedland, R., & Alford, R. R. (1991). Bringing Society Back In: Symbols, Practices, and Institutional Contradictions. In W. W. Powell & P. J. DiMaggio (Eds.), *The New Institutionalism in Organizational Analysis* (pp. 232-263). Chicago: The University of Chicago Press.

Fuller, S. (2003). Can Universities Solve the Problem of Knowledge in Society without Succumbing to the Knowledge Society? *Policy Futures in Education, 1*(No.1), 106-124.

Fuller, S. (2005). What Makes Universities Unique? Updating the Ideal for an Entrepreneurial Age. *Higher Education Management and Policy, 17*(No. 3), 27-49.

Funnell, W., & Cooper, K. (1998). *Public Sector Accounting and Accountability in Australia*. Sydney: UNSW Press.

Gardberg, N., & Fombrun, C. (2006). Corporate Citizenship: Creating Intangible Assets Across Institutional Environments. *Academy of Management Review, 31*(2), 329-346.

Gauthier, M. (2004). Incentives and Accountability: The Canadian Context. *Higher Education Management and Policy, 16*(2), 95-107.

Gibbons, M., Limoges, C., Newotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The New Production of Knowledge. The Dynamics of Science and Research in Contemporary Societies*. London: Sage Publications.

Gillham. (2000). *Case Study Research Methods*. London Continuum.

Glynn, J. J., & Murphy, M. P. (1996). Public management. Failing accountabilities and failing performance review. *International Journal of Public Sector Management, 9*(No. 5/6), 125-137.

Godfrey, P. (2005). The Relationship Between Corporate Philanthropy and Shareholder Wealth: A Risk Management Perspective *Academy of Management Review, 30*(4), 777-798.

Goldfarb, B., & Henrekson, M. (2003). Bottom-up versus top-down policies towards the commercialization of university intellectual property. *Research Policy, 32*, 639-658.

Gordon, L. (1992). The New Zealand State and Educational Reforms: 'Competing' Interests. *Comparative Education, 28*(No.3), 281-291.

Gouldner, A. W. (1954). *Patterns of Industrial Bureaucracy*. New York: The Free Press.

Graves, O. F., Flesher, D. L., & Jordan, R. E. (1996). Pictures and the Bottom Line: The Television Epistemology of U.S. Annual Reports. *Accounting, Organizations & Society, 21*(1), 57-88.

Gray, R., Guthrie, J., & Parker, L. (2002). Rites of passage and the self-immolation of academic accounting labour: an essay exploring exclusivity versus mutuality in accounting scholarship. *Accounting Forum, 26*(1), 1-30.

Greenwood, R., & Hinings, C. R. (1993). Understanding Strategic Change: The Contribution of Archetypes. *Academy of Management Journal, 36*(5), 1052-1082.

Greenwood, R., & Hinings, C. R. (1996). Understanding radical organizational change: bringing together the old and new institutionalism. *Academy of Management Review, 21*(4), 1022-1054.

Greenwood, R., & Hinings, C. R. (2006). Radical Organizational Change. In S. R. Clegg, C. Hardy, T. B. Lawrence & W. R. Nord (Eds.), *The Sage Handbook of Organization Studies* (Second ed., pp. 814-842). London: Sage Publications Ltd.

Greenwood, R., Suddaby, R., & Hinings, C. R. (2002). Theorizing Change: The Role of Professional Associations in the Transformation of Institutionalized Fields. *Academy of Management Journal, 45*(1), 58-80.

Greve, H. R., & Taylor, A. (2000). Innovations as catalysts for organizational change: Shifts in organizational cognition and search. *Administrative Science Quarterly, 45*(1), 54.

Guba, E. G. (1990). The alternative paradigm dialog. In E. G. Guba (Ed.), *The paradigm dialog* (pp. 17-30). Newbury Park, CA: Sage.

Guba, E. G., & Lincoln, Y. S. (2005). Paradigmatic Controversies, Contradictions, and Emerging Confluences. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage Handbook of Qualitative Research* (Third ed.). Thousand Oaks, CA: Sage Publications, Inc.

Gulbrandsen, M., & Smeby, J. C. (2005). Industry funding and university professors' research performance *Research Policy, 34*, 932-950.

Hammerstedt, R. H., & Blach, E. L. (2008). Commercialization of basic research from within the university and return of value to the public. *Animal Reproduction Science, 105*(2008), 158-178.

Hannan, M. T., & Freeman, J. (1977). The Population Ecology of Organizations. *The American Journal of Sociology, 82*(5), 929-964.

Hannan, M. T., & Freeman, J. (1984). Structural Inertia and Organizational Change. *American Sociological Review, 49*(2), 149-164.

