INSIDE THE INNOVATION MATRIX

FINDING THE HIDDEN HUMAN DIMENSIONS

Australian Business Foundation

ISBN 978-0-9804138-3-0

Australian Business Foundation (editors).
Inside the Innovation Matrix: Finding the hidden human dimensions

Includes bibliographical references.

Published by the Australian Business Foundation Limited
ABN 56 067 381 999
140 Arthur St North Sydney NSW 2060

To order Australian Business Foundation publications or download individual papers, go to:

www.abfoundation.com.au

Inside the Innovation Matrix Team:

Project leader:	Carolyn Evans, ThinkEvans Pty Ltd
Editing services:	Tony Spencer-Smith, Editor Group Pty Ltd
Designed & typeset by:	Kim Webber, Southern Star Design
Cover design by:	Mark Anderson, Mandos Design Pty Ltd

Printed and bound in Australia on paper made in Australia from sustainable forests.

INSIDE THE INNOVATION MATRIX

FINDING THE HIDDEN HUMAN DIMENSIONS

researcher | activist | futurist | thought leader | intelligence source

Contents

Stephen Mills

Stephen Mills is a corporate affairs and issues management specialist with more than 10 years experience in managing external relationships for leading financial services companies including ASX Ltd, Citigroup and Bankers Trust. Stephen previously served as a speechwriter to Prime Minister RJL Hawke (1986-91), was a journalist and editor in the Fairfax newspaper group, and has published two books. He is the Chief Executive Officer of ShareGift Australia, a non-profit group dedicated to promoting the no-cost sale of shares to benefit Australian charities, and lectures in Issues Management and Public Sector Leadership at the University of Sydney.

Narelle Kennedy

Narelle Kennedy is the founding Chief Executive of the Australian Business Foundation, and has extensive experience in both the public and private sectors around Australia. She is a member of Chief Executive Women, a Director of the Entrepreneurship Centre, a member of the Institute of Public Administration Australia and a Fellow of the Australian Institute of Company Directors. She previously held the statutory position of Superintendent of Weights and Measures in NSW, the first woman to do so. Narelle was awarded a Centenary Medal for service to Australian society through economic and industry policy research.

Foreword

Stephen Mills and Narelle Kennedy

Stephen Mills is the Chairman of the Australian Business Foundation and Narelle Kennedy is the Chief Executive.

The latest research project from the Australian Business Foundation delves into the human kaleidoscope of innovation. Going well beyond old-school, linear stories about a brilliant inventor or creative entrepreneur, this project seeks to understand the transformative power of innovation by exposing the hidden intricacies of individuals, their networks and their interactions – the human dimensions of innovation.

This book is not about innovation for its own sake. It is about how to drive innovation-led prosperity, to enable Australia to continue to be a great place to live, work and play.

Finding the hidden human dimensions of innovation

Innovate: *verb*, to create something new and valuable

In the lexicon of the Australian Business Foundation, our scholarship casts innovation very much as a process rather than an event. The active ingredient of that process is, undoubtedly, people.

Over a decade, innovation has been at the centre of the Foundation's research, so that it was a logical progression for our Research Advisory Committee to foster examination of the 'people factors' in innovation.

Recognising that the recommendation would be more complex than a single line of enquiry could address coherently, we instead made an open call for papers to be included in this compendium. By this collaboration, we have started a conversation to address the complex, sometimes chaotic, always creative role that human interaction plays in how people generate new economic value.

Axiomatic: *adjective*, taken for granted

We have found that if the human factor is the least secret ingredient in successful innovation, it is also the least well understood. That people are the most valuable assets of any business enterprise is axiomatic in the contemporary thinking of businesses, government and academe. But tackling the multifaceted character of the human dimensions of innovation, as well as the non-linear nature of innovation itself, is no simple task.

It has become evident from this research that the human dimensions of innovation are best placed against the backdrop of a wider 'innovation ecosystem', including elements as diverse as the financial and legal systems, universities and research institutions, government regulations and standards, and professional and industry norms and practices. This shows that human interactions and interdependencies are pivotal, not just the personal attributes of individual innovators, entrepreneurs or business leaders.

Synergies: *noun*, plural, things that are greater than the sum of their parts

Innovation drives productivity improvements, which are fundamental to economic growth without inflation and, thus, of sustained economic prosperity. Considering innovation-led prosperity puts the focus squarely on the economic and social benefits that come from innovating.

Innovation, however, is often mistakenly equated with new technologies, discoveries or inventions, or portrayed as simply embracing all forms of individual or organisational creativity regardless of whether new economic or social value is created. Instead, this research embraces the diversity, intricacy and potential for chaos inherent in innovating, along with its implicit synergies.

Collaboratively: *adverb*, (working) jointly with others esp. in an intellectual endeavour

We did not seek homogeneity in the papers in this book, nor even agreement with the views previously expressed by the Foundation. The authors have proceeded from divergent frames of reference, professional backgrounds and subject matter expertise. The intersections, and sometimes collisions, of ideas expressed provide an outcome all the richer for substantiating the level of intricacy inherent in the issue.

In fact, the project is a model of its own subject matter. Being a substantive departure from our established mode of research, its realization would not have been feasible for the Foundation without the active input of the contributors, the thoughtful project leadership from ThinkEvans and the specialist editing advice and assistance from Editor Group to augment the team resources of the staff of the Foundation.

Conversation: *noun*, exchange of observations, opinions, or ideas

In the coming months, members of the Foundation will have the opportunity to engage in discussions on the human dimensions of innovation via the Foundation's web site at www.abfoundation.com.au. We hope you will participate and contribute with your own anecdotes and analysis to the development of thinking around this crucial topic.

On behalf of the Australian Business Foundation, we take great pride in presenting this ground breaking project, and we look forward to continuing the conversation about harnessing the hidden human dimensions of innovation in Australia and around the world.

Carolyn Evans

Carolyn Evans CSC is the Managing Director of boutique management consultancy ThinkEvans Pty Ltd. As a multidisciplinary team, ThinkEvans specialises in strategic capacity building and complex problem solving for clients in the public, private and not for profit sectors. Prior to founding ThinkEvans, she was a senior corporate economist and general manager, as well as being on the boards of various commercial and not for profit entities. After an early career as an officer of the Royal Australian Air Force, Carolyn was awarded a Conspicuous Service Cross in 1994 for services to Defence logistics.

Tony Spencer-Smith

Tony Spencer-Smith is Training Director and Specialist Writer at Sydney corporate editorial consultancy Editor Group. He runs Editor Group's training division, which provides writing and media training to corporate and government clients. As well as giving regular business writing courses, he writes and edits speeches and other documents for senior executives. Prior to joining Editor Group, he was a senior journalist. Following an early career at several major South African newspapers, he was later a senior executive with Reader's Digest magazine, most recently as Editor-in-Chief of the Australia and New Zealand editions. He has also had two novels published, one of which won the leading literary prize in South Africa in 1992.

Carolyn Evans was the project leader for *Inside the Innovation Matrix*, and Tony Spencer-Smith provided specialist editing services.

Introduction

Tony Spencer-Smith

Tony Spencer-Smith is Training Director and Specialist Writer at Sydney corporate editorial consultancy Editor Group.

Delving inside the innovation matrix, this book probes well beyond the surface of a word that is ubiquitous in current commentary. The insights achieved are key to fostering innovation, which is itself crucial to both sustained prosperity and positive social outcomes.

Inside the Innovation Matrix

Innovation does not spring from nowhere. It is a process embedded in a creative matrix of human interactions which give it origin and form. This book explores those hidden human dimensions.

The word innovation is ubiquitous in modern business and political life. Every organisation projects itself as innovative; every country strives to be innovative to compete in a world changing at a dizzying pace.

While there are many definitions of the word, few would disagree with the working one that it represents the bringing into being of something new and valuable. In fact the concept of the new, the novel, is at the heart of the origin of the term.

Because producing something new is a creative act, the emphasis in the past has been on creative individuals and the discoveries of science and technology. In a relatively linear model, a white-coated researcher comes up with a powerful fact or idea, and this is eventually turned into new products for the market.

As this book will show, innovation is far broader and deeper than that. The actual products of innovation are merely visible signs of the usually invisible innovation matrix. This book is a tool to help Australian business and the country as a whole to mine the secret riches of that matrix.

New dawn for innovation

These are exciting times for innovation in Australia. The new Federal Government has signalled in a number of ways that increasing productivity is one of its priorities, and that innovation is a key to that. It has even embodied innovation in its departmental structure, giving it pride of place in the title of the new Department of Innovation, Industry, Science and Research.

One of the first things the new government did was to launch an expert review of Australia's national innovation system in early 2008.

Speaking in March 2008 at the *New Agenda for Prosperity Conference* at the University of Melbourne, Prime Minister Kevin Rudd said the review had the "goal of making the changes necessary to foster greater innovation in research and development and build a stronger culture of innovation in business."

Then there was the emphasis on innovation at the *Australia 2020 Summit* in April. The initial report of the proceedings said productivity growth required "a world-leading education and innovation system", and listed the establishment of a national institute for innovation and creativity as one of the "top ideas".

These government initiatives are helping to give new impetus to the many private sector moves to enhance Australia's innovative capabilities.

The hidden human dimensions of innovation

Of course creative individuals are important, and some valuable new things do reach the markets and our everyday lives through a rigorous linear process of research and development. But in fact innovation is rooted in collaboration, networks and knowledge sharing.

It is these hidden human dimensions of innovation on which this book concentrates. It seeks to probe beyond the obvious, to look at ways in which organisations can operate in order to become truly innovative.

This is a book written by senior academics, consultants and business people. But however eminent the reputations of the contributors, the emphasis is on the practical.

While many of the concepts explored are quite complex, we believe that in all these papers there are lessons, ideas and guidelines that can help those running companies to foster innovation that adds value. That is where the other part of our working definition of innovation comes in. We are not concerned here with innovation for its own sake, but with innovation that builds prosperity and positive social outcomes.

Dipping a foot into the ocean of innovation

Because the matrix in which innovation functions – both within organisations and between them, within countries and around the globe – is so multi-faceted, no attempt has been made to squeeze papers into certain categories or push a certain viewpoint.

In the vast innovation sea, many different creatures abound. If this book throws light on some of them it has done its job.

To use another metaphor, think of flying at great height. The scene far below sparkles and dances, different features catching the eye in turn. You might not grasp the whole complex tapestry, but important aspects of it leap out to enlighten.

Each of these 14 papers speaks with a different voice. Many deal with networking, because innovation is in many ways a social and not a technical process. Others are more focussed on the way companies are structured, on their interior innovation architecture.

Many draw on the lessons of successful companies, in one case tracing the path of a single successful invention, in others being based on studies of many Australian organisations.

As an example of the latter, in *Innovation in Winning Organisations in Australia: Myths and Realities*, Graham Hubbard reveals the innovation lessons of a 25-year study of 11 top-performing Australian organisations. These findings show that many conventional views on innovation are myths, and provide a practical guide to innovating successfully to overcome the barriers many companies face.

How networks can increase net worth

Networks, so much part of the innovation matrix, come in many forms, many of which are examined in this book. They facilitate that flow of ideas, knowledge and people which Alistair Nolan of the OECD has described as "the oxygen for innovation".

John Bessant in *Using Learning Networks as an Aid to Innovation*, reminds us that while innovation is a splendid competitive weapon, it is sometimes best fostered by collaboration. He says companies are increasingly coming together in learning networks to collaborate on a regional or technological basis. He emphasises the strong emerging strand of inter-firm learning, especially in supply chain development, and how such learning networks can be fostered.

Calling on organisations to cast the net even wider are Anand Kulkarni and George Bougias in *Australia's Diaspora Networks in the 21st Century: Winning the Hearts and Minds of the Overseas Innovation Class*.

They point out that Australia is well placed to capitalise on the increased international mobility of people that has led to a world of diasporas which have become an integral part of global knowledge flows. Up to now, they say, the emphasis in Australia has been on attracting skilled migrants, thus benefiting from the diasporas of other countries. This paper focuses on ways Australia can benefit from its own sizeable diaspora, such as drawing explicitly on the connections and networks of Australians abroad to forge long-term trade, investment and innovation linkages.

Mark Matthews and Bob Frater, in *How Intangible Networks Can Boost the Innovation Odds*, underline another type of network by telling the gripping story of how Radiata Communications beat international competition to the development of a new local wireless network, culminating in Radiata being bought by Cisco Systems for A$567 million.

Like many companies striving to develop a truly new product, Radiata had to take on overwhelmingly low odds of success. It seemed irrational on their part, but they managed to reduce those cruel odds partly through tapping into the valuable knowledge built up by the radio astronomy and electronic engineering communities in Australia.

The authors say researchers and policy makers should not underestimate the value of intangible, informal networks like these in making such innovation processes possible,

even though the networks are hard to identify. The right balance needs to be found between these intangible networks and the formal legal and organisational structures that are also necessary to conduct research and innovation.

Other networks are geographical in nature, says Marcus Spiller in his intriguingly-named paper *Innovation: Your Place or Mine?* His argument is that the potential for innovation in a country is not evenly spread. One could draw up a map with certain areas marked as primary innovation nodes, because these are the areas serviced by the advanced business services that are important for innovation. He warns that to avoid a situation where few places besides Sydney and Melbourne can be innovative, a proactive policy approach is needed.

Then there are John Steen, Sam Macaulay and Tim Kastelle in *New Tools to Map and Manage Innovation Networks*. Their contribution is to emphasise that networks are not uncontrollable things which just happen. The powerful diagnostic tool of social network analysis, they say, means that executives and policy-makers can manage networks methodically, measuring the effectiveness of their efforts rather than using intuition and guesswork.

While most papers emphasise the complex ecology of innovation, one acts as a counterpoint by reminding us that there is still a vital role for brilliant individuals; for scientists and technologists able to mine the ore of reality for the truly new; for spending money on research.

The Heroes of Innovation? Scientists and Technologists in Australian Business, by Jane Marceau, Tim Turpin and Richard Woolley, based on research by the authors into the careers of more than 500 Australian scientists, states that they suspect that many are being lost to research at a time when they could be scientifically most productive.

Australia does not have a particularly strong record of innovation through research, and can ill afford such a loss. If you compare us with many other countries in terms of such measures as patents generated, we do not shine. So there would be definite value in spending more to ensure a strong population of scientists and technologists in business.

At the same time, it is worth emphasising that Australia's relatively low rating in the formal innovation stakes does not mean that we are not an innovative nation. The Australian Business Foundation's research over 10 years has shown that Australia has a strong record of innovating through problem-solving, through learning by using technology and through working with others.

This is the sort of approach emphasised in most of these papers, and it means Australia is well-placed to establish an even stronger matrix of innovation.

Rewiring organisations for innovation

How should organisations be structured so as to be consistently innovative? What DNA does an organisation need to be able to break the mould, to slip the surly bonds of repetition? A number of the papers look at different ways to do this.

Deloitte is a company well known for its innovative practices. Seeking to steal a march on its competitors, it has reinvented itself – in itself a process of bold innovation. Two of the papers in this book were written by Deloitte people.

Gerhard Vorster and Jenny Wilson tell us *How Deloitte Embedded Innovation in its DNA*. They say that nothing less than transformation at every level of an organisation is needed to foster innovation: attracting talented individuals and giving them the freedom to be different; setting up bold teams that cut across bureaucratic structures; and redefining relationships with customers, suppliers and competitors.

In the second Deloitte paper, *Learning from the Market in Triple Time*, Mehrdad Baghai, Giam Swiegers and Rebecca Watson describe the development of a highly innovative form of sales campaign designed to learn from the market. These Intensive Learning Campaigns have shown how complex organisations operating in mature markets can rapidly adapt and grow, innovating on the basis of what the market signals it actually needs.

Managing for innovation

What can managers do to foster innovation? According to *Managing the Innovation Faultline* by Verity Byth and Ross Honeywill, it is vital to take into account that there are two completely different types of employees.

They say seven years of Australian workplace profiling research have revealed that while some employees are natural innovators drawn to challenge, change and innovation, others are natural stabilisers drawn to hierarchies and the status quo. Using this simple yet powerful tool, managers can ensure that both types are able to give of their best and contribute to an innovative environment.

Factors Behind Successful Creative Project-Based Teams, by Leslie Butterfield and Dafydd Wyn Owen, is one of two papers which deal with the importance of project management. The authors give their recipe for building project management teams that break out of the tired old ways of doing things and come up with innovative solutions.

The other paper which explores this theme is *The Human Factor in Innovation Project Portfolio Management*, in which Catherine Killen, Robert Hunt and Elko Kleinschmidt show how project portfolio management capabilities can improve innovation decisions and outcomes. They present findings from a recent study of six successful Australian

organisations that highlights the importance of human dimensions in the establishment and evolution of these capabilities.

Karen Becker and Paul Hyland remind managers that innovation is as much about people unlearning set ways of doing things as it is about learning new ways to do them. In *Overcoming Barriers to Innovation by Facilitating Unlearning* they present a model to help managers oversee this neglected aspect of innovation at both the individual and group level.

Finally, every book like this needs a wild card. One of the papers, Oliver Freeman's *People, Scenarios and Innovation*, defies any kind of categorisation. Fizzing like a fistful of firework, it throws out a range of ideas, calls for radical new thinking and challenges fundamental premises.

Freeman's emphasis on scenario planning demands of innovators that they look at the alternative future worlds or environments they may have to encounter, thus paradoxically learning from the future and letting this influence the strategic innovation they create for their businesses and organisations today.

Always something new out of Australia

In its essence, this is a book about the ecology of innovation.

Scientists realised they understood little about the natural world without taking into account the complex web of life. The same is true of innovation. Think only of specific innovative acts, and the world of human interaction behind it will remain concealed.

We hope this collection of papers will help to bring those hidden human dimensions into the limelight, and make a contribution to Australia's goal of becoming a world leader in innovation.

GRAHAM HUBBARD

Professor Graham Hubbard is Professor of Strategic Management at the Adelaide University School of Business. Graham was previously Head of School of the Graduate School of Business. He has also been Professor of Strategic Management at Mt Eliza Business School, Visiting Professor at the Carlson School of Management, University of Minnesota, and Head of the Marketing Group at RMIT University. He has a private consulting practice in strategic management for major organisations in Australia. Graham is the author or co-author of numerous books on strategic management and thinking, as well as three books of case studies of real organisations designed for MBA and executive programs. Graham's particular research interests are in understanding the nature of 'successful' organisations, organisational performance measurement, sustainability reporting, corporate diversification and mergers and acquisitions.

Innovation in Winning Organisations in Australia: Myths and Realities

Graham Hubbard

Professor Hubbard is Professor of Strategic Management at the Adelaide University School of Business.

A 25-year study of 11 top-performing Australian organisations has revealed valuable innovation lessons for companies wanting to emulate them. These findings show that many conventional views on innovation are myths, and provide a practical guide to innovating successfully, overcoming the barriers many companies face. By using a broad definition of innovation and by getting the whole organisation geared for change, Australian companies can greatly improve their innovative capacity.

Introduction

The results of my 25-year study of 11 high-performing organisations in Australia from 1980 to 2006 (Hubbard et al., 2007) gives insights into innovation practices in these organisations. Since these organisations have been high performers over such a long period, their innovation practices bear consideration as role models for others.

The practices of these high-performing organisations do not agree with the conventional wisdom – the myths – that innovation is largely technically driven, product-oriented and limited to R&D departments. On the contrary, the findings – the realities – suggest that innovation is a state of mind, strongly linked to the value systems, supported through normal systems and processes and expected to occur throughout the organisation in all its activities. In particular, adaptability and collaboration were identified as key values and behaviours in innovation practices.

This paper begins by considering what innovation means in practice compared with the theoretical myths. The innovation practices of the 11 high-performing organisations are then outlined. Barriers that limit organisations from becoming more innovative are considered. The paper concludes with some practical recommendations for organisations seeking to overcome those barriers.

What is innovation?

Green (2007) defined innovation as:

> *doing new things or doing things in a new way: drawing on knowledge and creativity to add value in products and processes. (pp 50–57)*

This is a wider definition than simply 'doing new things' and specifically includes processes as part of the innovation spectrum. Innovation was seen as having three components:

- A technical component: this corresponds to the traditional definition of innovation as a significantly new product or service. This is the easily measurable and observable component of innovation.
- An organisational component: this reflects the process component, which is less easily observable and measurable to those outside the organisation but which, nonetheless, can have just as big an impact as technical components. It picks up the fact that more than two-thirds of innovation in Australia is non-R&D focused.
- An institutional component: this suggests that the external environment will strongly influence the innovation capability that is built within an organisation. It suggests that organisational attitudes to innovation – and therefore the amount of innovation that occurs – will be influenced by the nature and position of the indus-

try (e.g. entrepreneurial, start-up, mature, technological, commodity) and by the level of industry and government support for innovation in that industry.

In an early Australian study, Carnegie et al. (1993) also took a wide view of innovation. They defined it as:

> *something that is new or improved done by an enterprise to create significantly added value either directly for the enterprise or indirectly for its customers. (p 3)*

Studying 120 businesses in Australia, they classified innovation into six categories:

- technological breakthroughs,
- providing new and improved products and services,
- creating better processes,
- combining process and product innovation,
- continuous product and service improvements, and
- across the board improvements.

The first two constitute the traditional 'technical' view of innovation, but the last two cover more incremental and more broadly based operational improvements, including processes, within the organisation.

The Business Council of Australia (2006) studied nineteen cases of innovation. While not defining innovation, they noted that there were widely different views held by organisations about what it constituted. They also noted that innovative activity extended across all parts of the organisation and was not limited to conventional R&D. Like Carnegie et al. and Green, this perspective also takes a wide view of innovation and draws attention to the different perspectives held within the business community about innovation.

The study of the 11 high-performing organisations in Australia (Hubbard et al, 2007, hereafter called 'the First XI' study) concluded that 'innovation in Australia is not generally big bang/big idea innovation' (p 100). It found that innovation by the First XI included:

- borrowing ideas from overseas,
- process innovations, and/or
- product and service innovations.

The organisations separated innovation from continuous improvement, though they saw them collectively as part of an element of their winning wheel framework – adapt rapidly – suggesting a close relationship between the two and the importance of both for high performance.

These definitions and conclusions have in common a broad view of innovation, a view that includes continuous/incremental improvement activities and activities that occur across the whole of the organisation. Not one of the organisations identified the 'breakthrough' innovations (conventionally thought to constitute innovation) as having a significant part in the innovations studied.

Why the gap between myth and reality?

Why is there such a gap between the myth of innovation as a breakthrough or big bang product or service and the reality of innovation evidenced in these different analyses in Australia?

One obvious reason is that, by limiting innovation to breakthrough products and services, very few organisations can imagine themselves as being innovative. Yet, evidence suggests that innovative organisations perform better than non-innovative ones (e.g. Frost and Sullivan, 2006; IBM, 2006). Therefore, by taking a wider view of innovation to include process innovation and incremental improvement, organisations can help everyone see themselves as potentially being involved in this important activity of innovation. The organisation can stimulate and utilise the creativity of all its people, rather than limiting this potential to those in a small, specialist department such as R&D.

The other reason is that much of the innovative activity actually observed is not product- or service-based. Since many of these other activities are clearly seen as important in improving organisational performance, formally including them in innovation seems appropriate.

Innovation in winning organisations in Australia

Practices of the First XI organisations suggest that they take this wider approach and benefit from it. The First XI study found virtually no breakthrough innovations in products or services in any of the eleven organisations in the 25 years studied. Yet it found many examples of innovative behaviours that had major effects on the performance of those organisations. The study classified innovation into three categories: borrowing from overseas, process innovations and product and service innovations. We consider each below.

Borrowing from overseas

While taking an idea from overseas is not a breakthrough innovation, if the product, service or process introduced into Australia is a first, it will have the same effect in the local market as if it were a local innovation. Indeed, this borrowing process may well account for why Australian businesses are relatively low spenders on R&D. If you can

find an idea overseas that works and then introduce it to the local market, why spend the investment on R&D yourself?

For instance, Brambles' development of its Cleanaway rubbish solutions business began in a chance visit to the backblocks of a small US state during which the now-familiar wheely bins, which could be emptied automatically by a truck's mechanical arm, were discovered. Brambles had a garbage disposal system for industrial companies and saw the wheely bins as having potential in Australia. The development by Cleanaway of a wide variety of wheely bin solutions has resulted in a major international business.

Brambles' development of its CHEP pallet company came after the concept was introduced to Australia by the US Navy, which developed the system for unloading ships more rapidly during the Second World War. Brambles bought the system from the Australian government after the war, and developed the idea to the extent that it is now the world leader in pallet management systems; hardly a technologically complicated product, yet one on which a global business is based!

Another example is Qantas' development of low-cost airline Jetstar. This is very innovative for Qantas, a full-service airline. Indeed, no major full-service airline in the world has been able to develop a low-cost airline while maintaining its full-service operation. Yet, the idea of a low-cost airline was developed first by SouthWest Airlines in the US many years ago and then successfully developed by Ryanair in Europe, though many other low-cost airlines failed. Qantas learnt from those failures how to avoid the problems that full-service airlines had previously had with developing low-cost airlines. Yet it was far from a breakthrough innovation.

Another example is Woolworths' technological link to Walmart. Woolworths pays Walmart a fee to access its technology. Thus, many innovations at Woolworths come from initial research and development by Walmart. The close relationship between the two organisations has been further strengthened by recently retired Woolworths CEO Roger Corbett being appointed to the Walmart board of directors.

Process innovations

Innovations in processes, which similarly lead to significant increases in organisational performance such as higher growth, better efficiency or service, or better profitability, are just as important as product and service breakthroughs, but are much less focused on.

One of the best and most difficult process innovations by the First XI was Rio Tinto's fundamental reshaping of managerial roles and responsibilities, based on the decision-making principles of UK academic Elliot Jacques. Rio was concerned about its very poor industrial relations and the consequent effects on costs and profits. These were common throughout the mining industry at the time. Rio decided that it needed to take

managerial control of operations and develop better relations more directly with the employees whom they supervised, rather than letting unions and industrial relations courts impose general industry ways of operating.

Over a course of 15 years, location by location, by restructuring its management system, carefully allocating roles and responsibilities, training managers and employees and changing remuneration structures, Rio (in the face of great resistance from many quarters) changed the nature of employment practice and relationships in its organisation. It gained great productivity benefits and profit improvements, while also rewarding employee performance and obtaining much greater control and certainty over deliveries and customer satisfaction.

In 2007 Rio was working on two other major process innovations: the 'mine of 2020' (an environmentally sustainable mine), and block caving (a process of creating large open spaces in underground mining rather than the tunnels of today, thought to be important for the deep underground mines expected in the future).

Other examples of major process innovations in the First XI study include:

- Macquarie Bank's allocation of a specified proportion of pre-tax profit for bonuses for all its employees, thus aligning employee and organisation incentives and motivations.
- Harvey Norman's franchise system, whereby the franchisor provides a wide range of centralised services, including cash management and control to the franchisee.
- Lend Lease's development of the project management technique and of the strata title system, thus enabling property rights to be allocated to air space above the ground, enabling the development of apartment buildings in NSW.
- Westfield's processes for redeveloping shopping centres (as opposed to building new centres), which involves all building specialists upfront in the planning phase to maximise the cross-fertilisation of ideas and opportunities to see problems before the actual work begins.

These are at the heart of the success of the performance of each of these organisations. Yet each innovation is little understood because it is not a clear product or service that can be observed externally or which is sold directly to customers.

Product and service innovation

The third aspect of First XI innovation is the traditional perspective of product and service innovation. However, the examples of innovative practice from the First XI that fit into this category are incremental in nature rather than breakthroughs.

For instance, Macquarie Bank provides a host of examples. It developed the first Cash Management Trust, pioneered listed and unlisted infrastructure investment trusts and

expanded them into a wide range of infrastructure products such as airports, toll roads, tunnels, ferries and utilities.

The Salvation Army has consistently added new services, including a Problem Gambling Unit; water relief for drought-stricken farmers; a Youthworx community radio station as a training ground and employment avenue for unemployed young people; and Employment Plus, its business unit entry into the general unemployment market.

Product and service innovation at Woolworths has been about adding products and services that already exist elsewhere, such as petrol retailing, banking services, liquor chains, hotels and the expansion of Dick Smith's Electronics into superstore format.

What we do not see in First XI innovations are the breakthrough innovations, such as the iPod, iPhone, Xbox, mobile phone, laptop computer and drugs such as Viagra, which we associate with traditional concepts of 'innovation'. We do have such breakthrough innovations in Australia (e.g. Cochlear ear implants, MYOB business software, Biota's anti-influenza drug Relenza), but these are mostly in new entrepreneurial start-ups rather than large mature organisations.

Perhaps we do not see these in large successful organisations in Australia due to our small market size, the costs of commercialisation, the lack of commercialisation skills or our remoteness from large markets. Nevertheless, what is clear is that a very wide range of important, value-adding innovation occurs in high-performing Australian organisations. These innovations enable them to outperform competitors and go international, both of which are key expected outcomes for organisations now and particularly in the future.

The role of adaptability in the innovation process

One of the nine elements of the winning wheel for Australian organisations in the First XI study was found to be the ability to adapt rapidly. Adapting rapidly was found to result from understanding the need for speed (without losing control), coupled with the need for strategic and operational flexibility, which was seen to require continuous improvement and innovation (see Figure 1).

Thus the First XI study found that in order to be adaptable, an organisation needed to both innovate and continuously improve. Further, the organisations adapted quickly, indicating the importance of speed, a factor we are painfully aware of now with the ubiquitous use of the Internet to communicate information all over the world instantaneously and conduct transactions at any time.

Keeping the strategy and operations somewhat flexible helps to allow rapid innovation. For instance, Macquarie Bank has expanded products and services internationally

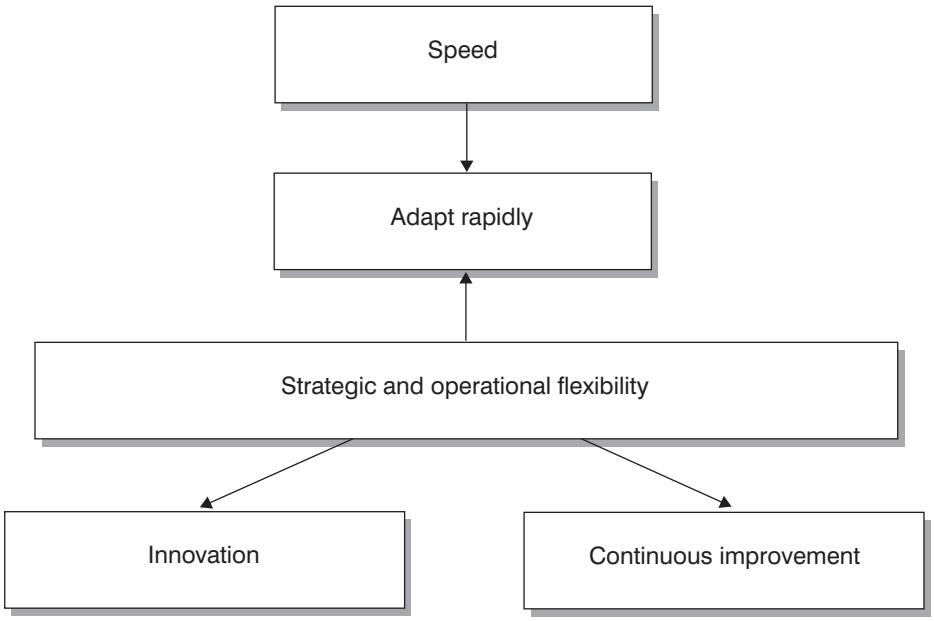


FIGURE 1: Factors behind adapting rapidly in winning organisations in Australia

by sending someone into a country to live from a hotel for some months while establishing whether or not there is a possibility of building a viable business there. If sufficient progress is made, the commitment is upgraded. If not, the person is brought back. This results in little investment up front and means ideas outside the existing strategy can be explored easily and quickly.

Continuous improvement is of course the ultimate in adapting. Whether or not continuous improvement constitutes innovation is unclear and seems to depend on the scale of the improvement. However, establishing continuous improvement as a goal encourages people in all parts of the organisation to find ways to improve their operations, improve their efficiency and find new sources of revenue.

The report *Backing Australia's Ability* (2004) noted that the roles of people and their interactions were critical for innovation. The more people interact, the more likely continuous improvement – and innovation – will occur. The First XI study found many ways in which continuous improvement was fostered through:

- creating a culture of change,
- having a customer focus,
- having growth as a driver,
- having a clear view of a desirable future,
- being dissatisfied with the current level of performance,

- having good people,
- having good systems,
- having a cost focus, and
- planning for continual upgrading.

In terms of speed, when Westfield considers purchasing other retail centres, it immediately considers what changes it can make to improve performance for customers, retailers and its shareholders. As soon as the transaction is finalised, it immediately begins the process of redevelopment. As Chairman and co-founder Frank Lowy said in a 2000 biography:

> *We eat, sleep and talk business. This is not an eight hour a day commitment. We are at it 24 hours, on the weekend too. The business hovers over us constantly.*

Similarly, Qantas established and began operating Jetstar in less than 12 months, almost completely independently from Qantas' existing operations, with costs lower than its focused low-cost competitor, Virgin.

THE ROLE OF COLLABORATION

Another myth concerning innovation is that it is about a brilliant individual, working alone, who comes up with a good idea. US examples of Steve Jobs at Apple, Jeff Bezos at Amazon, and Larry Page and Sergei Brin at Google come quickly to mind. In practice, the First XI study found none of this in Australia. Instead, through another key element of the winning wheel, a practice identified as 'looking out, looking in', First XI organisations are externally focused in a number of ways (see Figure 2):

- They are focused on customers.
- They work with other organisations.
- They are focused on the future.
- They are thinking outside Australia.
- They have a sense of community responsibility.

In terms of innovation, working with other organisations is the most obvious example of the importance of collaboration, but all of these practices require some collaboration with other groups to achieve the sense of 'looking out'.

Working with other organisations included, particularly, working with partners, working with suppliers and working with governments and regulators (see Figure 3). Of these, working with partners is the most obvious link for innovation. For instance, while Macquarie Bank is widely admired for its new product and service developments, most of Macquarie's activities involve working in a joint venture with

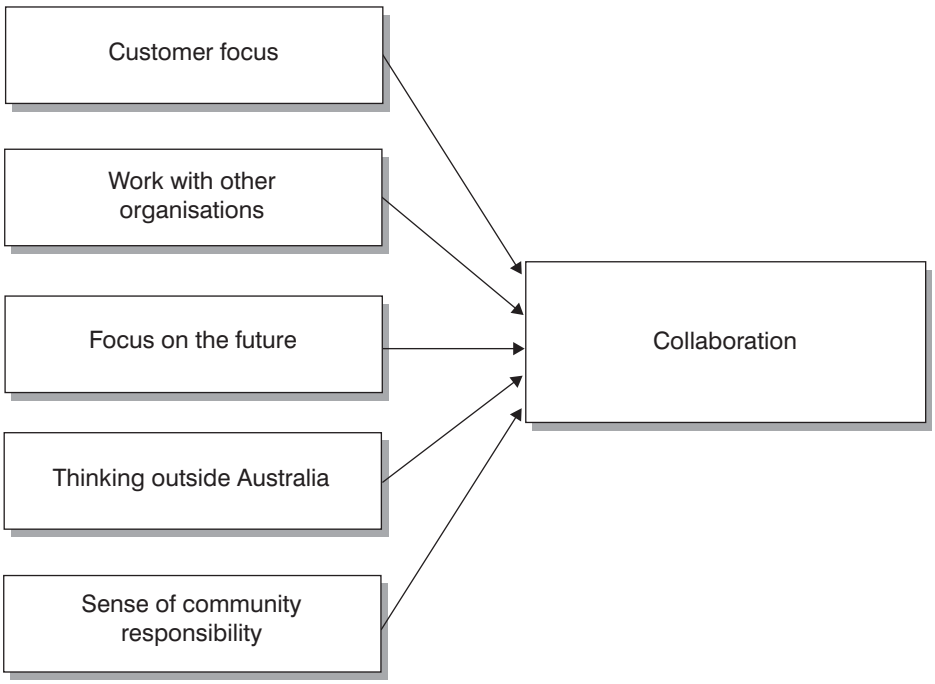


FIGURE 2: Factors behind collaboration in winning organisations in Australia

one or more partners. Macquarie Bank believes that its progress is limited by the shortage of good creative and innovative people. Its own employees are therefore encouraged (and rewarded) to identify high performers working in partner organisations (a good way to see what actual performance is like without incurring any cost) and then suggest they consider bringing their talents and creativity to Macquarie Bank.