Hardy, C., & Maguire, S. (2008). Institutional Entrepreneurship. In R. Greenwood, C. Oliver, K. Sahlin & R. Suddaby (Eds.), *The SAGE Handbook of Organizational Institutionalsm*. London: SAGE Publications Ltd.

Hardy, C., Maguire, S., & Lawrence, T. (2004). Institutional entrepreneurship in emerging fields: HIV/AIDS treatment advocacy in Canada. *Academy of Management, 47*(5), 657-679.

Hargrave, T. J., & Van De Ven, A. H. (2006). A Collective Action Model of Institutional Innovation. *Academy of Management Review, 31*(4), 864-888.

Harman, K. (1989). Culture and Conflict in Academic Organisation: Symbolic Aspects of University Worlds *Journal of Educational Administration, 27*(3), 30-54.

Hawke, G. R. (1988). *Report of the Working Group on Post Compulsory Education and Training*. Wellington: Ministry of Education.

Henderson, R., Jaffee, A. B., & Trajtenberg, M. (1998). Universities as a source of commercial technology: a detailed analysis of university patenting, 1965-88. *The Review of Economics and Statistics, 80*, 119-127.

Hessels, L. K., & Lente, H. v. (2008). Re-thinking new knowledge production: A literature review and a research agenda. *Research Policy, 37*, 740-760.

Hindle, K., & Yencken, J. (2004). Public research commercialization, entrepreneurship and new technology based firms: An integrated model. *Technovation, 24*, 793-803.

HM Treasury. (2004). *Science and innovation investment framework 2004-2014*. London: HM Treasury, Department of Trade and Industry and Department for Education and Skills

HMSO. (1993). *Realising our Potential*. London: Her Majesty's Stationery Office (HMSO)

Hood, C. (1991). A Public Management for All Seasons. *Public Administration, 69(1)*, 3-19.

Hood, C. (1995). The 'New Public Management' in the 1980s: variations on a theme. *Accounting, Organisations and Society, 6*, 193-211.

Howard, J. (2005). *The emerging business of knowledge transfer. Creating value from intellectual products and services* (Report of Study Commissioned by DEST): Department of Education, Science and Training, Commonwealth of Australia.

Hyndman, N. S., & Anderson, R. (1995). The Use of Performance Information in External Reporting: An Empirical Study of UK Executive Agencies. *Financial Accountability & Management, 11*(1), 1.

Jaffee, D. (2001). *Organization Theory: Tension and Change* (First ed.). New York: McGraw Hill.

Jepperson, R. L., & Meyer, J. W. (1991). The Public Order and the Construction of Formal Organizations. In W. W. Powell & P. J. DiMaggio (Eds.), *The New Institutionalism in Organizational Analysis* (pp. 204-231). Chicago: The University of Chicago Press.

Johansson, M., Jacob, M., & Hellstrom, T. (2005). The strength of strong ties: University spin-offs and the significance of historical relations. *Journal of Technology Transfer, 30*(3), 271-286.

Johnston, J. M., & Romzek, B. S. (1999). Contracting and Accountability in State Medicaid Reform: Rhetoric, Theories, and Reality. *Public Administration Review, 59*(5), 383-399.

Jones, G. A., McCarney, P. L., & Skolnik, M. L. (Eds.). (2005). *Creating Knowledge, Strengthening Nations. The changing Role of Higher Education*. Toronto: University of Toronto Press.

Juniper, J. (2002). Universities and collaboration within complex, uncertain knowledge-based economies. *Critical Perspectives on Accounting, 13*, 747–778.

Kearns, K. P. (1994). The strategic management of accountability in nonprofit organizations: An analytical framework. *Public Administration Review, 54*(2), 185.

Keasey, K., & Wright, M. (1993). Issue in Corporate Accountability and Governance: An Editorial. *Accounting & Business Research,* pp. 291-303. Retrieved from http://search.epnet.com/login.aspx?direct=true&db=buh&an=11895698

Keeling, R. (2006). The Bologna Process and the Lisbon Research Agenda: the European Commission's expanding role in higher education discourse. *European Journal of Education, 41*(2), 203-223.

Klepper, S., & Sleeper, S. (2005). Entry by spinoffs. *Management Science, 51*, 1291-1306.

Kohut, G. F., & Segars, A. H. (1992). The President's Letter to Stockholders: An Examination of Corporate Communication Strategy. *Journal of Business Communication, 29*(1), 7-21.

Lam, A. (2005). Work roles and careers of R&D scientists in network organizations. *Industrial Relations, 44*, 242-275.

Lambert, R. (2003). *Lambert Review of Business-University Collaboration: An Independent Report to HM Treasury*. London: HM Treasury.

Lamond, D. (1995). Dilemmas of measuring performance in a government trading enterprise: The state Bank of New South. *Australian Journal of Public Administration, 54*(2), 262.