Lend Lease provides other examples. It worked successfully with funds manager MLC and property trust investor and manager General Property Trust (GPT) for over 30 years to successfully develop proposals of value for each partner. Indeed, GPT was originally set up by Lend Lease to ensure that Lend Lease had a regular buyer of and manager of the major commercial properties that it developed, innovatively reducing the risk involved in the development process.

In 2007, Lend Lease was working in large-scale collaborations with BP (service station development), Brambles (airport privatisation), John Lewis (building and construction – UK), Mirvac (building and construction – Australia), Prudential (investment – Australia), Vanguard (investment – international) and Maple-Brown Abbott (investment – international) amongst others, aiming to develop more efficient and innovative processes in a wide variety of its activities.

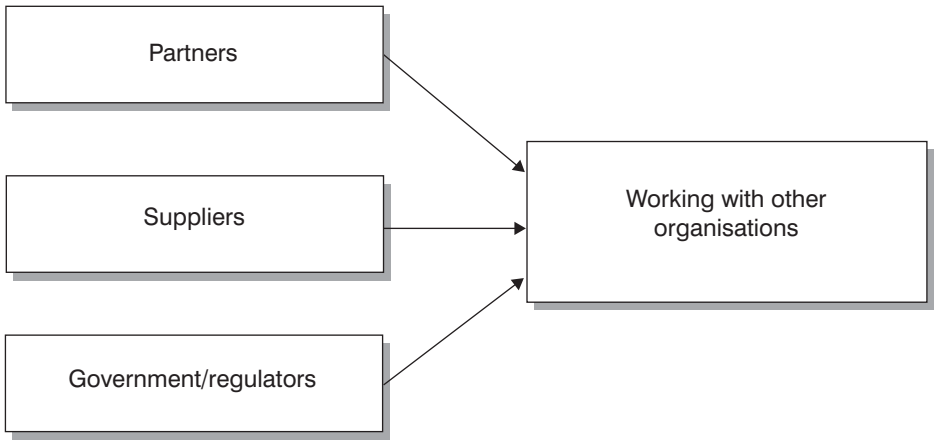


FIGURE 3: Working with other organisations

These First XI findings about the importance of working with others to innovate are supported by other research. For instance, Frost and Sullivan (2006) found that extensive collaborators outperformed in both growth and profitability. They also found that business performance is improved by collaboration, strategic orientation and market opportunities. They concluded that collaboration was much more significant in impacting performance than either strategic orientation or market opportunities. Similarly the Department of Industry, Tourism and Resources (2006) found that collaborators had a much greater chance of achieving truly 'new' innovation.

Barriers to innovation

From the above descriptions of successful practice, many barriers to innovation will be clear. These include:

- *Organisations have a narrow view of 'innovation'.* A survey by the Australian Bureau of Statistics (2006) suggested that only 35% of organisations undertook any form of innovation at all! A likely reason for this is that many organisations don't see themselves as being innovative or see that innovation applies to them or their industry. For instance, organisations in mature industries may well feel that the chances of innovation are small, and so do not attempt it.
- *Organisations misunderstand the importance of innovation.* While we have quoted findings above to support this, these are recent and are not yet widely disseminated. In the organisations to which I consult, although innovation seems to have arrived on their radar, few feel any real opportunity to innovate or reflect any understanding that innovation – and consequent organisational change – are important drivers for future growth and wellbeing.

- *Organisations are inwardly focused.* Many organisations are simply concerned with trying to manage their day-to-day operations to make themselves efficient. They do not see the opportunities to learn from what is going on internationally or in other industries.
- *Organisations are short-term focused.* An organisation focused on the short term will have trouble considering investments that will take a long time to bear fruit, particularly if those investments (e.g. those of a breakthrough nature) are seen as highly speculative and risky. Many listed organisations think the share market is short-term oriented, so managers act this way as a result. Organisations with a short-term focus will be unlikely to want to invest for the future, making investment for even continuous improvements likely to be reactive rather than proactive.
- *Organisations don't value continuous improvement or innovation.* Many organisations are now including either or both of these terms in their corporate values statements, to reflect the perceived importance that they have for future operations. However, many remain focused on short-term and financial performance, without seeing that lack of a change-oriented focus can be detrimental in the longer term.
- *Organisations are too slow to act.* Even if they start to develop innovative opportunities, the moment is lost through being too slow. Experiencing this loss once may well be sufficient to convince them they cannot follow identified opportunities in the future.
- *Organisations don't know how to innovate.* Many organisations realise innovation is a good thing, but do not know how to set up the climate internally to encourage innovation to flourish or what tools and techniques they should use to become innovative.

The issues identified above relate to the organisation's own areas of control – their attitudes, values, systems and processes throughout the organisation (see Figure 4). However, Green (2007) argued that organisational innovation is also impacted by its institutional context. The context that the organisation finds itself in can constrain its innovation attitudes and practices. For instance, institutional and contextual reasons for low levels of innovation can include:

- *Organisations are not exposed enough to competitive forces.* Organisations which have quasi-monopolies (e.g. government bodies, government business enterprises, geographical monopolies, utilities) may not see the need to add value when there is little or no competition. Therefore they underinvest in innovation. This will work unless the organisation suddenly finds itself facing competition, at which time its lack of competitive instinct will be painfully exposed.
- *The government is not supportive.* In industries where there is little government support, it may be argued that organisations will be less inclined to be innovative. However, this seems a weak argument. Waiting for government support is hardly conducive to the innovative climate that high-performing organisations seek to achieve. Further, government agendas and processes may not fit the needs of the

Attitudes:

Narrow view of innovation
Underestimates the importance of innovation
Inwardly focused

Values:

Short-term focused
Don't value innovation or continuous improvement

Systems and processes:

Too slow to act
Don't know how to innovate

FIGURE 4: Organisational barriers to innovation

organisation and can cause it to distort its activities by doing things simply to obtain government funding.

How to improve innovation output

There is no magical silver bullet for innovation. Nevertheless, by undertaking a wide variety of small changes in attitudes, values and actions, any low-innovation organisation should be able to significantly change its innovation output. The following recommendations address the major barriers outlined above (see Figure 5).

In terms of attitudes, organisations can:

- *Take a wide view of what constitutes 'innovation'.* In particular, by including continuous and process improvements in the definition of innovation, all organisations ought – in their planning processes and the attitudes that underlie them – to be able to say they have innovative actions under way for the future. By taking this wide view, the organisation becomes more open to the world, a factor seen to be important in highly innovative organisations. (Chesborough, 2003, found innovative firms were more open than others.)
- *Understand the importance of innovation for the future of the organisation.* Standing still cedes new ground to competitors. Organisations need to be thinking about how to grow. Growth often requires change, particularly if the organisation seeks to outgrow its competitors. Innovation represents an important opportunity for change throughout the organisation and thus represents a significant mechanism for ensuring the future of the organisation. With this new understanding, an increased emphasis on innovative activities must follow.

Attitudes:

Take a wide view of innovation
Understand importance of innovation

Values:

Value innovation
Value continuous improvement
Value speed
Value change

Actions:

Focus outward
Think and act longer-term
Develop/buy innovation training and development activities
Make organisational innovation someone's specific responsibility
Change the measurement and reward systems

Organisational context:

Seek external support

FIGURE 5: Overcoming barriers to innovation

- *Specifically valuing innovation and continuous improvement.* Including innovation and continuous improvement in the formal values of the organisation explicitly recognises that the organisation sees them as important, indeed fundamental, to the future of the organisation.

In terms of values, organisations should:

- *Value speed.* Many organisations are simply too slow in their analysis, decision-making and implementation to be effective innovators. Speed is important! Organisations should benchmark against competitors and find ways to increase response speed.
- *Value change.* Many people value the current status quo. They do not want change. Yet change is essential for innovation. Find ways to promote the value of change and celebrate the outcomes of successful change initiatives.

In terms of actions, organisations can:

- *Focus outwards.* By taking specific actions to become aware of industry and world trends (e.g. by attending conferences, visiting other organisations, gathering, reading

and analysing external information), many new ideas are bound to be raised. Choosing the best of them may well have a significant effect on the organisation's own innovative output. Australians are regarded as highly adept system integrators (Barlow, 2007, pp 58?65). Taking external ideas from a variety of sources and integrating them for the benefit of a particular organisation is a popular method of Australian innovation.

- *Think and act (a bit) longer-term.* Another myth is that organisations are assessed solely on their short-term results. Of course these matter, but the lack of a good long-term perspective is also taken into account by leading analysts. Ensuring that there is a pipeline of specific activities that will have medium- and longer-term impacts helps develop an innovative organisation.
- *Develop or buy-in a series of innovation training and development activities.* Many consulting organisations specialise in innovation frameworks. Try one or two. The initial investment, perhaps in a public or pilot program, will be low, but the signal within the organisation will be clear: innovation matters now.
- *Make innovation the responsibility, firstly, of an individual or group,* gradually broadening it out over time to become part of everyone's job (at least in terms of continuous improvement). While starting with a specialised department or group flies in the face of much of successful practice, someone or a small group needs to be responsible to get action going and then broaden the responsible group until innovation is embedded throughout the organisation.
- *Change the measurement and reward systems to include recognition for innovation and continuous improvement outcomes.* If values have been changed, aligning the measurement and reward systems to this will be important. Even if not, the focus on measurement ('what is measured is actioned') will ensure that some new action takes place. Trying to ensure the right things are measured and then rewarded becomes the next step.
- *Seek external support.* Work in alliances or joint ventures with organisations with similar or complementary interests. Seek funds from government. Many government programs and subsidies exist to encourage the development of innovation in organisations. But beware of undertaking certain activities just because government is rewarding them. The activities must align with business and corporate objectives if the innovative activity is to be appropriate for organisational success.

Conclusion

The reality of innovation is that attitudes, values, systems and processes that encourage and support innovation are important in high-performing organisations. Taking a broad view of what constitutes innovation, expecting everyone in the organisation to contribute and designing processes and systems to align behaviour to these attitudes and values will increase the innovative output of most organisations and align them more with the practices of high-performing organisations like the First XI.

References

Australian Bureau of Statistics and Department of Industry, Tourism and Resources (2006), *Patterns of Innovation in Australian Businesses*, Australian Government.

Australian Government (2004), *Backing Australia's Ability – An Innovation Action Plan for the Future*, Australian Government.

Barlow, T (2007), 'Australia's Capability for Systems Integration', Committee for the Economic Development of Australia, CEDA Growth 58, July.

Business Council of Australia (2006), *New Concepts in Innovation: The Keys to a Growing Australia*, Business Council of Australia.

Carnegie, R, Butlin, M, Barratt, P, Turnbull, A and Webber, I (1993), *Managing the Innovating Enterprise*, Business Council of Australia.

Chesborough, H (2003), *Open Innovation: The New Imperative for Creating and Profiting from Technology*, Harvard Business School.

Department of Industry, Tourism and Resources (2006), *Collaboration and Other Factors Influencing Innovation Novelty in Australian Businesses*, Department of Industry, Tourism and Resources.

Frost and Sullivan (2006), *Meetings Around the World: The Impact of Collaboration on Business Performance,* white paper sponsored by Verizon Business and Microsoft.

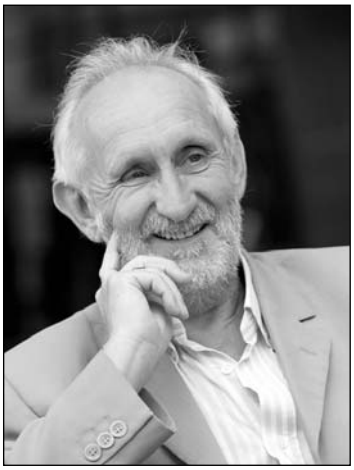
Green, R (2007), 'Competing Through Innovation: An International Perspective', *Competing from Australia*, Committee for the Economic Development of Australia, CEDA Growth 58.

IBM (2006), *Expanding the Innovation Horizon – Global CEO Study 2006*, IBM.

Margo, J (2000), *Frank Lowy: Pushing the Limits*, HarperCollins.

JOHN BESSANT

Professor John Bessant currently holds the Chair in Innovation and Technology Management at Tanaka Business School, Imperial College where he is also Research Director. He previously worked at Cranfield, Brighton and Sussex Universities. In 2003 he was awarded a Senior Fellowship with the Advanced Institute for Management Research and was also elected a Fellow of the British Academy of Management. Author of 15 books and many articles, he has acted as advisor to various national governments and to international bodies including the United Nations, The World Bank and the OECD.



Using Learning Networks as an Aid to Innovation

John Bessant

Professor Bessant is the Professor and Chair in Innovation Management at Imperial College, London.

Innovation can give firms a great competitive edge, but it sometimes needs to be fostered by collaboration rather than competition. Increasingly, companies are coming together in learning networks to collaborate on a regional or technological basis. Although much of the discussion on learning organisations is concerned with structures and processes within particular firms, there is an emerging strand that deals with the theme of inter-firm learning. For example, in supply chain development there is a growing recognition that the next step after confrontation is cooperative relationships to engage in a process of shared development and learning. How can such learning networks be fostered?

INTRODUCTION

Few firms would dispute that in order to survive in an increasingly hostile and turbulent environment, they need to innovate. Without regular change in what they offer (product or service innovation) and the ways in which they create and deliver that offering (process innovation), there is a considerable risk of their losing competitive edge and eventually failing.

The challenge is not simply one of identifying what has to change but also how to *implement* it and this represents a key issue in innovation. In particular this focuses attention on the problem of learning and the ways in which enterprises organise and manage the process of acquiring and absorbing new knowledge and transforming it into competitive capabilities. Concern with these issues has led to considerable research and experimentation around mechanisms to support and facilitate the development of learning capabilities. In public policy terms, for example, this has led to great growth in the provision of advice and counselling/consulting services as an instrument of innovation policy (Bessant and Rush, 1995). One approach with considerable potential is to mobilise shared learning amongst and between firms (Bessant and Tsekouras, 2001).

HOW DO ORGANISATIONS LEARN?

In principle firms have a number of opportunities available to them to enable learning – through experiment (e.g. R&D), through transfer of ideas from outside, through working with different players (suppliers, partners, customers), through reflecting and reviewing previous projects, and even through failure. There is some agreement that learning can be viewed as a cyclical process, involving a combination of experience, reflection, concept formation and experimentation (Kolb, 1984). But learning only takes place when the cycle is completed – thus effort in some but not all quadrants may not necessarily lead to learning. And learning is not automatic; there must be motivation to enter the cycle, and if there is insufficient arousal, learning may not take place.

Table 1 indicates some of the problems that stop firms from effective learning.

Increasing discussion of this has taken place around the concept of 'absorptive capacity': the ability of firms to make effective use of external knowledge. As Zahra and George point out, this is not a simple activity but rather requires capabilities in recognising the need for, and finding, relevant knowledge (*acquisition*); in absorbing and making sense of it in terms of what the firm already knows (*assimilation*); in putting it to use in some new form of product or process innovation (*transformation*); and finally in capturing some value through its application (*exploitation*) (Zahra and George, 2002). Multiple studies have drawn attention to the complex nature of absorptive capacity and the number of ways in which firms may fail to realise the potential advantages from acquiring and using new knowledge; in other words, their difficulties with the learning process (Zollo and Winter, 2002).

TABLE 1: Key blocks to learning

Learning block	Underlying problem
Lack of entry to the learning cycle	Perceived stimulus for change is too weak. Firm is isolated or insulated from stimulus. Stimulus is misinterpreted or underrated. Denial – 'we don't need to change'
Incomplete learning cycle	Motivation to learn is present but process of learning is flawed. Emphasis given to some aspects – e.g. experimentation – but not to all stages and to sequence.
Weak links in the cycle	Reflection process is unstructured or unchallenging Lack of access to or awareness of relevant new concepts Risk avoidance leads to lack of experimentation Lack of sharing or exchange of relevant experiences – parochial search for new ideas 'Not invented here' effect
Lack of learning skills or structure	Lack of supporting and enabling structures and procedures
Knowledge remains in tacit form.	Lack of mechanisms for capturing and codifying learning
Repeated learning	Lack of mechanisms for capturing and codifying learning leads to repetition of same learning content.
Learning is infrequent, sporadic and not sustained.	Mechanisms for enabling learning are not embedded or are absent.

The challenge is not simple or one-dimensional, but creating and developing learning support structures and processes is clearly a significant management issue. One direction that such development might take builds on the principles of shared and cooperative learning to help maintain momentum. Although much of the discussion on learning organisations is concerned with structures and processes within particular firms, there is an emerging strand that deals with the theme of inter-firm learning. For example, in work on supply chain development there is a growing recognition that the next step after moving from confrontational to cooperative relationships within supply chains is to engage in a process of shared development and learning (Hines, 1994; Bessant, Kaplinsky and Lamming, 2003).

This aspect of learning has something in common with the principles of learning within groups instead of at the individual level. In particular the active participation of others in the process of challenge and support is recognised as a powerful enabling resource and was developed into a widely used approach termed 'action learning'(McGill and Warner Weil, 1989). This concept stresses the value of experiential learning and the benefits that can come from gaining different forms of support from others in moving around the learning cycle. Part of the vision of Revans, one of the pioneers of the concept, involved the idea of 'comrades in adversity', working together to tackle complex and open-ended problems (Revans, 1980; Pedler, Boydell and Burgoyne, 1991).

The potential benefits of shared learning include the following:

- In shared learning there is the potential for challenge and structured critical reflection from different perspectives.
- Different perspectives can bring in new concepts (or old concepts that are new to the learner).
- Shared experimentation can reduce perceived and actual costs risks in trying new things.
- Shared experiences can provide support and open new lines of inquiry or exploration.
- Shared learning helps explicate the systems principles, seeing the patterns – separating 'the wood from the trees'.
- Shared learning provides an environment for surfacing assumptions and exploring mental models outside of the normal experience of individual organisations; it helps prevent 'not invented here' and other effects.

Arguably this approach has much to offer, and the experience of regional clusters of small firms provides one important piece of evidence in support of this. The ability of textile or ceramic producers to share knowledge about product and process technology and to extend the capabilities of the sector as a whole is recognised as central to their abilities to achieve export competitiveness. In the case of Italian furniture, for example, a dominant position in world trade has been achieved and sustained over decades – yet the average firm size is less than twenty employees (Best, 2001).

It assumes particular relevance for those agencies concerned with accelerating or enabling the diffusion of innovation across a population. The above example has much to interest regional development organisations, for instance, whilst at a sector level industry ministries may be concerned to accelerate the adoption of productivity-enhancing technologies, especially amongst small and medium-sized enterprises. Nor is the ownership of this challenge confined to the public sector; major firms will be concerned with bringing participating firms within their supply networks up to 'good practice' standards of quality, cost, delivery, and so on, through the systematic adoption of process innovations. And business associations may be concerned to enhance the competitiveness of their member firms by timely and effective adoption of new ideas.

Accepting that there is potential in the concept of learning in networks or clusters, two questions are raised. The first is the extent to which one can consciously build on this concept in the design and operation of 'managed networks' such as supply chains or technological collaborations. The second is the extent to which it can be used as an alternative or complementary model for enabling learning around a specific theme – for example, technology transfer, upgrading and competence development amongst small firms.

Developing learning networks

Networks of any kind offer many opportunities for learning to take place – by sharing ideas, trying out experiments, and so on. Such learning takes place essentially as a by-product of some other activity or purpose within the network. But it might be possible to use the network concept as a vehicle whose *primary* purpose is to enable learning.

This definition implies a number of features:

- Such networks are formally established and defined.
- They have a primary learning target – some specific learning/knowledge that the network is going to enable.
- They have a structure for operation, with boundaries defining participation.
- They involve processes that can be mapped on to the learning cycle.
- They involve measurement of learning outcomes that feed back to the operation of the network and eventually determine whether or not to continue with the formal arrangement.

Examples of such learning networks might include:

- A formal club whose members have come together to try and understand and share experiences about new production concepts – for example, a 'best practice' club or forum.
- A regional grouping of small firms with the challenge of achieving and sustaining growth.
- A shared pre-competitive R&D project – 'co-laboratories'.
- A supplier association or development program where the aim is to upgrade levels of capability.
- A professional institution where the aim is to upgrade and update members' knowledge.
- A trade or sectoral research organisation where the aim is to upgrade sectoral knowledge.

Such networks can be formally promoted, with a clear focus and organising 'hub', whilst others are largely cooperative and based on mainly informal mechanisms. And networks can also be hybrids; for instance, it is possible to find examples of networks that are both government-promoted and also topic-based.

Learning networks in practice

A good and long-standing example of such arrangements in operation is the case of Toyota where an active supplier association has been responsible for sustained learning and development over an extended period of time (Dyer and Nobeoka, 2000). Hines reports on other

examples of supplier associations that have contributed to sustainable growth and development in a number of sectors, particularly engineering and automotive (Hines et al., 1999). In Australia , Marsh and Shaw describe collaborative learning experiences in the wine industry, whilst another study reports on experiences in the agricultural and food sector (AFFA, 2000; Marsh and Shaw, 2000). Case studies in the Dutch and UK food industries, the construction sector and aerospace provide further examples of different modes of learning networks organised around supply chains (Fearne and Hughes, 1999; Dent, 2001). Data from six UK supply chain learning networks studied in depth (Bessant, Kaplinsky et al., 2001) indicated improvements both for the main customer and its suppliers, confirming that supply chain learning programs can, in principle, be 'win-win' programs.

Regional development programs have increasingly used networking models of this kind – for example, in the Kent region of the UK it has been deployed to create learning clubs to support SME growth and development. The model has been extended to a major program in the South East Economic Development Agency (SEEDA) area where 'Profitnet' involves 35 learning networks based around geographical, sectoral or topic lines. Morris reports on the active development of a cluster in the Durban area of South Africa using learning network principles as its core design (Morris, Bessant and Barnes, 2006).

It will be useful to look in a little more detail at an example to draw out core themes in designing and running learning networks. This involves a long-running program in South Africa that began with state support and university involvement but has moved to become a commercially viable platform for continuing development amongst an increasing member base of firms.

In the mid 1990s the South African economy underwent a significant shift from import-substituting industrialisation to trade liberalisation, a major drop in tariff protection and rapid integration into the world economy. This posed major challenges for the automotive component sector. Essentially component manufacturers were faced with the need to become competitive at world class levels and to do so quickly, or else the major assemblers locating in South Africa would decide to source their components internationally. Research carried out at the University of Natal suggested that, when comparing South African firms with their international competitors, local performance was very weak; this data served as a catalyst for change in behaviour amongst a group of component manufacturers. Using government support (65%) and their own investment, a learning network was established in January 1998 and named the 'KwaZulu Natal Benchmarking Club' (KZNBC).

The initial KZNBC membership comprised eleven component makers and one large assembler and was supported and facilitated by staff from the University of Natal. It was designed as a learning network to facilitate rapid development of world-class manufacturing capability and central to this was the use of a benchmarking model of key competitiveness drivers. Organisation of the club was based on two industry representatives and the facilitators/service providers acting as an executive on behalf of the rest. Initially the services available to members were:

- Confidential diagnostic reports that measured the operational performance of each firm against the drivers in the benchmarking model. The report also contained the results of a survey of the 10 major customers' perceptions of the firm in terms of the same performance drivers, and similar data from their 10 major suppliers. In other words it offered confidential but evidence-based feedback on performance and the emerging learning agenda.
- Confidential annual reports benchmarking each firm against a 'like for like' international competitor.
- Monthly newsletters outlining aggregate benchmark data for the whole network.
- Quarterly workshops discussing generic findings, common problems and emerging solutions to deal with the competitiveness issues raised.
- Encouragement of experience and information sharing, for example through inter-plant visits.

Although the intention was to make this an effective experience-sharing learning network, it proved difficult at the outset to overcome the long history within the sector of lack of trust and an unwillingness to share information, a legacy of the apartheid era. Additionally there was a strong tendency to pass the blame for the emerging problems to others – government, suppliers, customers, and so on. This was gradually overcome through a process of facilitated activities that gave a sense of a larger purpose to the activities of the network and led to the firm members taking ownership of the network. In particular the shift in venue, from running workshops at the University of Natal (perceived as a 'neutral' space) to holding them on the premises of one of the member firms, signalled the beginning of a shift towards more open experience-sharing and gradual trust-building.

In general, the KZNBC was perceived as successful, both by its members and by other firms in the sector and as a consequence two further clubs were established, first in the Eastern Cape (October 1999) and later in Gauteng (mid 2001). They were located in key centres for the components industry and modelled along the KZN template; in total around 60 firms were represented in these networks, linked by a common service provider and sharing generic resources like newsletters. Significantly, although each region had somewhat differing agendas related to the particular grouping of assemblers and so on, there was considerable interchange amongst members, with inter-firm visiting and participation in workshops outside the core region. In this way the knowledge-sharing activities developed into a national capability across the sector.

Key performance indicators for the network itself included:

- Evidence of increasing knowledge sharing. For example, firms were willing to make presentations to other member firms on how they had achieved significant success on some of the key performance indicators.

- Evidence of significant knowledge transfer, for example through recorded spontaneous firm visits by members. There was also a willingness to become involved in joint projects that required the transfer and sharing of highly confidential information.
- Evidence of major improvement in their operational performance. This was reflected in the competitiveness indicators measured in the annual survey of firm performance and reflected in the longitudinal data presented in Table 2.
- Finally, the spread of the clubs as new members were attracted.

Considerable qualitative data exists to support the contention that knowledge sharing and transfer took place, and there is clear evidence of growth in the popularity of the clubs and the persistence of membership (suggesting that firms perceived the activities as beneficial). But the significant indicator is that of actual improvements in operational performance that member firms attributed to their participation in the network. Table 2 presents this data in summary form.

TABLE 2: Learning and operational performance change of firms in networks[1]

Critical success factors	Key performance indicators	South African firms			Comparator firms	
		1998–99	2001	Improvement 1998–99 to 2001	Western Europe	Emerging economies
Cost control	Total inventory (days)	62.6	42.0	32.8%	31.2	38.6
Quality	Customer return rate (ppm)	3270	1240	62.0%	549	624
	Internal reject rate (%)	4.9	3.9	20.7%	1.9	3.5
	Supplier return rate (ppm)	21989	18518	16.0%	8319	13213
Flexibility	Lead time (days)	19.9	17.9	9.9%	16.8	12.0
	Supplier on time (%)	78.7	82.2	4.5%	92.2	92.3
	On time to customers (%)	92.2	92.7	0.6%	96.1	93.5
Capacity to change	Training spend as % total remuneration	1.3	2.0	56.2%	1.3	3.1
	Absenteeism (%)	4.4	4.0	9.4%	4.2	5.7
Innovation capacity	R&D expenditure (%)	1.64	2.12	29.5%	1.83	2.90

Source: Benchmarking and Manufacturing Analysts (www.bmanalysts.com)

This data suggests that the industry has gone a long way towards catching up with world-class standards, especially in internal operations, although externally linked activities like delivery performance show less improvement. Clearly a number of factors apart from the Club's operations have contributed to this, but the qualitative data mentioned earlier suggests that firms perceive considerable value in such shared learning and see it as a way to accelerate their progress up the learning curve. The limits to such horizontal cooperation can be seen in the relative lack of impact on inter-firm issues, suggesting that some form

[1] Time series data only exists for 32 South African–based component firms (3–4 year period). Performance in 2001 is matched by a sample of 26 international firms, for which we do not have time-series data.

of vertical cooperation is also needed to help with sector development. This touches on the emerging theme of 'supply chain learning' and the options for transferring the learning network model to such linkages (Bessant, Kaplinsky and Lamming, 2003).

Building effective learning networks

Studies of learning networks suggests that their design and operation involves three key phases, each of which requires active management:

- A set-up phase where a variety of drivers converge around a commitment to action, often led by a champion individual or agency.
- An operating phase in which the learning framework becomes established and begins to address the chosen learning agenda.
- A sustaining phase where the challenge of maintaining momentum surfaces and where there is a high risk of failure.

Importantly, the activities required and the key problem issues confronted at each of these stages differ. At the outset the challenges centre on acquiring resources and mobilising commitment – but this is often facilitated by a shared sense of crisis. The role of active agents and champions – often from outside the network and with a perceived neutral status – is also significant. For example, in an early and successful learning network around supply chains in the UK oil and gas sector (CRINE), the impetus came from a widespread recognition of the weak competitive position of the UK sector as a whole, which prompted set-up orchestrated by the major business association in the sector. Another network, the 'Industry Forum', was established as a response to similar concerns in the UK automotive components sector, and became a template for a major UK government programme based around peer-to-peer learning. Set-up can also emerge through shared perception of common opportunity – for example, the possibility of entering new markets – through upgrading of capabilities across a supply chain/network (Kaplinsky, Morris and Readman, 2001).

Initial operation tends to be driven along particular paths often set by the lead or coordinating firm and there is a risk that other players in the network will not really buy in to the model or will become disappointed in some way with the learning processes. Early operations are supported by goodwill and the momentum from the set-up stage; over time this can be reinforced or diluted. Much depends here on the extent to which the initiative is founded on good relationships and particularly a basis of trust, which is a significant issue in supply chain networks, for example (DTI/CBI, 2002).

The operating phase is characterised by the need to establish and agree on core operating processes and responsibilities and who will own them. Table 3 indicates the range of these.

The sustaining phase is the most difficult since it is here that the initial impetus needs to be replaced with something able to maintain longer-term momentum and to take on the characteristics of shared ownership and direction.

TABLE 3: Eight core processes in inter-organisational networking

Process	Underlying questions
Network creation	How the membership of the network is defined and maintained
Decision-making	How (where, when, who, etc.) decisions get taken
Conflict resolution	How (and if) conflicts are resolved
Information processing	How information flows and is managed
Knowledge capture	How knowledge is articulated and captured to be available for the whole network
Motivation/ commitment	How members are motivated to join/remain in the network, for example through active facilitation, shared concerns for development, etc.
Risk/benefit sharing	How the risks and benefits are shared
Integration	How relationships are built and maintained between individual representatives in the network

KEY THEMES EMERGING

'Design' variables

Under this heading we consider those factors that need to be considered when setting up a learning network, and these include:

- *Purpose.* What is the main learning target for which the network is being set up? Here the issue is one of clarity; if the network is set up as a loose affiliation of organisations with a general but rather vague perception of the need to improve some aspect of their operations, the resulting network will lack focus. Conversely a clearly defined and shared sense of purpose with a focused and measurable learning target is likely to be more viable.
- *Participants.* Who are the members of the network going to be, and what is the basis of membership? Although learning networks are essentially 'open' in character, there is a value in defining boundaries, particularly in terms of providing focus and coherence. One commonly used mechanism is to establish the network as some form of member's club (often with a nominal subscription base) in which participation brings a set of services (such as workshops, consultancy, newsletters, etc.). The purpose here is less one of income generation than of securing a commitment on the part of members to participate.
- *Structure.* Is it a 'moderated' network with a coordinating hub, a radial network diffusing information from the centre, or a member-to-member wheel model? A number of different models exist for learning networks and much appears to depend upon the type of learning involved. For networks where the primary issue is to communicate formal knowledge – for example, to diffuse awareness of new legal requirements or

building regulations – a simple radial model in which information flows one way from centre to periphery would be suitable. However, in the case where the learning target is concerned with tacit knowledge acquisition – for example, mastering a new technique – a model that stresses high levels of two-way interaction may be more appropriate.

- *Roles within the network.* It is important to identify and define these, particularly those of coordinator and facilitator. Networking as a process may not happen without some assistance, both in terms of arranging relevant mechanisms (running workshops, editing newsletters, etc.) and also in energising and motivating learning and in enabling effective interchange of experience to take place. It is also important to consider what arrangements are made for identifying and training network brokers, coordinators and facilitators. The importance of these roles, particularly in helping networks with more advanced forms of learning, is considerable, but the skills involved may not be familiar and there may be a need to provide support – perhaps even a second learning network – for network brokers and so on, to acquire and develop relevant skills and expertise.
- *Type of learning to be transacted.* Is it primarily information diffusion or more concerned with tacit knowledge exchange? Here the concern is with clarifying the nature of the learning likely to be involved, and recognising that learning can take place in several ways (Holti and Whittle, 1998). At its simplest it might involve the acquisition and absorption of straightforward factual data that is available in explicit and codified form, for example a new set of regulations on pollution control or emission standards. Then there is learning in relatively simple adaptive fashion: learning to do things a little better. An example here would be mastering a particular production process that is already explicit in terms of the information about it and evident in practice elsewhere, so that there are reference sites and demonstration visit possibilities. At higher levels learning may require challenging assumptions and reframing the problem issues to be addressed. An example here would be learning new manufacturing philosophies like 'total quality management' that involve a culture change, in other words a rethink of fundamental assumptions and beliefs. This reframing requires very different approaches to simple information or adaptive learning so there are implications about the design and operation of a suitable network to enable this.
- *Content of learning.* How will the learning be diffused? Assuming that there is a clear focus on what needs to be learned, there is then the need to look at delivery. To take an educational analogy, what is the 'syllabus' and how will it be broken up into manageable chunks? It is often helpful here to have some kind of reference framework. For example, in the South African example the use of a clear and internationally comparable benchmarking framework was central to success.
- *Mechanisms to be used.* How will the different stages of the learning cycle be addressed? What combination of experience-sharing, structured reflection, introduction of new concepts and shared experimentation will be used? How will these be mobilised in a programme of activities?
- *Pump-priming activities to motivate organisations to join*. These include public subsidy, benchmarking, and awareness raising campaigns.