Laperche, B. (2002). The Four Key Factors for Commercialising Research. The Case of a Young University in a Region in Crises. *Higher Education Management and Policy, 14*(No.3), 149-175.

Lapsley, I. (2008). The NPM Agenda: Back to the Future. *Financial Accountability & Management, 24*(1), 77-96.

Lapsley, I., & Miller, P. (2004). Transforming universities: the uncertain, erratic path *Financial Accountability & Management, 20*(2), 103-106.

Larner, W., & Le Heron, R. (2005). Neo-liberalizing Spaces and Subjectivities: Reinventing New Zealand Universities. *Organization, 12*(6), 843.

Leadbeater, C. (2000). *Living on Thin Air*. Hammondsworth: Penguin Books Ltd.

Leblebici, H., Salancik, G. R., Copay, A., & King, T. (1991). Institutional change and the transformation of interorganizational fields: An organizational history of the U.S. radio broadcasting industry. *Administrative Science Quarterly, 36*, 333-363.

Lee, Y. S. (1996). 'Technology transfer' and the research university: a search for the boundaries of university-industry collaboration. *Research Policy, 25*(1996), 843-863.

Lee, Y. S. (2000). The sustainability of university-industry research collaboration: an empirical assessment. *Journal of Technology Transfer, 25*(2), 111.

Lerner, J., Moore, D., & Shepherd, S. (2005). *A Study of New Zealand's Venture Capital Market and Implications for Public Policy: Report to the Ministry of Research Science & Technology*. Retrieved 20/9/09. from http://www.morst.govt.nz/Documents/publications/researchreports/Venture-Capital-Market-Study.pdf.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.

Lindelof, P., & Lofsten, H. (2003). Science park location and new technology-based firms in Sweden - implications for strategy and performance. *Small Business Economics, 20*(3), 245-258.

Lockett, A., Wright, M., & Franklin, S. (2003). Technology transfer and universities' spin-out strategies. *Small Business Economics, 20*, 185-200.

Lofsten, H., & Lindelof, P. (2002). Science parks and the growth of new technology-based firms - academic-industry links, innovation and markets. *Research Policy, 31*(6), 859.

Louis, K. S., Jones, L. M., Anderson, M. S., Blumenthal, D., & Campbell, E. G. (2001). Entrepreneurship, secrecy, and productivity: a comparison of clinical and non-clinical life sciences faculty. *Journal of Technology Transfer, 26*(3), 233-245.

Lounsbury, M. (1999). From Heresy to Dogma: An Institutional History of Corporate Environmentalism. *Administrative Science Quarterly, 44*(1), 193-195.

Lounsbury, M. (2001). Institutional sources of practice variation: Institutional sources of practice variation: Staffing college and university recycling programs. *Administrative Science Quarterly, 46*, 29-56.

Lounsbury, M. (2007). A tale of two cities: Competing logics and practice variation in the professionalizing of mutual funds. *Academy of Management, 50*, 289-307.

Lounsbury, M. (2008). Institutional rationality and practice variation: New directions in the institutional analysis of practice. *Accounting, Organizations and Society, 33*(4-5), 349-361.

Macintosh, N. B., & Daft, R. L. (1987). Management control systems and departmental interdependencies: an empirical study. *Accounting, Organisations and Society, 12*(1), 49-61.

Mansfield, E. (1998). Academic research and industrial innovation: an update of empirical findings. *Research Policy, 26*, 773-776.

Marginson, S. (2000). Rethinking Academic Work in the Global Era. *Journal of Higher Education Policy and Management, 22*(No. 1), 22-35.

Marginson, S., & Considine, M. (2000). *The Enterprise University: power, governance and re-invention in Australia*. Cambridge: Cambridge University Press.

Markman, G. D., Gianiodis, P. T., Phan, P. H., & Balkin, D. B. (2005). Innovation speed: transferring university technology to market
Research Policy, 34, 1-18.

Markman, G. D., Siegel, D. S., & Wright, M. (2008). Research and Technology Commercialization. *Journal of Management Studies, 2008*(45), 1402-1423.

Marshall, C., & Rossman, G. B. (1999). *Designing Qualitative Research* (3rd ed.). Thousand Oaks, CA: Sage Publications, Inc.

Marshall, C., & Rossman, G. B. (2006). *Designing Qualitative Research* (Fourth ed.). Thousand Oaks,CA: Sage Publications, Inc.

Mazzoleni, R., & Nelson, R. (1998). The benefits and costs of strong patent protection: a contribution to the current debate. *Research Policy, 27*(3), 273-284.

McKenna, S. (2000). Commercialisation, corporatisation and privatisation - The transformation of government enterprises as a feature of globalisation: A case study of scientific research. *Management Research News, 23*(2-4), 92.

McKinnon, J. (1988). Reliability and Validity in Field Research: Some Strategies and Tactics. *Accounting, Organizations and Society, 1*(1), 34-54.

McKinstry, S. (1996). Designing the Annual Reports of Burton PLC from 1930 to 1994. *Accounting, Organizations & Society, 21*(1), 89-111.

Messner, M. (2009). The limits of accountability. *Accounting, Organisations and Society, 34*, 918-938.

Meyer, A. D. (1982). Adapting to Environmental Jolts. *Administrative Science Quarterly, 27*(4), 515-537.

Meyer, A. D., Brooks, G. R., & Goes, J. B. (1990). Environmental Jolts and Industry Revolutions: Organizational Responses to Discontinuous Change. *Strategic Management Journal, 11*, 93-110.

Meyer, J. W. (1977). The Effects of Education as an Institution. *American Journal of Sociology, 83*(1), 55-77.

Meyer, J. W. (2008). Reflections on Institutional Theories of Organizations. In R. Greenwood, C. Oliver, K. Sahlin & R. Suddaby (Eds.), *The SAGE Handbook of Organizational Institutionalism* (pp. 790-811). London: SAGE Publications Ltd.

Meyer, J. W., Boli, J., Ramirez, T., & Ramirez, F. (1997). World Society and the Nation-State. *American Journal of Sociology, 103*(1), 144-181.

Meyer, J. W., & Rowan, B. (1977). Institutionalized Organizations: Formal Structure as Myth and Ceremony. *American Journal of Sociology, 83*(2), 340.

Meyer, J. W., & Rowan, B. (1983). The structure of educational organisations. In J. W. Meyer & W. R. Scott (Eds.), *Organizational Environments: Ritual and Rationality*. Beverly Hills: Sage Publications

Meyer, M. (2003). Academic entrepreneurs or entrepreneurial academics? Research based ventures and public support mechanisms. *R&D Management, 33*(2), 107-115.

Mian, S. A. (1997). Assessing and managing the university technology incubator: An integrative framework. *Journal of Business Venturing, 12*(4), 251-285.

Miles, M. B., & Hubermann, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook* (2nd ed.). London: Sage Publications.

Ministry of Education. (1989a). *Learning for life two: Policy decisions*. Wellington: Government Printer.

Ministry of Education. (1989b). *Learning for life: Education and training beyond the age of fifteen*. Wellington: Government Printer

Ministry of Education. (2003). *Tertiary Education Strategy 2002-2007*.

Ministry of Education. (2006). *Tertiary Education Strategy 2007-12: Incorporating Statement of Tertiary Education Priorities 2008-10*. Retrieved 15/9/2008. from http://www.minedu.govt.nz/~/media/MinEdu/Files/EducationSectors/TertiaryEducation/TertiaryEducationStrategy.pdf.

Mitchell, A. (1998). Annual brand report. *Management Today*, 110.

Mizruchi, M. S., & Fein, L. C. (1999). The Social Construction of Organizational Knowledge: A Study of the Uses of Coercive, Mimetic, and Normative Isomorphism. *Administrative Science Quarterly, 44*(4), 653-683.

Modell, S. (2003). Goals versus institutions: the development of performance measurement in the Swedish university sector. *Management Accounting Research, 14*(4), 333-359.

Modell, S. (2005). Students as consumers? An institutional field-level analysis of the construction of performance measurement practices. *Accounting, Auditing & Accountability Journal, 18*(4), 537-563.

Mohamedbhai, G. (2003). Globalization and its Implications for Universities in Developing Countries In G. Breton & M. Lambert (Eds.), *Universities and Globalization. Private Linkages, Public Trust*. Paris: UNESCO Publishing.

Moja, T. (2003). Globalization Apartheid: The Role of Higher Education in Development. In G. Breton & M. Lambert (Eds.), *Universities and Globalization. Private Linkages, Public Trust*. Paris: UNESCO Publishing.

Morphew, C. C., & Huisman, J. (2002). Using Institutional Theory to Reframe Research on Academic Drift. *Higher Education in Europe, 27*(4), 491-506.

MoRST. (2006). *Science for New Zealand: An overview of the RS&T system*: Ministry of Research Science & Technology, MoRST

MoRST. (2008). *Capitalising on Research and Development Action Group meeting minutes - April 2008*. Retrieved. from http://www.morst.govt.nz/business/crag/minutes/april-2008/.

MoRST. (April 2008). *Capitalising on Research and Development Action Group meeting minutes - April 2008*. Retrieved. from http://www.morst.govt.nz/business/crag/minutes/april-2008/.

Mowery, D. C., Nelson, R., Sampat, B., & Ziedonis, A. (2001). The growth of patenting and licensing by U.S universities: an assessment of the effects of the Bayh-Dole Act of 1980. *Research Policy, 30*, 99-119.