Operational variables

Under operational variables we need to consider how the network will actually operate and the ways in which it can be finetuned to improve its performance on a continuing basis. Factors here include:

- *Coordination and facilitation.* Evidence from our case studies and from a number of studies of learning networks suggests that formal inputs to help energise and coordinate operations were critical factors. The role of 'network broker' is complex but requires a combination of energy and enthusiasm, credibility within the community in which the network is located, and an ability to facilitate the *process* of networking rather than engage in 'expert' consultancy. In other words, the broker needs to avoid telling people what they should do and instead should help them articulate their learning needs and the various routes across the network which might enable them to meet those needs.
- *Measurement framework.* What will constitute success and how will it be measured? Internal measures could include the number and turnover of members and renewals of subscriptions. External measures could include improved performance directly attributable to increased knowledge capacity.
- *Operating arrangements.* An important part of the maintenance and continuous improvement activity associated with managing a learning network is concerned with reviewing the mechanisms whereby learning can take place. This involves both selection from and addition to the range of options (workshops, visits, seminars, newsletters, briefings, etc.) and development within each of these categories (frequency, organisation, location, contents, etc.).
- *Operating channels.* In similar fashion it is important to review how effectively the network is diffusing knowledge and enabling learning. Reviewing the channels in use (face-to-face meetings, site visits, structured interactions, use of electronic media, etc.) needs to take place on a continuing basis against the range of options and their performance.
- *Resources.* What resources, from people to learning materials, are available or can be developed to support the network?
- *Blocks and barriers.* These include factors that inhibit the successful operation of the network, including lack of motivation to learn, communication difficulties, blocking behaviour by key individuals or groups and an entrenched culture of 'we've always done it this way'.
- *Enabling tools and techniques*. These include formal interventions that can help deal with some of these blocks such as training, organisational development inputs, facilitation and benchmarking. Table 4 below gives some indicative examples mapped on to the learning cycle mentioned earlier.

TABLE 4: Mechanisms to support the learning cycle

Stage in learning cycle	Enabling mechanisms
Motivation – how to motivate and maintain motivation to enter and repeat the cycle	Approaches to create a 'wake up call' followed by systematic benchmarking and measurement to highlight where gaps are and to feed the strategy and the policy deployment process.
Experience – how to share experiences and perspectives across the supply chain, and particularly to exchange viewpoints	Meetings and workshops Newsletters and electronic equivalents – bulletin boards, user groups, websites, etc. Visits Reviews of case studies of other's experiences Reports and publications capturing experiences from elsewhere
Reflection – how to encourage different and critical ways of looking at operations within the supply chain	Structured and challenging assessment, maybe involving independent third parties, benchmarking, etc. Review of both performance and practice gaps Facilitated reviews Use of reflection tools
Conceptualisation – how to bring in new ideas and models and integrate them with existing knowledge base	Use of seminars, workshops, training programs and through transfer or secondment of personnel. Examples include the master engineer approach in Industry Forum and the transfer of internal experience of TQM at Shorts to suppliers through secondment of shop-floor teams. Potential role for 'out of industry' inputs through visits, etc. Books, reports, web-based information Formal training programs
Experiment – how to encourage trying out of new approaches and enable learning through experience	Guided change initiatives such as projects under supervision of 'guest engineers', support for risk-taking including financial backing and 'handholding' with smaller firms as they try something different.

CONCLUSIONS

Innovation theory increasingly points to the importance of building a *dynamic capability* within firms; not simply having one lucky break but systematically exploiting and creating innovation opportunities. Assuming that most firms are not born with well-developed dynamic capabilities, there is a challenge around learning and creating this. In other words, we need to look at processes of organisation and management. This article suggests that one area in which such work might usefully be taken forward is along the lines of shared, peer-to-peer learning and the creation of enhanced absorptive capacity through learning together. At the policy level, the challenge then becomes one of enabling and facilitating a process rather than directly targeting or intervening.

REFERENCES

AFFA (2000), *Supply Chain Learning: Chain Reversal and Shared Learning for Global Competitiveness*, Department of Agriculture, Fisheries and Forestry – Australia (AFFA), Canberra.

Bessant, J, Kaplinsky, R and Lamming R (2003), 'Putting Supply Chain Learning into Practice', *International Journal of Operations and Production Management*, vol 23, no 2, pp 167–84.

Bessant, J and Rush, H (1995), 'Building Bridges for Innovation: The Role of Consultants in Technology Transfer', *Research Policy*, no 24, pp 97–114.

Bessant, J and Tsekouras G (2001), 'Developing Learning Networks', *AI and Society*, vol 15, no 22, pp 82–98.

Best, M (2001), *The New Competitive Advantage*, Oxford University Press, Oxford.

Dent, R (2001), *Collective Knowledge Development, Organisational Learning and Learning Networks: An Integrated Framework*, Economic and Social Research Council, Swindon.

DTI/CBI (2002), *Supply Chain Learning – A Resource for Improvement*, Department of Trade and Industry/ CBI/Fit for the Future, London.

Dyer, J and Nobeoka K (2000), 'Creating and Managing a High-Performance Knowledge-Sharing Network: The Toyota Case', *Strategic Management Journal*, vol 21, no 3, pp 345–67.

Fearne, A and Hughes D (1999), 'Success Factors in the Fresh Produce Supply Chain: Insights from the UK', *Supply Management*, vol 4, no 3.

Hines, P (1994), *Creating World Class Suppliers: Unlocking Mutual Competitive Advantage*, Pitman, London.

Hines, P, Cousins P, Jones DT, Lamming R and Rich N (1999), *Value Stream Management: The Development of Lean Supply Chains*, Financial Times Management, London.

Holti, R and Whittle S (1998), *Guide to Developing Effective Learning Networks in Construction*, CIRIA/Tavistock Institute of Human Relations, London.

Kaplinsky, R, Morris M and Readman J (2001), *Globalisation and Upgrading: Innovation and Learning in the Wood Furniture Value Chain*, UNIDO, Vienna.

Kolb, D (1984), *Experiential Learning*, Prentice-Hall, Englewood Cliffs, NJ.

Marsh, I and Shaw B (2000), 'Australia's Wine Industry. Collaboration and Learning as Causes of Competitive Success', working paper, Australian Graduate School of Management, Melbourne.

McGill, I and Warner Weil S (1989), *Making Sense of Experiential Learning*, Open University Press, London.

Morris, M, Bessant J and Barnes J (2006), 'Using Learning Networks to Enable Industrial Development: Case Studies from South Africa', *International Journal of Operations and Production Management*, vol 26, no 5, pp 557–68.

Pedler, M, Boydell T and Burgoyne J (1991), *The Learning Company: A Strategy for Sustainable Development*, McGraw-Hill, Maidenhead.

Revans, R (1980), *Action Learning*, Blond and Briggs, London.

Zahra, SA and George G (2002), 'Absorptive Capacity: A Review, Reconceptualization and Extension', *Academy of Management Review*, no 27, pp 185–94.

Zollo, M and Winter SG (2002), 'Deliberate Learning and the Evolution of Dynamic Capabilities', *Organization Science*, vol 13, no 3, pp 339–51.

Anand Kulkarni

Dr Anand Kulkarni is a senior economist with extensive experience in both State and Commonwealth Governments, advising on industry development and innovation policy among other things. His research interests include the rise of China and India, institutional economics and knowledge flows. He has published on these issues.

George Bougias

George Bougias is a private sector economist and adviser. He has extensive experience in both public and private sectors, especially with the Victorian Government, and in a range of property consulting roles. His research interests include innovation, economic development, business strategy and property market dynamics/opportunities. He is a regular contributor on these issues.

Australia's Diaspora Networks in the 21st Century: Winning the Hearts and Minds of the Overseas Innovation Class

Anand Kulkarni and George Bougias

Dr Anand Kulkarni is a senior economist with extensive experience in both the State and Federal Governments in policy development. George Bougias is a private sector economist and adviser.*

The increased international mobility of people is a key feature of knowledge and idea flows in modern economies. The skilled and educated are among the most mobile and the countries that harness this talent – both within and outside their national borders – will benefit through enhanced economic growth. Australia is well placed to capitalise on this phenomenon because we are a largely migrant country, with an increasing number of skilled migrants, as well as a sizeable diaspora of our own citizens around the world. While policies have so far focused on how Australia can gain skilled migrants by using the diasporas of other countries, relatively little attention has been given to how we can maximise the economic and other benefits of our own diaspora. This paper focuses on ways we can do that, drawing on the experiences of other countries.

* The views expressed in this paper are those of the authors alone.

Introduction

In an age of global mobility of labour and an increasing focus on economic advantage built on people, knowledge and innovation, Australia's diaspora represents the next frontier in unlocking our national potential. Smart, highly skilled and educated, our diaspora is embedded in key positions across the globe in a range of endeavours. Although some people will return and some will not, all have a critical role to play in shaping Australia's economic future as a key player in the global knowledge economy.

Innovation and internationalisation – key drivers of growth

Innovation and internationalisation are without doubt the key features of the modern economic landscape. While the impact of each is significant in its own right, the combination of both is radically reshaping the global economy.

Innovation is now widely recognised as a key driver of economic growth and wealth creation in the world. It is estimated, for example, that the United States is around 75 per cent wealthier today (in terms of real GDP per capita) than it was only 30 years ago. Much of the increase in wealth has been driven by innovation and its impact on productivity (US Department of Commerce, 2008). Countless other statistics point to the rise of R&D intensities of nations, growth in trade in high-technology goods and services, and the increase in highly credentialed people in the workforce.

As a result, innovation has fundamentally altered the way firms, regions and nations compete. Today, the world recognises that the superior use of knowledge – rather than some other input to the production process – and the process of innovation form a key long-term and sustainable competitive strategy. While other forms of advantage can come and go, such as that brought about by a plentiful supply of some raw material or resource, only a competitive advantage built on innovation can be enduring. New ideas generate countless other ideas.

Technology and the liberalisation of the world's markets are just some of the factors underpinning a more globalised world. The modern era is unprecedented in the scale and scope of globalisation. In particular the entry of the world's most populous nations, China and India, into the global market economy is ensuring that the world is connected like never before.

Global people power – the next wave of growth

People ultimately drive innovation, and it is human capital rather than financial or physical capital that is today's most sought-after production factor. This is reflected in the rapid growth of skilled migration, international collaboration in science and tech-

nology and, increasingly, the location of R&D facilities near skilled people. This trend is not just in developed countries but also in developing nations that combine skills and lower labour cost. In fact, two key factors are at play: the movement of people around the world to fill jobs, and the movement of productive activities to be near concentrations of suitable skilled people.

In this complex world, knowledge, information and idea flows abound, crossing traditional jurisdictional boundaries. People are central to this. Indeed, the global war for talent and the best minds is a key feature of the modern global economic landscape as countries compete with each other to fill skills shortages and cope with the rising knowledge intensity of economies (The Economist, 2006). This is especially the case in developed economies where nations must also address issues such as population ageing and reduced fertility rates. However, and amazingly, even in India, home to a large, young and skilled labour force, skills shortages in key sectors are emerging.

The diaspora – a competitive asset for nations

Traditionally, Australia has been home to migrants from many countries from a vast array of nations. A key focus in recent years has been on boosting the number of skilled migrants coming to Australia. There has been phenomenal growth in the number of skilled migrants calling the 'clever country' home. Over the periods 1996–97 and 2005–06, the annual number of these 'Skill Stream' migrants (including dependants) has increased nearly fourfold from over 24,000 to over 91,000. This growth has fundamentally altered our migration intake with skilled migrants now making up nearly 51 per cent of all permanent additions – up from 23 per cent in 1996–97 (ABS, 2007).

However, while Australia has been a clear leader in attracting skills and talent to our shores – and therefore attracting the diaspora of other countries – arguably we have yet to maximise the benefit from our own diaspora.

The Australian diaspora should be a key element of our national innovation, economic development and competitive strategy. This is not only because the diaspora is, overwhelmingly, extremely diverse and rich in skills, experience and knowledge, but also because the diaspora is proudly Australian and therefore exceptional ambassadors for the nation. In this regard, Australia's diaspora is not unlike that of some other countries with overseas populations consisting of disproportionately well-educated and higher-income groups. Because of this, Australia's diaspora is one of the key drivers of global innovation.

As a recent article (Chong, 2008) suggests, the United Arab Emirates (UAE) is a magnet for Australian talent in an array of fields, including urban planning, financial services and construction. Some 14,000 Australians are based in the UAE. Australian expertise, ideas, connections and can-do attitude are much sought after. They represent a rich

and diverse asset to capitalise on. Organisations such as Southern Cross Group and Australians Abroad are playing important roles in harnessing linkages to the Australian diaspora.

Some other countries also have large sections of their populations overseas. For example, it was estimated at the beginning of the millennium that 7 million (or 2.5 per cent) of the national population of the US was overseas while in New Zealand it was 850,000 or 21.9 per cent of the national population (see Figure 1). Australia's diaspora as a share of the population was estimated at 4.3 per cent – greater than that of China, the US or India.

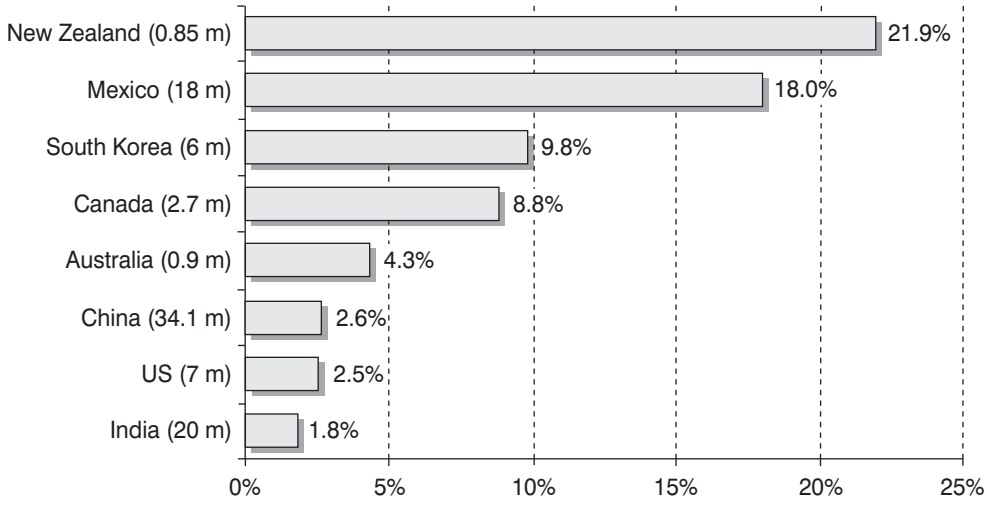


FIGURE 1: National diasporas in relation to resident national population
Source: Canada Asia, 'Commentary', no 41, 2006

Hence, in Australia's case, while skilled immigration ('brain gain') will remain a key driver for growth – and an area in which Australia can be expected to do relatively well given our ability to attract migrants due to our economic, social, cultural, environmental and other advantages – the increased fluidity of global human capital and the importance of networks and access to ideas (to name just a few factors) will mean that the *movement* of minds and ideas will increase in importance. As a highly globalised, educated and skilled elite, the Australian diaspora can and should play a key role in this process.

Many countries have reaped the benefits of their own diaspora, often in substantial ways. For example, increased Korean exports to the US of automotive products have been attributed, at least in part, to the efforts of the Korean diaspora to open doors, while the development of the fledgling Taiwanese venture capital industry has been driven by Taiwanese expatriates in Silicon Valley (Saxenian, 2006). Further,

Indian businesses in the US and the UK have been critical in transferring knowledge and business back to India through a range of activities, initially mainly the outsourcing of simple business processes but increasingly complex and high-value-added knowledge processes.

The increasing importance of the world's diasporas is being recognised by academic studies. Anna Lee Saxenian, a key researcher in the field, argues that the diasporal 'brain circulation' is a new form of competitive advantage and suggests drawing on the experiences of Indians and Chinese in Silicon Valley. Saxenian argues that the old pattern of one way flows from the core (developed world) to the periphery (developing world) is being replaced by far more complex and decentralised two-way flows of skills, capital and technology (Saxenian, 2005).

Saxenian also argues that in addition to helping the host country, the diaspora can help the home countries, many of which are developing nations. For example, Saxenian (2005) suggests that the US-educated diasporas are transferring development opportunities to formerly peripheral regions as they build professional and business connections to their home countries.

Trade and business connections, reduced transactions costs associated with doing business with like-minded people, and substantial remittances are some of the many benefits associated with diaspora engagement. Now we are witnessing the prominent role for diaspora in the innovation and knowledge sphere.

Competitive strategies to connect with those abroad

The diaspora and its successes are largely driven by the individual's desire to explore new opportunities overseas. Self-reliance and ingenuity are the hallmarks of the Australian diaspora as they are of the migrants who have called Australia home.

There are two key objectives for government in our view in relation to the diaspora:

- When appropriate, woo back expatriates.
- If not, capitalise on this rich asset abroad as a basis for innovation connections.

We examine three countries of particular interest: China, India and Scotland. All three have sizeable diasporas relative to their populations and approach diaspora management in different ways, some focusing on return migration and others on forging ongoing ties with those abroad. What is common is the inherent recognition that the intellectual, economic, social and other contribution of their respective diasporas is critical.

In the final analysis, approaches to diaspora rest on cultivating people networks. At one extreme is what we call 'hard-power networks', which rely on centralised, highly interventionist government-driven approaches, including particularly an emphasis on

return migration. At the other end is the 'soft-power network' model, driven largely by the efforts of individuals, entrepreneurs and associations. To the extent that government is involved at all, approaches to the diaspora are based on facilitating networks, symbolic gestures, information provision and awareness raising.

Inevitably, the three countries have elements of all of these features. However, China's is more oriented to the hard-power network approach, India's approach is mixed, while Scotland's is soft-power driven.

China

The PRC Government is making significant and strenuous efforts to woo back migrants and students to contribute to the goals of independent innovation. A complex set of interrelated policies is designed to support this overall policy goal and includes (see e.g. OECD, 2007):

- A critical role for science and technology parks in attracting returning scholars.
- Significant tax incentives and large-scale project funding (including tax reductions and exemptions from duty on purchases of imported equipment and financial support for start-ups).
- Assistance with relocation costs, housing benefits, free office space and fast-tracking of promotions for returnees in research institutions.
- National programs to attract leading scientists (such as the 100 Talents Program of the Chinese Academy of Sciences, which offers annual grants of up to US$120,000 for four years to overseas Chinese scientists willing to return).
- A program for "training talents towards the 21st century" targeting returning teachers.
- Funding for scholars and researchers to undertake short-term projects back home.
- Financial support for special professorships for returnees.
- More flexible programs for students and scholars overseas to serve the country through academic exchanges, joint research and teacher training.
- The relaxation of impediments to returning to China, including the granting of permits for entering and leaving the country to enable returnees to continue to work abroad and in China. Such returnees are also allowed remittances of earnings after tax on a par with foreigners working in China.

China's science and technology parks deserve a special mention as they are a major feature of the country's economic development strategy in the knowledge sphere. These parks are designed to promote clustering and act as knowledge-transfer vehicles in cutting edge technologies. They are indicative of the hard-power network approach of the Chinese and are strongly government-driven, emphasising return migration and highly visible large-scale endeavours.

In 2006, China announced that it would build 30 new science and technology parks by 2010, bringing such facilities up to a total of 80 (State Science and Technology Institute,

2006; Wu Chong, 2006). Many of these parks are dedicated entirely to returned students and scholars. It is estimated that in 2003, 45 such innovation incubators were dedicated to returned overseas scholars. They hosted about 3,000 enterprises and employed more than 40,000 people. Other figures suggest that the number could be as high as 60 dedicated parks with around 4,000 businesses and more than 10,000 returned Chinese students.

While return migration is a key feature of the government's approach, there is an increasing recognition of the growing importance of 'brain circulation' and the PRC Government is introducing more flexibility in movement from and into China. The Ministry of Education, for example, is encouraging students and scholars studying abroad to return home with guaranteed freedom to come and go. In order to actively encourage students to go abroad and then return (to bolster China's domestic human capital), the Government is providing scholarships for students to study abroad with the proviso that they return in the future.

India

Like China, India is playing an increasingly prominent role in innovation and global knowledge flows and that country's diaspora is crucial. However, India's approach to the diaspora differs significantly from that of the PRC Government.

India's 2003 Innovation Policy Statement provides the framework for developing Indian science, technology and innovation. One of the key objectives of the statement is to attract young talent to science, from both home and abroad. India's 10th Five-Year Plan (2002–07) and its 11th (2007–2012) both emphasise knowledge creation and application in and outside the country.

While India seeks the return of its diaspora, to some extent this goal is arguably secondary, to that of forging links with its overseas citizens and promoting business and emotional connections. Symbolism, information and awareness, and cooperative network building, are the hallmarks of this softer Indian approach, which emphasises idea and knowledge flows.

Importantly, India has also introduced a Minister of Overseas Indian Affairs, a member of the cabinet whose key role is to promote connections between the Indian diaspora and home. Apart from recognising that many of India's diaspora will never return and that government action is required to more fully leverage opportunities arising from the diaspora, the creation of the position also shows the soft power and symbolic approach of the government. The minister's duties include holding official functions and promoting technology and commercial links.

Further reflecting the emotional and symbolic significance of the diaspora, the Indian Government has also instituted an annual conference of the diaspora (Pravasi Bharatiya Divas) for 9 January each year. The then Indian Prime Minister said in inau-

gurating the annual conference in 2003: "We invite you not only to share our vision in the new millennium but also to help us to shape its contours. We do not want your investment we also want your ideas. We do not want your richness, we want the richness of your experience." Importantly, 9 January is chosen in remembrance of the return to India from South Africa of its greatest diaspora member, Mahatma Gandhi. The conference canvasses sector-specific issues and broader issues of significance relating to culture, economy, society and technology. Prizes are awarded to outstanding diaspora achievers as a further sign to the entire Indian nation that overseas Indians play a critically important role in the life and future of the nation.

India employs a range of strategies to tap into its diaspora's potential, including:

- Science wings in key embassies abroad to promote international collaboration.
- A website for Indian scientists abroad to promote online information sharing, collaborative ventures, and the like. Other websites have been established linking the diaspora with India.
- The establishment of the Centre for the Study of Indian Diaspora at the University of Hyderabad.
- Greater ease of entry (and exit) for the diaspora, including especially temporary migration in order to facilitate brain circulation. In particular, the government now issues the 'Person of Indian Origin Card' and 'Overseas Citizenship of India' titles, which allow for relaxed entry conditions (including long-term or lifelong visa arrangements), exemptions from registration with local authorities upon arrival and parity with non-resident Indians on financial matters. Importantly, and as a further sign of the Indian Government's appreciation of the importance of knowledge and people flows, it also issues a 'Gratis Person of Indian Origin' status to exceptionally eminent people of Indian origin who… "play an important role in building bridges between India and the country of his/her adoption" (Ministry of Overseas Indian Affairs, 2006, p 62).
- Scholarships for children of the Indian diaspora to study in India and awareness-raising measures such as the 'Know India Programme', which aims to link the younger generation of the Indian diaspora with India.

As Bound (2007, p 22) notes, "Unlike China, Taiwan and Korea, where government policies are used to attract back returnees, in India the flows are organised bottom up in response to emerging private sector and lifestyle opportunities." And Leadbeater and Wilsdon (2007, p 9) also suggest that "India does not have an innovation system but an innovation class: the global, nonresident Indians, who are embedded in social and business networks that connect India to Silicon Valley and beyond."

As an example of the varying paths the diaspora can take in shaping a country's economy, Figure 2 shows how India's entrepreneurs have followed at least one of three paths (or models) in helping to forge global innovation networks. All these paths have used a softpower approach based on people-to-people connections.

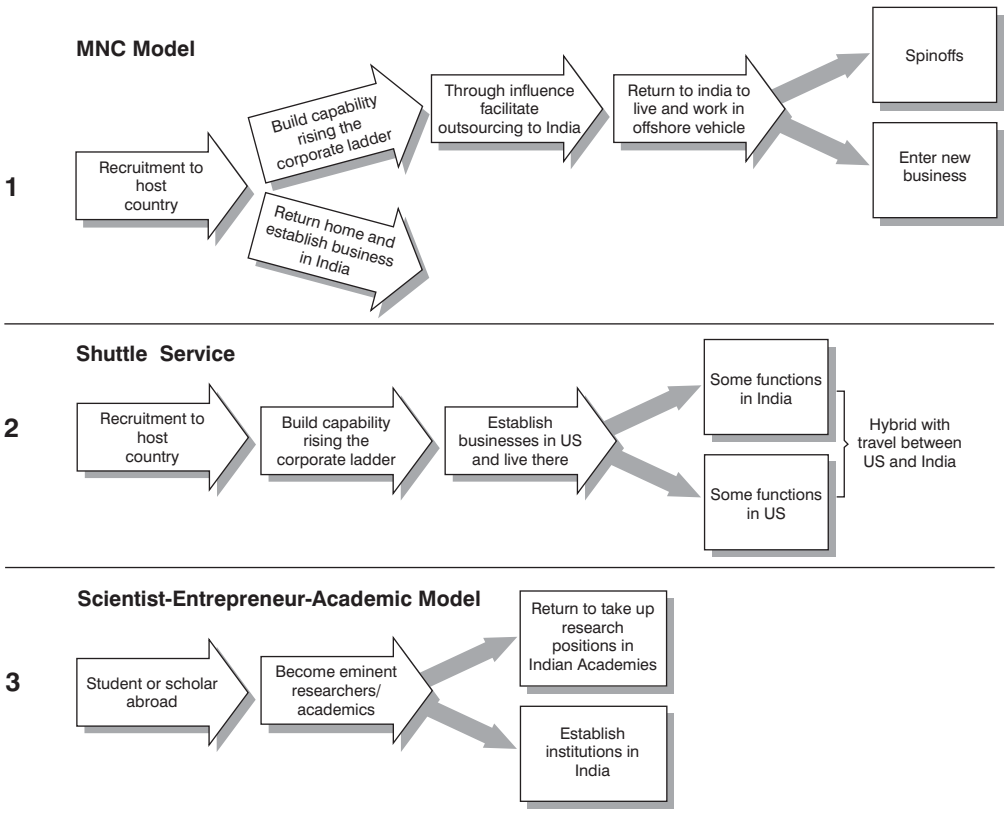


FIGURE 2: Patterns of Indian diaspora engagement

Sources: Chart and discussion adopted from following texts: Pandey et al (2006); Saxenian (2006); Bound (2007)

The first model (MNC Model) resulted in an initial entrée into the US for Indian entrepreneurs, mainly to fill skills shortages, that later paved the way for the strong growth of an industry back home. Indian workers and entrepreneurs advanced through the corporate ladder in major US multinational firms and have been able to generate considerable offshoring work for India. This has been built on their growing "brand" as the elite of the Indian diaspora drawing on their influence, persuasion and skills.

Another path, still in the same vein, has seen many Indians returning home to start businesses related to their host firm, following years abroad. This in turn has provided opportunities for return migration back home, at least on a temporary basis, to take up very senior roles in these offshore US vehicles/affiliates. Over time, this has led to various spin-offs from these off-shored vehicles or entirely new businesses. As a result, there has been a continuation of trade, investment and other links with the US, a process that is becoming increasingly knowledge-

intensive. As the number of India returnees and Indians working overseas has increased, the links and networks have become deeper and richer and the economic relationships more lucrative.

The second approach (Shuttle Service) has a similar initial trajectory but differs in that prominent Indian diaspora members continue to live in the US. They establish smaller businesses in the US – thereby boosting the US economy – but these activities have split functions across the US and India. For example, there might be head-office type functions in the US, but back-office functions or even R&D in India. The diaspora running these businesses engage in shuttle service travel, moving to and from between the US and India and thus making these firms truly transnational in their scope and outlook.

A third approach, the scientist-entrepreneur-academic model, involves students and scholars leaving India to gain knowledge and connections abroad. Over time, they become recognised for their expertise and either return home to take up prestigious positions in existing Indian academic and research institutes or become involved in establishing new institutions, such as the International School of Business (ISB) established by the Indian diaspora. Indian academics in the US have been known to take sabbaticals from their positions in the US to teach at the ISB.

In all cases, the returning members of the diaspora, whether doing so temporarily or permanently, continue to nurture and enhance their knowledge and commercial links to the host country.

In some respects, although still a developing country, India's approach in the field of diaspora policy is leading edge because of its focus on entrepreneurial networks, knowledge and business creation, and brain circulation. Underscoring the dynamic and powerful role of India's entrepreneurial networks is the TiE-The Indus Entrepreneurs. TiE stands for 'talent, ideas and enterprise' and began as a network of Indian-born diaspora members in the US's Silicon Valley.

The network now extends to more than 45 branches ("chapters") in 10 countries and undertakes a range of functions, including professional development for members and networks to link venture capital with entrepreneurs and government lobbyists. For example, TiE networks played an important role in the liberalisation of telecommunications and venture capital sectors in India. TiE has also established training institutes in Silicon Valley, is expanding slowly to other parts of the world and has launched TiE television for US and Asian viewing.

Scotland

Scotland pursues a soft-power approach in maximising the linkages with its diaspora, driven to some degree by that country's small size, which limits the amount of

resources that can be used for diaspora policies and programs. In this regard Scotland is of particular interest to Australia.

Scotland's approach to its diaspora stems from the government's innovation economy strategy – the 'Smart, Successful Scotland' strategy. The strategy is based on three themes: growing businesses, learning and skills, and global connections.

The latter is very important to Scotland and reflects a fundamental shift in the country's approach to economic development and investment policy and, importantly, diaspora policy. This is because traditionally Scotland had concentrated on attracting knowledge through inward investment and trade, but is now increasingly looking at deeper and broader global engagements. The diaspora is seen as playing a key role in this process.

As successful, well-connected and influential global players, many members of Scotland's diaspora are seen as critical to fulfilling this mission. As such, Scotland views the connections and capabilities that the diaspora brings as more important than return migration. A prime vehicle for this is the GlobalScot program, which, although having limited government funding or intervention, has been successful in achieving positive outcomes for Scotland.

The program is driven by the reach, influence and commitment of leading Scots abroad (as the case study below shows) and is very much based on coaching and mentoring. While some seed funding, facilitation and information provision by support staff in Scottish Government overseas offices represent the government effort, much of GlobalScot relies on passionate businesses and individuals.

BOX 1: GLOBALSCOT

Following an extensive period of research, GlobalScot was launched in 2001. With a small budget of £300,000 and supported by staff from the Scottish Development International Offices (which is the international arm of Scottish Enterprise, the leading economic development agency) and member support managers, GlobalScot members (i.e. leading Scots abroad), are playing key roles in shaping Scotland's future.

Scots around the world, invited by the Scottish First Minister to join, have been enthusiastic participants. The initial acceptance rate was as high as 75 per cent. There are as many as 950 GlobalScot members in over 40 countries including the Americas (46.5 per cent), Europe, Middle East and Africa (36 per cent) and 16.9 per cent in Asia-Pacific.

GlobalScot is focused on key sectoral priorities of Scottish enterprise including aerospace, chemicals, construction, electronics, energy, financial services, food and beverages, forestry, life sciences, shipbuilding/marine, textiles and tourism.

(Continued)

Members of GlobalScot undertake a range of tasks under the three a's: advice, access and aspirations. They provide the following services: advice on economic development opportunities and strategies; intelligence on global trends, technologies and practices; mentoring in relation to starting up businesses; and advice on processes, product development and management. GlobalScot plays an important role in terms of introductions to potential business partners and customers for Scottish businesses, hosting events, assisting trade missions and learning journeys, and using influence to facilitate commercial deals.

Through their vision and success, GlobalScot members help to raise the aspirations of Scottish businesses and individuals. Activities include providing internships abroad for Scottish university students and connecting GlobalScot members with secondary schools in Scotland through email mentoring, guest lectures, staff development for teachers and video-conferencing discussion on selected topics. Motivational talks for Scottish businesses and networking events have proved to be inspirational and informative.

One of the keys to GlobalScot is the relatively inexpensive but highly efficient support infrastructure. With its relatively small budget, the GlobalScot network is a prime example of focusing and targeting resources wisely. Member support managers play an in important role in face-to-face consultations with new GlobalScot members to provide an overview of Scotland's economic situation, priorities and challenges. These consultations also enable members to offer views on how best they might contribute.

A recent review of GlobalScot suggested that for a government investment of £900,000 over three years, at least £30 million was generated in gross value-added for Scottish businesses. In 2006–07 GlobalScots provided an estimated 650 responses to requests, an increase from 605 in 2005–06 and 503 in 2004–05. Some 92 per cent of GlobalScot members have made at least one active contribution.

Some key successes facilitated by GlobalScot include inward investment projects, licensing deals in the US for electronic equipment, marketing advice to enter the software market in the US, commercial development of a Scottish University invention in 3-D technology, and assistance with development of the Scottish Biotechnology Framework for Actions.

Sources: MacRae and Wight (2006); Global Scot, *Annual Review* (2007).

Towards a new approach for Australia

As a relatively new type of policy making, approaches towards the diaspora are very much evolving and Australia is poised to learn from the approaches of other countries. While some work has been done on Australia's diaspora, a national consensus on an integrated approach, let alone a strategy, has yet to emerge.

From the approaches reviewed in this paper, elements of Indian and Scottish strategies are appealing. In particular, India's focus on entrepreneurs is of interest, while Scotland's innovative GlobalScot program could be worthy of emulation by Australia. An assessment of the diaspora policies in that country now seems to centre on the question "well what next?" Given the small but highly successful GlobalScot program, the need to widen and deepen the program to reach into new markets and sectors (including the fast-growing Asian markets) is a challenge (Macrae and Wright, 2006; Bowker, 2003).

Whatever Australia does choose, it will be critical that the approach to our diaspora reflects our own circumstances, in particular our priorities and aspirations and, of course, opportunities and challenges. It is worth noting that China's approach is less likely to be compatible with a future direction for Australia. Indeed, there are question marks about the extent of successes associated with the Chinese model and whether in fact the cream of the crop really is returning home (OECD, 2007)
As a very first step it might useful to consider a range of principles that could guide the future development of diaspora policy. A tentative list could include:

- *Leverage* – This includes identifying and drawing explicitly on the connections and networks of Australians abroad to forge long-term trade, investment and innovation linkages, especially idea and knowledge flows. Measures here could include providing greater online linkages, promoting innovation facilitators to connect with expatriates, and possibly even creating political representation for overseas Australians.
- *Collaboration* – Working together with the diaspora on collaborative projects including R&D and scientific work, and utilising expatriates as knowledge conduits to facilitate joint ventures with other interested parties.
- *Emigration* – Developing a coherent emigration policy to promote at least short-term movement of Australians overseas to gather experience, knowledge and connections (Hugo, Rudd and Harris, 2003). Preferably they would then bring these back home, or they could at least remain valuable assets abroad.
- *Integration* – Linking diaspora policy (and indeed all of our human capital policies) to our other key national policies such as innovation and trade.
- *Advocacy* – Working on the global stage for cooperation among nations on people movements to best address the needs of home and host countries. This could include advocacy for new global institutions to address these issues.

REFERENCES

Australian Bureau of Statistics (ABS) (2007), 'Migration: Permanent Additions to Australia's Population,

Australian Social Trends, cat no. 4102.0, Canberra.

Australian Senate (2005), *They Still Call Australia Home: Inquiry into Australian Expatriates*, March 2005,

Legal and Constitutional References Committee, Canberra.

Bound K (2007), *India: The Uneven Innovator. The Atlas of Ideas: Mapping the New Geography of Science*, DEMOS.

Bowker J (2003), 'GlobalScot Would Do Well to Look and Listen More', 13 August, <www.thescotsman.com/business>, accessed 2 October 2007.

Canada Asia (2006), 'Commentary', no 41, March.

China, '11th Five-Year Plan', <http://english.gov.cn/special>, accessed 2 October 2007.

'China Issues S/T Development Guidelines', <www.gov.cn/english/2006-02/9>, accessed 2 October 2007.

China Ministry of Education, 'Work Related to Students and Scholars Studying Abroad', <www.moe.edu.cn/english/international_2.htm>, accessed 11 October 2007.

'China to Give More Support for Enterprises', <www.gov.cn/english/2006-02/9>, accessed 2 October 2007.