Mowery, D. C., Nelson, R. R., Sampat, B., & Ziedonis, A. (2004). *Ivory tower and industrial innovation*. Stanford, CA: Stanford University Press.

Nadler, D. A., & Tushman, M. L. (1997). *Competing by Design: The Power of Organizational Architecture*. New York: Oxford University Press.

Naidoo, R. (2000). The 'Third Way' to widening participation and maintaining quality in higher education: lessons from the United Kingdom. *Journal of Educational Enquiry, 1*(No.2), 24-38.

Naidoo, R. (2005). Universities in the Marketplace: The Distortion of Teaching and Research. In R. Barnett (Ed.), *Reshaping the University. New Relationships between Research, Scholarship and Teaching*. Berkshire, England: Open University Press, McGraw-Hill Education.

NCIHE. (1997). *Higher Education in the Learning Society*. London: National Committee of Inquiry into Higher Education (NCIHE)

Nelson, B. (2003). *Our Universities: Backing Australia's Future*. Canberra: Commonwealth of Australia.

Nelson, M., Banks, W., & Fisher, J. (2003). Improved Accountability Disclosures by Canadian Universities*. *Canadian Accounting Perspectives, 2*(1), 77-107.

Neu, D., & Wright, M. (1992). Bank Failures, Stigma Management and the Accounting Establishment. *Accounting, Organizations & Society, 17*(7), 645-665.

Neumann, R., & Guthrie, J. (2002). The corporatization of research in Australian higher education. *Critical Perspectives on Accounting, 13*, 721–741.

New Zealand Government. (2002). *Growing an Innovative New Zealand*. Retrieved 10/9/2009, from http://www.executive.govt.nz/minister/clark/innovate/innovative.pdf

Nordfors, D., Sandred, J., & Wessner, C. (Eds.). (2003). *Commercialization of Academic Research Results* VINNOVA Verket for Innovationssystem/Swedish Agency for Innovation Systems.

Norman, R. (2003). *Obedient Servants? Management Freedoms and Accountabilities in the New Zealand Public Sector.* Wellington: Victoria University Press.

O'Neill, O. (2002). *A Question of Trust*. Cambridge: Cambridge University Press.

Oakes, L. S., Townley, B., & Cooper, D. J. (1998). Business Planning as Pedagogy: Language and Control in a Changing Institutional Field. *Administrative Science Quarterly, 43*(1998), 257-292.

Oakes, L. S., & Young, J. J. (2008). Accountability re-examined: evidence from Hull House. *Accounting, Auditing & Accountability, 21*(6), 765-790.

OECD. (2002). *Benchmarking industry-science relationships*. Paris: OECD.

OECD. (2003). *Changing patterns of governance in higher education* Paris: OECD Publishing.

OECD. (2004). *On the Edge: Securing a Sustainable Future for Higher Education*: OECD.

OECD. (2004a). *Financial Management and Governance in HEIs: England*: OECD.

OECD. (2004b). *Financial Management and Governance in HEIs: Germany*: OECD.

OECD. (2005). *OECD Economic Surveys: New Zealand*: OECD, Paris.

OECD. (2007). *OECD Reviews of Innovation Policy: New Zealand*. Paris: OECD.

OECD. (2008). *Tertiary Education for the Knowledge Society - OECD Thematic Review of Tertiary Education*. Paris: OECD.

OECD. (2009). OECD Economic Surveys: New Zealand 2009. *OECD Economic Surveys 2009, 2009*(No.4), 1-151.

Oliver, C. (1991). Strategic Responses to Institutional Processes. *Academy of Management Review, 16*(1), 145-179.

Oliver, C. (1992). The antecedents of deinstitutionalization. *Organization Studies, 13*, 563-588.

Olssen, M. (2002). The restructuring of tertiary education in New Zealand: Governmentality, neo-liberalism, democracy. *McGill Journal of Education, 37*(1), 57.

Owen-Smith, J. (2003). From separate systems to a hybrid order: accumulating advantage across public and private science at research one universities. *Research Policy, 32*, 1081-1104.

Painter, M. (1997). Public Management: Fad or Fallacy? In M. Considine & M. Painter (Eds.), *Managerialism: The Great Debate* (pp. 39-43). Melbourne: Melbourne University Press.

Pallot, J. (1991). Accounting, Auditing, and Accountability. In J. Boston, J. Martin, J. Pallot & P. Walsh (Eds.), *Reshaping the State: New Zealand's Bureaucratic revolution* (pp. 198-232). Auckland: Oxford University Press.

Palmer, D. A., Jennings, P. D., & Zhou, X. (1993). Late adoption of the multidivisional form by large U.S. corporations: Institutional, political, and economic accounts. *Administrative Science Quarterly, 8*, 100-131.