'China to Strengthen Basic Research, <www.gov.cn/english/2006-02/9>, accessed 2 October 2007.

Chong F (2008), 'Australians Finding Themselves Hot Property in Booming United Arab Emirates', *The Age*, 8 January.

Dahlman C and Utz A (2005), *India and the Knowledge Economy: Leveraging Strengths and Opportunities*, World Bank, Washington DC.

The Economist (2006), 'The Battle for Brainpower: A Survey of Talent', 7 October.

Ellerman D (2006), 'The Dynamics of Migration of the Highly Skilled: A Survey of the Literature', in Kuznetsov Y (ed), *Diaspora Networks and the International Migration of Skills*, World Bank Institute.

Florida R (2005), *The Flight of the Creative Class*, Harper Business.

Florida R (2003), *The Rise of the Creative Class*, Harper Business.

Franchi-Jonsson H (2006), 'Silicon Valley: The Global R&D Hub', in Karlsson M (ed), *The Internationalisation of Corporate R&D*, Swedish Institute for Growth Policy Studies.

GlobalScot (2007), *Annual Review*, August.

GlobalScot, 'Building an International Network for Scotland', <www.globalscot.com/public/aims/index.aspx>, accessed 2 October 2007.

GlobalScot, 'Welcome', <www.globalscot.com/public/aims/index.aspx>, accessed 2 October 2007.

Hugo G, Rudd D and Harris K (2003) *Australia's Diaspora: Its Size, Nature and Policy Implications*, Committee for Economic Development of Australia (CEDA).

Hugo G (2004), 'Leaving Australia: A New Paradigm of International Migration', Research Note no 54 2003–04.

India, Department of Science and Technology, 'Science and Technology Policy 2003', <http://dst.gov.in/stsyIndia/stp2003.htm>, accessed 19 September 2007.

India, Department of Science and Technology, *Annual Report 2006–2007*, <http://dst.gov.in/about_us/ar06-07/ar06-07index.htm>, accessed 19 September 2007.

India, Department of Science and Technology, *Annual Report 2003–04*, <http://dst.gov.in/about_us/ar03-04index.htm>, accessed 19 September 2007.

India, Planning Commission, *10th Five Year Plan 2002–2007*, <www.planningcommission.nic.in/plans/planrel/fiveyr/welcome.html>, accessed 19 September 2007.

India, Planning Commission, *Towards Faster and More Inclusive Growth: An Approach to the 11th Five Year Plan*, June 2006, <http://planningcommission.nic.in/plans/planrel/11appdrft/11app_eng.pdf>, accessed 19 September 2007.

Karlsson M (2006), 'The Challenges of International Corporate R&D', in Karlsson M (ed), *The Internationalisation of Corporate R&D*, Swedish Institute for Growth Policy Studies.

Kulkarni A, Grewal BS, Malhotra P and Bougias G (2005), *National Competitive Advantage and Skilled Migration: A Knowledge Economy Perspective and the Role of India and China*, ABERU Discussion paper no 18, Monash University.

Kuznetsov Y and Sabel C, *Global Mobility of Talent From a Perspective of New Industrial Policy: Open Migration Chains and Diaspora Networks*, <http://info.worldbank.org/etools/docs/library/201210/Search_Networks_final1.pdf>.

Kuznetsov Y and Sabel C (2006), 'International Migration of Talent, Diaspora Networks, and Development: Overview of Main Issues', in Kuznetsov Y (ed), *Diaspora Networks and the International Migration of Skills*, World Bank Institute.

Kuznetsov Y (2006), 'Leveraging Diasporas of Talent: Toward a New Policy Agenda', in Kuznetsov Y (ed), *Diaspora Networks and the International Migration of Skills*, World Bank Institute.

Leadbeater C and Wilsdon J (2007), *The Atlas of Ideas: How Asian Innovation Can Benefit Us All*, DEMOS.

MacRae M and Wight M (2006), 'A Model Diaspora Network: The Origin and Evolution of GlobalScot', in Kuznetsov Y (ed), *Diaspora Networks and the International Migration of Skills*, World Bank Institute.

Ministry of Overseas Indian Affairs (2006), *Handbook for Overseas Indians*.

Mitra R (2007), *India's Emergence as a Global R&D Center: An Overview of the Indian R&D System and Potential*, Swedish Institute for Growth Policy Studies, Working Paper 2007: 012.

National Science Foundation (2007), *Asia's Rising Science and Technology Strengths: Comparative Indicators for Asia, the European Union, and United States*, August.

OECD (2006), *Main Science and Technology Indicators*, 2006/2 edition.

OECD (2006), *Science, Technology and Industry Outlook*.

OECD (2007), *OECD Reviews of Innovation Policy: China – Synthesis Report*, August.
"Overseas Chinese Scholars Encouraged to Return Home",
<http://www.china.org.cn/english/news/195043.htm>, accessed 13 September 2007.

Pandey A, Aggarwal A, Devane R and Kuznetsov Y (2006), 'The Indian Diaspora: A Unique Case?', in Kuznetsov Y (ed), *Diaspora Networks and the International Migration of Skills*, World Bank Institute.

People's Republic of China State Council, *Medium- and Long-Term National Plan for Science and Technology Development Programme 2006–2020*.

Report of the High level Committee on Indian Diaspora,
<www.indiandiaspora.nic.in/contents.htm>, accessed 19 September 2007.

S&T International Cooperation, Division of Department of Science and Technology,
<www.stic_dst/org>, accessed 19 September 2007.

Saxenian A (2006), *The New Argonauts: Regional Advantage in a Global Economy*, Harvard University Press, Cambridge MA.

Saxenian A (2005), 'From Brain Drain to Brain Circulation: Transnational Communities and Regional Upgrading in India and China', in *Studies in Comparative International Development*, vol 40, no 2, pp 35–61.

Scottish Business Grants, <www.scottishbusinessgrants.gov.uk/rsa/CCC_FirstPage.jsp>, accessed 2 October 2007.

Scottish Development International, 'Innovation in Industry', <www.sdi.co.uk>, accessed 2 October 2007.

Scottish Development International, 'Our Services', <www.sdi.co.uk/pages/ourservices>, accessed 2 October 2007.

Scottish Enterprise, *Annual Review 2006–2007*, <www.scottish-enterprise.com>.

Scottish Executive (2004), *A Smart, Successful Scotland 2004: Strategic Direction to the Enterprise Networks and an Enterprise Strategy for Scotland*,<www.scotland.gov.uk/publications>, accessed 2 October 2007.

Scottish Government, *A Science Strategy for Scotland 2001: Progress Report*,
<www.scotland.gov.uk/publications>, accessed 2 October 2007.

Scottish Government, 'Debate on Scottish Economy,
<www.scotland.gov.uk/news/releases/2007/05>, accessed 2 October 2007.

Schwagg Serger S (2006), 'China: From Shop Floor to Knowledge Factory?', in Karlsson M (ed), *The Internationalisation of Corporate R&D*, Swedish Institute for Growth Policy Studies.

'State Helps More Students Go Abroad', <http://au.china-embassy.org/eng/jy/t66730.htm>, accessed 13 September 2007.

State Science and Technology Institute (2006), *SSTI Weekly Digest*, 1 May,
<http://www.ssti.org/Digest/2006/050106.htm>, accessed 6 May 2008.

'Statement by the Minister For Foreign Affairs on the Report of the Taskforce on Policy regarding Emigrants, 28 August 2002, <www.dfa.ie/home/index.aspx?id=26227>, accessed 25 September 2007.

'Students to Go Abroad but Encouraged to Return, <www.china.org.cn/english/education>, accessed 13 September 2007.

'The Second Diaspora Event', <www.hcindia-au.org/diaspora_main.html>, accessed 19 September 2007.

Thursby J and Thursby M (2006), *Here or There? A Survey of Factors in Multinational R&D Location*, Report to the Government-University-Industry Research Roundtable, The National Academies Press.

United Nations (UNCTAD) (2005), *World Investment Report: Transnational Corporations and the Internationalization of R&D*.

U.S. Department Commerce (18 January 2008), 'Gutierrez Calls for Government, Private Sector, and Academic Actions on Innovation Measurement', <http://www.innovationmetrics.gov/press_releases/011808PressRelease.pdf>, accessed 6 May 2008.

Wessner C and Shivakumar S (eds) (2007), *India's Changing Innovation System: Achievements, Challenges and Opportunities for Co-operation: Report of a Symposium Committee on Comparative Innovation Policy Best Practices for the 21st Century*, Washington DC, The National Academies Press.

Wilsdon J and Keeley J (2007), China: The Next Science Superpower? The Atlas of Ideas: Mapping the New Geography of Science, DEMOS.

World Bank (2007), *Global Economic Prospects 2007: Managing the Next Wave of Globalization*.

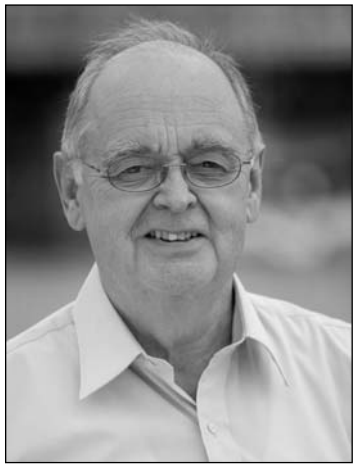
Wu Chong (2006), 'China to Build 20 New Science and Technology Parks', 19 April 2006, <www.scidev.net/news>, accessed 5 October 2007.

<www.tie.org/chapterHome/about_tie/viewInnerPagePT> (now www.tiesv.org), accessed 1 October 2007.

Mark Matthews

Dr Mark Matthews is the Executive Director of the Forum for European-Australian Science and Technology cooperation (FEAST). He is also the Interim Director of the Research Evaluation and Policy Programme (REPP) in the Research School of Social Sciences at The Australian National University. Mark has extensive private sector experience in public policy consulting in both the United Kingdom and Australia and he has held positions in the universities of Sussex (Research Fellow, Science Policy Research Unit), Bath (Research Fellow, School of Management) and Warwick (Senior Fellow, Warwick Manufacturing Group, Department of Engineering).

Bob Frater



Over more than 40 years, Dr Bob Frater AO has researched electronics, telecommunications, radioastronomy instrumentation, electroacoustics and biomedical devices. In 1996, he was made an Officer of the Order of Australia for his contributions to science in Australia and internationally, including his work on the construction of the highly successful $50 million Australia Telescope at Narrabri in northern NSW. Bob is presently the Vice President for Innovation with ResMed Corporation and holds a number of other board positions. He has been with ResMed since 1999, after leaving CSIRO where he had been Deputy Chief Executive for 11 years. He is a Fellow of the Australian Academy of Science and a Fellow of the Australian Academy of Technological Sciences & Engineering, and chaired the Research Advisory Committee of the Australian Business Foundation until September 2008.

How Intangible Networks Can Boost the Innovation Odds

Mark Matthews and Bob Frater

Dr Matthews is the Executive Director of the Forum for European-Australian Research Cooperation (FEAST) and is also with the Research School of Social Sciences, The Australian National University. Dr Frater is Vice-President Innovation, Resmed Pty Ltd.*

"The boundary between invention and innovation is the place where individual human ingenuity connects with long-term macroeconomic growth".

(Branscomb and Auerswald, 2001, p 1)

The story of how Australian company Radiata Communications Pty Ltd beat international competition to the development of an effective new local wireless network is now widely cited as an example of successful research commercialisation. This paper tells how the company overcame the odds by using an intelligent and flexible approach assisted by a rich Australian research history in the area, along with networks of highly skilled people who trusted each other. The breakthrough culminated in Radiata being acquired by Cisco Systems for A$567m. This success provides a variety lessons for would-be innovators.

Introduction

Innovation is inherently risky and involves a strong element of learning-by-doing. When attempting to innovate, the greater the experience in innovating the lower the risk of failure. This knowledge of how to navigate the white-water risks faced when innovating is highly tacit and is therefore not easily taught outside of actual experience.

This learning-by-doing is not just personal; there is also a collective dimension. People who innovate together gain valuable collective experience. This amounts to an intangible asset for a region or national economy.

The movement from invention to innovation, that is to say the commercialisation of an invention, involves taking abnormally high investment risks in order to generate the usually remote possibility of making abnormally high returns. When this process is particularly successful the result is, in statistical terms, an outlier – a rare event that deviates from the norm. Comparatively little attention is paid to these outliers in orthodox economics and econometrics because these events are viewed as transient phenomena that reflect a temporary disturbance to normal competitive circumstances. Conventional business schools also devote comparatively little attention to the leap from invention to innovation because these are, by definition, pre-competitive activities.

Nonetheless, these outliers often have a significant effect on national and regional prosperity – and can sometimes create whole new industries or market segments. From a policy perspective, although one cannot develop policies and commercialisation strategies based on events that are as unlikely as lightning strikes, one can seek to create more favourable conditions and incentives to encourage appropriately skilled people to take these abnormal risks.

Encouraging research commercialisation by spin-offs, start-ups and licensing deals (all of which have merits) can clash with the risk-averse approach to setting tightly specified performance targets in the public sector (ie, clearly defined inputs and outputs). The inherently risky nature of commercialisation means that failures are inevitable – but that these failures are valuable.

Unless the policy framework explicitly recognises the value of learning-by-doing in investment risk management, the cumulative value of a history of successes and failures is likely to be overlooked. The Radiata story illustrates the extent to which both the public and private sectors can develop strategies and tactics to buy better odds of success.

The Race for a New Chip

By the late 1980s, there was a widespread conviction that short-distance wireless communication could become a major market area, as various users of electronic equipment sought to maximise the flexibility and interconnectivity of different types of device.

The technical challenge was that the signals used for wireless communication bounced off the walls, floor, ceiling and furniture, creating the same sort of effect as the ghosting in television pictures caused by signals bounced from nearby buildings.

Globally, a number of research teams started to think about technological solutions to turn the idea of wireless local area networks (LANs) into a reality. Researchers in the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Radiophysics Division and at Macquarie University's Electronics Department started to become active in considering the overall market potential and the specific technological solutions that could be developed.

They turned to the proposition that fast Fourier transform (FFT) techniques could provide a means of overcoming some of the many technical challenges faced. FFT is a mathematical technique that allows signals to be divided up, transmitted, and then recombined in such a way that the complex reflections found inside buildings can be handled.

Developing a solution

CSIRO decided to fund some exploratory work on the use of FFT in wireless LANs. It initially selected a relatively high carrier frequency of 60GHz. This was because CSIRO's existing expertise lay in the radio astronomy and microwave landing systems that operate in this high frequency range.

The initiative was known as the Program for Local Area Networks (PLANs) and involved the team at Macquarie University, with the collaboration centred around chip design, network and decoder design. Eventually, a joint research centre linking these two organisations was formed in 1993.

By 1995 a system had been demonstrated that was able to overcome the severe problems faced in an indoor multi-path environment. This work led to a US patent being granted in 1995 (assigned to CSIRO by the inventors) for a wireless LAN. CSIRO decided to license this technology on a non-exclusive basis.

During this initial period in the development of wireless LAN technology, one of Radiata's founders was working in the United States. In 1998 CSIRO and Macquarie University negotiated to create an attractive half-time position at the University to lure this well-regarded microprocessor designer back to Australia.

Once established at the university, he started to put in place some of the people and equipment required to make a commercial excursion into chip design. This involved a move into commercial computer aided design (CAD) tools. A US CAD company supplied the Macquarie team, at no cost, a set of CAD tools with a commercial value of US$6m. One product of this work was the development of a complete modem chip, the DMT-50.

This incorporated technology from a previous FFT chip design developed at the joint research centre in 1996. Work on the DMT-50 chip appears to have started before Radiata was formed and was completed in 1998 as part of Radiata's design work.

Radiata Inc. (a contraction of the term "radio data") was formed in 1997 primarily in response to the market potential created when the 5GHz spectrum for wireless LANs became available as part of the US National Information Infrastructure policy initiative. The 5GHz range has the advantage that it is relatively uncongested. For comparison, Bluetooth, which operates at 2.4GHz, shares spectrum with cordless telephones, microwave ovens and devices like baby monitors.

The parent company was incorporated in the US State of Delaware. It established an Australian-based research and development (R&D) operation Radiata Communications Pty Ltd and a Californian-based sales and marketing operation known as Radiata Communications Inc. Radiata's intellectual property (IP) was generally related to IP developed at the joint CSIRO–Macquarie University research centre. However, the company's informal IP (know-how) also contained substantial accumulated expertise in designing different types of integrated circuits.

How to enter the market without going bust

Market potential is one thing; being able to enter this market without going bust in the process is another, and turning uncertainty into risk is crucial to achieving this. In Radiata's case, the critical enabler in this process was the definition of an applicable technical standard.

Shortly after Radiata had been formed, the Institute of Electrical and Electronics Engineers (IEEE) defined the 802.11a standard for 5GHz wireless LAN networks. It seemed to be clear at the time that IEEE 802.11a represented a potentially lucrative market, but the technical challenges to access this potential market were immense.

The existence of a new international standard for wireless LAN communication at 5GHz had a significant impact on the investment risks faced in the commercialisation process. IEEE 802.11a defined the key performance parameters for the engineering decision-making process. This tight focus reduced the range of potential technological options that might have to be considered. It also restricted the scope and complexity of the engineering trade-offs faced. So although still representing major challenges for the engineering process, 802.11a's performance envelope would effectively turn uncertainty into risk.

The Radiata team had the credibility required to interest external investors, including ICT companies and venture capitalists. Membership of the US-based electronic engineering community of practice was one of the critical elements in Radiata's success. This network provided the connections between people and the trust that was critical

to investors' ability to judge the degree of investment risk they face. This is particularly important when attempting to innovate outside of the core of the world ICT market and the hub of corporate venture capital finance: the USA.