Parker, L., & Gould, G. (1999). Changing public sector accountability: critiquing new directions. *Accounting Forum (Blackwell), 23*(2), 109.

Parker, L., Guthrie, J., & Gray, R. (1998). Accounting and management research: Passwords from the Gatekeepers. *Accounting, Auditing & Accountability Journal, 11*(4), 371-402.

Parker, L. D. (2002). It's Been A Pleasure Doing Business With You: A Strategic Analysis And Critique of University Change Management. *Critical Perspectives on Accounting, 13*(5-6), 603-619.

Parsons, T. (1956). Suggestions for a Sociological Approach to the Theory of Organizations--I. *Administrative Science Quarterly, 1*(1), 63-85.

Patton, M. Q. (2002). *Qualitative Research & Evaluation Methods* (3 ed.). Thousand Oaks, CA: Sage Publications, Inc.

Pettigrew, A. M. (1987). CONTEXT AND ACTION IN THE TRANSFORMATION OF THE FIRM. *Journal of Management Studies, 24*(6), 649-670.

Phan, P. H., & Siegel, D. S. (2006). The effectiveness of university technology transfer. *Foundations and Trends in Entrepreneurship, 2*, 77-144.

Phillips, N., & Malhotra, N. (2008). Taking Social Construction Seriously: Extending the Discursive Approach in Institutional Theory. In R. Greenwood, C. Oliver, K. Sahlin & R. Suddaby (Eds.), *The SAGE Handbook of Organizational Institutionalism* (pp. 702-720). London: SAGE Publications Ltd.

Pick, D. (2006). The Re-Framing of Australian Higher Education. *Higher Education Quarterly, 60*(3), 229-241.

Pilbeam, C. (2006). Generating additional revenue streams in UK universities: An analysis of variation between disciplines and institutions. *Journal of Higher Education Policy & Management, 28*(No.3), 297-311.

Powell, W. W., & DiMaggio, P. J. (Eds.). (1991). *The New Institutionalism in Organizational Analysis*. Chicago: The University of Chicago Press.

Powell, W. W., & Owen-Smith, J. (1998). Universities and the market for for intellectual intellectual property in the life sciences. *Journal of Policy Analysis and Management, 17*(2), 253-277.

Powers, J. B., & McDougall, P. P. (2005). University start-up formation and technology licensing with firms that go public: a resource-based view of academic entrepreneurship. *Journal of Business Venturing, 20*, 291-311.

Rasmussen, E., Moen, O., & Gulbrandsen, M. (2006). Initiatives to promote commercialization of university knowledge. *Technovation, 26*(4), 518-533.

Rinne, R., & Koivula, J. (2005). The Changing Place of the University and a Clash of Values. The Entrepreneurial University in the European Knowledge Society. A Review of the Literature. *Higher Education Management and Policy, 17*(No.3), 91-123.

Romzek, B. S. (2000). Dynamics of public sector accountability in an era of reform. *International Review of Administrative Sciences, 66*, 21/44.

Romzek, B. S., & Dubnick, M. J. (1987). Accountability in the Public Sector: Lessons from the Challenger Tragedy. *Public Administration Review, 47*(3).

Romzek, B. S., & Ingraham, P. W. (2000). Cross Pressures of Accountability: Initiative, Command, and Failure in the Ron Brown Plane Crash. *Public Administration Review, 60*(3), 240.

Rose, N. (1999). Inventiveness in politics. *Economy and Society, 28*(No.3), 467-493.

Rosenberg, N., & Nelson, R. (1994). American universities and technical advance in industry. *Research Policy, 23*(3), 323-348.

Rothaermel, F. T., Agung, S. D., & Jiang, L. (2007). University Entrepreneurship: a taxonomy of the literature. *Industrial and Corporate Change, 16*(Number 4), 691-791.

Rothwell, R., & Dodgson, M. (1992). European technology policy evolution: Convergence towards SMEs and regional technology transfer. *Technovation, 12*(4), 223-238.

Rowan, B. (1982). Organizational Structure and the Institutional Environment: The Case of Public Schools. *Administrative Science Quarterly, 27*(2), 259-280.

Salmi, J. (2009). The Growing Accountability Agenda: Progress or Mixed Blessing? *Higher Education Management and Policy, 21*(No.1), 1-21.

Schofer, E., & Hironaka, A. (2005). The Effects of World Society on Environmental Protection Outcomes. *Social Forces, 84*(1), 25-47.

Schumpeter, J. (1961). *The Theory of Economic Development. (Orig.1912)*. Chicago: Galaxy Books.

Science and Innovation Advisory Council. (2001). *New Zealand's Innovation Report Card: Lots of Potential, Can do Better*: NZ Government.

Science and Innovation Advisory Council. (2002). *Final Report from the Science and Innovation Advisory Council: New Zealanders Innovators to the World: Turning Great Ideas into Great Ventures: An Innovative Framework for New Zealand*: Science and Innovation Advisory Council. Retrieved from www.executive.govt.nz/minister/clark/innovate/siac-2.pdf retrieved 15/6/2009

Scott, W. R. (1987). The Adolescence of Institutional Theory. *Administrative Science Quarterly, 32*(4), 493.

Scott, W. R. (1991). Unpacking Institutional Arguments. In W. W. Powell & P. J. DiMaggio (Eds.), *The New Institutionalism in Organizational Analysis* (pp. 164-182). Chicago: The University of Chicago Press.

Scott, W. R. (2001). *Institutions and Organizations* (2nd ed.): Thousand Oaks, CA: Sage

Scott, W. R. (2003a). Institutional carriers: Reviewing modes of transporting ideas over time and space and considering their consequences. *Industrial and Corporate Change, 12*(4), 879-894.

Scott, W. R. (2003b). *Organizations: Rational, Natural, and Open Systems* (5th International ed.). New Jersey: Pearson Education Inc, Prentice Hall.

Scott, W. R., & Meyer, J. W. (1991). The Organization of Societal Sectors: Propositions and Early Evidence. In W. W. Powell & P. J. DiMaggio (Eds.), *The New Institutionalism in Organizational Analysis*. Chicago: The University of Chicago Press.

Scott, W. R., & Meyer, J. W. (1994). *Institutional Environments and Organizations: Structural Complexity and Individualism*. Thousand Oaks, CA: Sage Publications, Inc.

Selznick, P. (1949). *TVA and Grass Roots: A study in the Sociology of Formal Organization*. New York: Harper and Row Publishers, Incorporated 1966.

Selznick, P. (1957). *Leadership in Administration: A Sociological Interpretation*. Berkeley, CA: Harper and Row Publishers, Incorporated.

Seo, M.-G., & Creed, W. E. D. (2002). Institutional Contradictions, Praxis, and Institutional Change: A Dialectical Perspective. *Academy of Management Review, 27*(2), 222-247.

Shattock, M. (2005). European Universities for Entrepreneurship: Their Role in the Europe of Knowledge. *Higher Education Management and Policy, 17*(No.3), 13-25.

Siegel, D. S., Waldman, D., & Link, A. (2003). Assessing the impact of organizational practices on the relative productivity of university technology transfer offices: an exploratory study. *Research Policy, 32*, 27-48.

Simons, R. (1995). *Levers of control: how managers use innovative control systems to drive strategic renewal*. Boston: Harvard Business School Press.

Sinclair, A. (1995). The Chameleon of Accountability: Forms and Discourses. *Accounting, Organizations & Society, 20*(2/3), 219-237.

Slaughter, S., & Leslie, L. L. (1997). *Academic Capitalism. Politics, Policies, and the Entrepreneurial University*: The John Hopkins University Press, Baltimore.

Slaughter, S., & Rhoades, G. (2004). *Academic capitalism and the new economy: markets, state, and higher education*. Maryland, USA: The John Hopkins University Press.

Spicer, B., Emanuel, D., & Powell, M. (1996). *Transforming Government Enterprises*. Wellington: The Centre for Independent Studies.

Stake, R. E. (2005). Qualitative Case Studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage Handbook of Qualitative Research* (Third ed., pp. 443-466). Thousand Oaks, CA: Sage Publications, Inc.

Stanton, S., & Stanton, J. (2002). Corporate annual reports: Research perspectives used. *Accounting, Auditing & Accountability Journal, 15*(4), 478.

Statistics New Zealand. (2005). *Innovation in New Zealand*: Statistics New Zealand, Wellington

Statistics New Zealand. (2009). *Research and Development in New Zealand 2008*. Retrieved 17/9/2009. from http://www.stats.govt.nz/~/media/Statistics/Publications/Analytical-reports/Research-Development-in-NZ-2008/research-development-2008.ashx

Subramanian, R., Insley, R. G., & Blackwell, R. D. (1993). Performance and Readability: A Comparison of Annual Reports of Profitable and Unprofitable Corporations. *Journal of Business Communication, 30*(1), 49-61.

TEAC. (2001). *Shaping the Strategy: Third Report of the Tertiary Education Advisory Commission*. Wellington: Tertiary Education Advisory Commission.

TEC. (2003). *Collaborating for Efficiency: Report of the Steering Group*. Wellingtom: Tertiary Education Commission.

TEC. (2007). *Investment Guidance 2008-2010*. Wellington: Tertiary Education Commission.

Tesch, R. (1990). *Qualitative Research: Analysis Types and Software Tools*. Hampshire: The Falmer Press.

Thursby, J. G., & Thursby, M. C. (2002). Who is selling the ivory tower: sources of growth in university licensing. *Management Science, 48*, 90-104.

Tinker, T., & Neimark, M. (1987). The Role of Annual Reports in Gender and Class Contradictions at General Motors: 1917-1976. *Accounting, Organizations & Society, 12*(1), 71-88.

Tolbert, P. S. (1985). Resource dependence and institutional environments: Sources of administrative structure in institutions of higher education. *Administrative Science Quarterly, 20*, 229-249.

Tolbert, P. S., & Zucker, L. G. (1983). Institutional sources of change in the formal structure of organizations: The diffusion of civil service reforms: 1880-1935. *Administrative Science Quarterly, 23*, 22-39.

Treasury, T. (1987). *Government Management. A Report to the Incoming Government.* Wellington.

Tushman, M. L., & Anderson, P. (1986). Technological Discontinuities and Organizational Environments. *Administrative Science Quarterly, 31*(3), 439-465.

USHSC. (1998). *Unlocking our Future: Towards a New National Science Policy, a Report to Congress* US House Science Committee (USHSC). Retrieved from www.house.gov/science_policy_report.htm

Van De Ven, A. H., & Hargrave, T. J. (2004). Social, Technical, and Institutional Change: A Literature Review and Synthesis In M. S. Poole & A. H. Van De Ven (Eds.), *Handbook of Organizational Change and Innovation* (pp. 1-429). New York: Oxford University Press.

Van Looy, B., Ranga, M., Callaert, J., Debackere, K., & Zimmermann, E. (2004). Combining entrepreneurial and scientific performance in academia: towards a compounded and reciprocal matthew-effect? *Research Policy, 33*(3), 425-441.

Vincent-Lancrin, S. (2006). What is Changing in Academic Research? Trends and Futures Scenarios. *European Journal of Education, 41*(2), 169-202.

Vohora, A., Wright, M., & Lockett, A. (2004). Critical junctures in the development of university high-tech spin-out companies. *Research Policy, 33*, 147-175.

Waddell, D. M., Cummings, T. G., & Worley, C. G. (2007). *Organisation Development and Change* (3rd Asia Pacific Edition ed.). South Melbourne: Thompson Publishing.

Walsh, J. P., Hinings, C. R., Greenwood, R., & Ranson, S. (1981). Power and advantage in organizations. *Organization Studies, 2*, 131-152.

Webster, A., & Etzkowitz, H. (1998). Towards a theoretical analysis of academic and industry collaboration. In H. Etzkowitz, A. Webster & P. Healy (Eds.), *Capitalizing knowledge: New intersections of industry and academia*. Albany, NY: State University of New York Press.

Wellman, J. V. (2001). Assessing state accountability systems. *Change, 33*(2), 46-52.

Wessner, C. (2003). Major Trends and Mechanisms to Commercialize Research Results in the US. In D. Nordfors, J. Sandred & C. Wessner (Eds.), *Commercialization of Academic Research Results: Innovation Policy in Focus*: VINNOVA - Swedish Agency for Innovation Systems.

West, J. (2008). Commercializing open science: deep space communications as the lead market for Shannon Theory, 1960-73. *Journal of Management Studies, 45*, 1506-1532.

Willmott, H. (1995). Managing the academics: Commodification and control in the development of university education in the U.K. *Human Relations, 48*(9), 993-1027.

World Economic Forum. (2000). *The Global Competitiveness Report 2000*: World Economic Forum.

Wright, M., Lockett, A., Clarysse, B., & Binks, M. (2006). University spin-out companies and venture capital. *Research Policy, 35*, 481-501.

Wright, M., Vohora, A., & Lockett, A. (2004). The formation of high-tech university spin-outs: the role of joint ventures and venture capital investors. *Journal of Technology Transfer, 29*, 287-310.

Yerbury, D. (1997). *Ten Inter-related Imperatives for Change and Their Implications for Australian Universities Twenty Years Hence.* Paper presented at the The Global University: A 21st Century View, Second International Conference, RMIT, July. from

Yin, R. K. (2003). *Case Study Research: Design and Methods,* (Third ed.). Thousand Oaks, CA: Sage Publications, Inc.

Yin, R. K. (2009). *Case Study Research: Design and Methods* (Fourth ed.). Thousand Oaks, CA: Sage Publications, Inc.

Zapico-Goni, E. (2007). Matching Public Management, Accountability and Evaluation in Uncertain Contexts: A Practical Suggestion. *Evaluation, 13*(4), 421-438.

Zucker, L. G. (1977). The Role of Institutionalization in Cultural Persistence. *American Sociological Review, 42*(5), 726-743.

Zucker, L. G. (1987). Normal change or risky business: Institutional effects on the "hazard" of change in hospital organizations, 1959-79. *Journal of Management Studies, 24*, 671-701.