In general, the Radiata team were fully aware of the extent to which potential investors rely on interpersonal networks to judge the risks they face in making an investment. When reacting to those seeking their investments, US venture capitalists ask three key questions: What do you know? Who do you know? Who knows you? Credibility and trust emerge from these networks and little can substitute for this means of investor risk reduction. The fact that each member of the team was perceived, at an individual level, to have a strong track record of success was vital to the venture.

The process that Radiata embarked on was fraught with difficulties. Its engineering challenge may have been tightly focused on providing a cost-effective solution to IEEE 802.11a, but it had little idea how to achieve this at the start of the process. As a result, its researchers followed blind alleys in the engineering design process and there was a risk of failure at an engineering level for a considerable time during the innovation process.

Work started on designing two complementary chips in 1999 (a modem and a radio-frequency chip) with the aim of ending up with a fully integrated design. The value of the Radiata team's capability lay in the ability to design such complex chips without incurring prohibitive design and development costs. Few companies in the world were able to cope with such severe challenges, which have been compared to the equivalent of "writing a million line computer program, running it for the first time and never having a single bug" (Weste, 2002). If a chip has design faults, the fabrication runs required to test whether these design problems have been eliminated can quickly bankrupt a company or delay the time to market.

The source of competitive advantage therefore lay in the tacit knowledge required to design error-free chips with a minimum of redesign loops. This is a familiar and highly valuable capability in any engineering environment, where redesign work can amount to the majority of all design and development costs. In Radiata's case, experience, intelligence and imagination allowed it to minimise the number of design iterations.

One of the major difficulties faced in carrying out this design work was the cost of state-of-the-art CAD tools that allowed this skill and experience to be used to achieve this high probability of success in meeting design targets. Based on preparatory work using CAD tools at Macquarie, Radiata negotiated a cost-effective lease arrangement with the leading chip design tools company Cadence for the initial phase of CAD work, on the understanding that it would acquire these tools after the first chips had been produced. An excellent working relationship with Cadence's founder was essential to this cost-effective deal.

The dominant radio-frequency chip paradigm at the time was used in GSM chips for mobile phones. These required far higher resolutions in signal processing than the shorter-range LAN radio single-chip solution being pursued by Radiata.

The importance of this is that engineering trade-offs are significantly different for GSM and wireless LAN chips. Competitors with considerable GSM chip-design capability found it difficult to grasp that it might be possible for Radiata to meet LAN objectives, because GSM engineers approached the problem with far higher tolerances.

Radiata had set out to develop crude short-range radios on a chip, not sophisticated ones. The emphasis was on getting the cost down within more limited range and signal processing parameters than GSM technology requires. In effect, therefore, Radiata was able to gain competitive advantage in the face of very powerful competition simply because it realised that it was operating in a different technological paradigm driven by different market considerations.

A respected mobile phone company RF chip engineer told the team: "We really admire your spirit but you haven't got a hope in hell of it working." The same day, Radiata delivered the first batch of its single-chip radios for testing. The chips worked as planned.

Attracting the attention of potential investors

Radiata staff made frequent business trips to the US for meetings throughout the company's short lifetime. An interesting relationship had started to develop with Cisco Systems. The company's executives goaded the Radiata engineering team to prove that it had a potentially viable solution to the IEEE 802.11a challenge. The informal dialogue with Cisco eventually involved an invitation from Cisco to meet its expert in this area and to try to convince him of the viability of Radiata's approach.

When Cisco's gatekeeper had been satisfied that the solution was viable, Cisco moved very quickly to take an 11 per cent stake in Radiata.

Radiata's 802.11a-compliant chip was completed and demonstrated at a major international exhibition in September 2000. The R-RF5, as it was called, could handle transmission rates of 54 megabits per second, sufficient to send full motion video over a wireless LAN. At that point, six large US companies were understood to have made direct bids for Radiata.

Cisco's bid of A$567m was accepted on 13 November 2000 and the deal was finalised in January 2001.

Radiata selected not the highest bid but the one that offered the strongest fit with its capabilities. Time to market was critical given that Radiata's 802.11a solution only had a 12-to-18-month lead over the competition.

Cisco's acquisition of Radiata required a rethink of key engineering aspects of the final push to introduce the product into the market. This extended the engineering effort from three months to 12 months to produce a fully integrated chipset design compliant with Cisco's demanding performance standards. However, even with this raising of the bar, it was only necessary to go to a second chipset iteration to meet the necessary design targets. The modem chip only required minor redesign work following the first iteration. The RF chip worked adequately and only required some minor revisions of the design of the mark used in the manufacturing process in order to improve the signal produced. It is hard to overstate the significance of these engineering achievements in the overall scheme of Radiata's success. Furthermore, Radiata's strategy for gaining US investor confidence in the first place was based on presenting Radiata as a US company. The realities of the abnormal investment risks that must be taken in order to generate abnormal returns, and knock-on benefits, favour a more international perspective over an insular one.

In January 2004, Cisco announced that it was winding down the development of its 802.11a wireless chipsets based on the Radiata technology. The reasons given were that newer Wi-Fi standards had become more important and that, as the market for wireless chipsets had matured to the point of becoming 'commoditised', it was no longer necessary to possess internal design capability in that area (Reardon 2004). It is also worth noting that the Stanford University start-up Atheros had beaten Cisco to market with their 802.11a chips, apparently because the need to comply with Cisco's stringent design quality assurance processes had slowed the Radiata team's progress (Skellern 2001).

Patent infringement litigation initiated by CSIRO has been developing in parallel to these events. If CSIRO is successful, over 100 companies could be forced to pay CSIRO royalties relating to the use of chips that comply with the 802.11a and 802.11g IEEE standards covered by the CSIRO patent (and indeed possibly the new 802.11n standard because this also uses the ODFM technology covered by the CSIRO patent).

It is inappropriate to comment on this on-going litigation, except to highlight two issues. Firstly, substantial financial resources are required to defend IP (supporting the argument for the critical mass in R&D provided by CSIRO). Secondly, there are complex, and potentially problematic, relationships between IP rights and the design of IEEE (and other) technical standards. If a new technical standard is designed around pre-existing IP, the risk created by vested interests is handled by a letter of assurance from all participants in the standard-setting process. This letter guarantees that the owner of any IP influencing the standard will license the IP for use in further research and will apply non-discriminatory pricing to licences for commercial use of the IP.

Tapping into Australia's strong history in complex radio technology

Radiata was able to exploit intangible assets that had already been developed in Australia as part of long-term strategic plans in radio astronomy.

Pushing the scientific research frontier in radio astronomy involves advancing the technological frontier in radio signal capture and processing. It involves stretching the range of frequencies over which signals can be captured and developing methods for distinguishing between signals and background noise. These techniques can also be used for industrial applications including satellite-based communications, mobile phones and short-distance applications such as wireless LANs.

The radio-astronomy community has long recognised this close coupling of the technologies used to improve radio-telescope instrumentation capabilities and commercial or defence applications. This recognition goes beyond simply being receptive to the notion that commercial spin-offs will occur from this R&D work. It extends to a more strategic recognition of the value of building close linkages between the companies that are able to develop and provide critical instrumentation technologies and the R&D and research training carried out in order to support radio astronomy.

This results in a system of academic-industry linkages that, since as far back as the 1960s – and possibly before – has been far more symbiotic than the simplistic model of basic research translating into industrial applications. The scientists and engineers involved in these capacity-building efforts recognised that close links between the radio-astronomy community and electronics companies would also help to build and sustain a competitive electronics industry in Australia.

The combination of skill and experience in chip design and access to state-of-the-art CAD tools creates this capability for 'low-D' R&D. This dramatically reduces the time and cost required to complete experimental and full-scale development, which is particularly important for small economies such as Australia in which there is relatively little scope for economies of scale in R&D funding.

This is illustrated in the following diagram, which represents different chip-design capabilities in terms of confidence curves; the different probabilities of meeting or exceeding a given percentage of design targets on the first design iteration. These confidence curves apply to any engineering design process. The better the design team, the higher the percentage of the design targets that will be met or exceeded on the first iteration.

Learning-by-doing in chip design shifts these confidence curves to the right. Pushing the design envelope moves a team's confidence curve to the left because there is a reduced familiarity with the specific technical challenges and a decreased capacity to rely on existing solutions. CAD and other simulation technologies that assist designers also play a major role in allowing this curve to shift to the right – provided they have the skill to use these tools effectively. Given the severe cost and time-to-market penalties of substantial redesign work, a high confidence curve can be extraordinarily valuable, particularly if being first into the market brings with it a stream of substantial future commercial advantages.

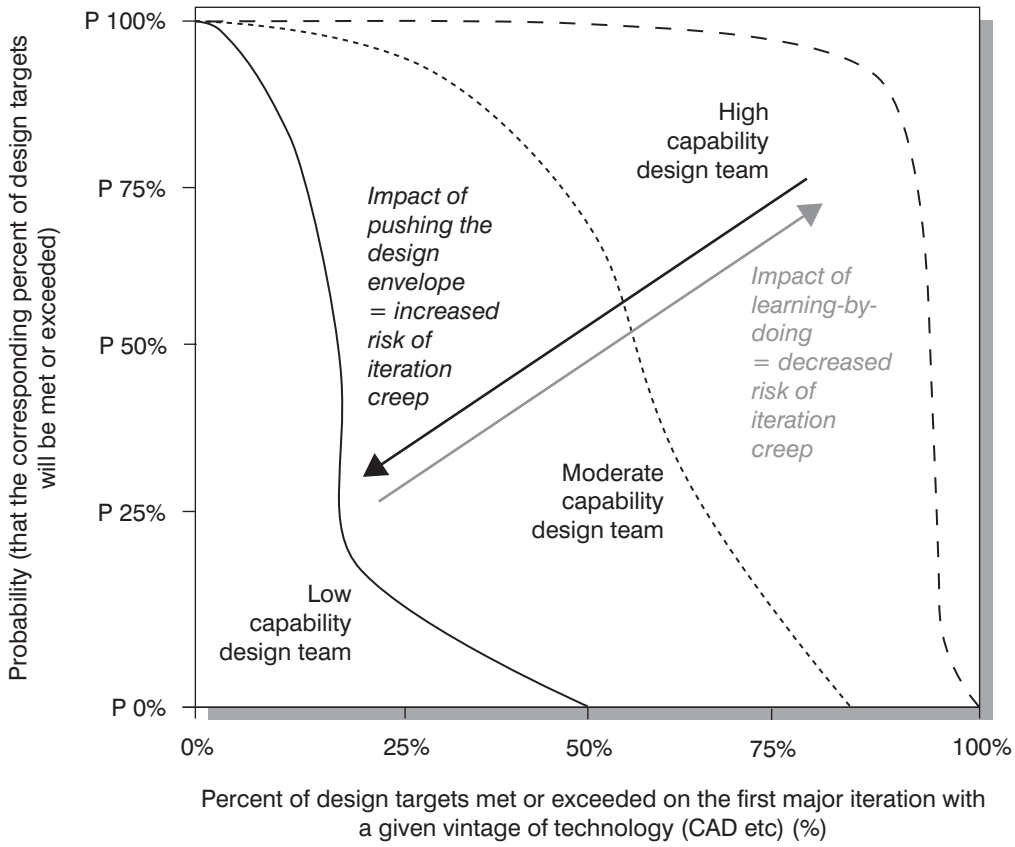


FIGURE 1: Chip design capabilities as confidence curves

Note: Technological advances in design process technologies (CAD and simulation etc) can decrease the risk of iteration creep if used effectively.

The discussion that follows shows how the prehistory to Radiata shifted the confidence curve to the right to such an extent that it far surpassed the industry norm, thus helping to create Radiata's high intangible asset value.

The outcome from the previous decades of investment in creating and enhancing chip design capacity in Australia is the relatively high confidence curve – and this remains a potentially important and valuable asset for Australia. This is a product of learning-by-doing generated in part by key people pursuing long-term strategic objectives.

How a telescope helped build a LAN

The core of this story is the use of the Fleurs Synthesis Telescope (FST) as a basis for doctoral research training that focused on real-world radio astronomy challenges. There are also important contributions originating in the US. The creation of Australia's capa-

bilities in chip design is partly the product of international transfers of technology embodied in people with US experience and partly due to a range of spin-offs from building radio telescopes and associated doctoral training.

The FST doctoral experience has produced cohorts of engineers who subsequently went on to work overseas, particularly in Europe and the United States. When these engineers returned to Australia they brought with them considerable expertise and contacts.

CSIRO's very large scale integration (VLSI) program was launched when researchers with US experience returned to Australia. This program was critical to the development of a key element of the Australia Telescope, known as the correlator chip. The Australia Telescope provided the essential user focus and first customer for this R&D work.

CSIRO's VLSI Program was spun off into a company called AUSTEK Microsystems. AUSTEK collaborated with CSIRO radiophysics researchers to produce an FFT chip. AUSTEK subsequently commercialised the technology. This experience at AUSTEK subsequently contributed to Radiata's success.

This complex chain of precursor activities was focused on the dual objectives of improving radio-telescope performance and developing the industrial capacity to provide the technologies necessary to do this. The strategy was long term and was not explicitly aimed at achieving specific commercial outcomes so much as pursuing a process of learning-by-doing in chip design that would generate a wide range of options for future exploitation. What stands out is the team-based doctoral training using a real operating radio telescope as a means of creating the right type of human capital and the strategic use of new and major upgrades of radio telescopes to further enhance these skills and add experience.

Over the 40-odd years of this story, these efforts became more and more focused on microchip design, because this field presented the best opportunities for increasing the performance of radio telescopes. There is a system of co-evolution linking radio astronomy, telecommunications and microchip design. This symbiotic relationship at the leading edge of science and technology provides Australia with a competitive advantage linked to the nation's geographical location in the southern hemisphere (an important factor in astronomy). This is not a spin-off in the familiar sense because it results from the objectives of fostering both scientific and technological capability.

Lessons from the Radiata story

Blue-sky research can have widespread practical applications

The Radiata story illustrates very clearly the ways in which the apparently blue-sky research objectives of radio astronomy can stimulate a range of application-oriented

technological and engineering R&D. This R&D is aimed at advancing the instruments used to conduct this research. This instrumentation-focused R&D, and the application-oriented research training it requires, is a little mapped but critical pathway for research commercialisation.

The nature and extent of Australia's interpersonal network-based intangible assets used in innovation

This case study shows how important interpersonal networks are in the innovation process. Consequently, we should aim to ensure that we understand the nature and extent of the networks that Australia currently has – and identify any significant shortcomings or gaps in these networks. As in this example, these networks are multi-sectoral but may not always be captured or reflected in formalised associations and relationships. On the basis of this case study, these networks also tend to evolve through deliberate strategic planning.

The strategic management of people's careers so they obtain multi-sector experience

People's careers and the capability of the network they comprise can benefit from strategic planning, as is shown by the use of radio telescopes for doctoral research training and career moves to create rounded skills. Multi-sector experience – time spent in the research base and in industry – can be critical to developing these sophisticated skill sets.

The sustained long-term planning and activities necessary to create these innovation networks

The network-building activities aimed at enhancing innovation capabilities described in this case study took place without targeted funding and emerged from within CSIRO and universities. One danger is that the current approach to public sector R&D management might limit the potential for this type of network-building by formalising and bureaucratising the process of allocating resources for R&D and assessing R&D outcomes over relatively short timeframes. In addition, today's shorter term tenures for senior R&D managers reduces their capacity to establish and sustain the sort of long-term strategic capacity building that this case study illustrates. Creating these networks requires budgetary slack and continuity in senior management.

The tactical use of international standard-setting procedures to create market niches

The Radiata story is a clear example of how efforts to define an international standard relating to technology create commercialisation opportunities. International engagement in these multilateral standard-setting processes provides Australian innovators with influence over these standards and gives them early warning of any emerging commercial opportunities.

Tight regulatory regimes may not appeal to many established companies, which see them as threats because they lack the technological capacity to develop compliant products and processes. However, these regimes also provide opportunities for innovation via new companies who champion what can be disruptive technologies which devalue existing corporate IP and net worth by doing new things in new ways.

How the science-push ethos meshes with a demand-pull ethos in the face of these risks

Entrepreneurs must characteristically take irrational risks from an investment perspective. One advantage of the science- and technology-push ethos is that it provides a frame of reference for taking such risks. The fact that those involved are willing to proceed on the basis of a gut feeling that a solution is technically feasible, even if it does not yet exist, provides a counterbalance to the impediment to innovation created by soberly weighing up the investment risks. However, once sufficient progress has been made on a technical level, managing investment risks becomes critical. If this transition comes too early in the process it can impede progress; if it comes too late it can lead to commercially irrational decisions.

How government programs help entrepreneurs to manage investment risks

Undertaking innovation involves taking risks with the money of the proponents and other people and organisations. Government funding helps to offset these risks and make it possible to proceed. To the extent that networks of the type described in this case study play a critical role in managing these investment risks, the nature and extent of support for these networks becomes a key policy issue.

Success stories alone are insufficient

We can learn as much, if not more, from failures to innovate, particularly when management decision making contributed to this. Success stories alone are insufficient.

Globalisation provides an opportunity for Australian innovators to offset any risk-inflating disadvantages that stem from innovating in Australia, while also allowing them to exploit any locational advantages such as cost-effective R&D and a southern hemisphere location. Government policy should recognise that supporting international engagement and experience and associated flows of people is critical to maximising the benefits and minimising the disadvantages of innovating in Australia.

Critical intangible assets help map our innovation capabilities

Radiata provides a useful example of how these networks or communities of practice have, at least in principle, a clear intangible asset value. There is a quantifiable relationship between the nature and extent of these networks and how compelling an investment proposition is.

It takes a long time to build innovative capacity

Although Radiata was born, grew and was acquired by Cisco Systems over just five years, this case study has highlighted the importance of the far longer process of developing the capabilities that enabled this particular episode to take place. Consequently, the contemporary focus on research commercialisation in Australia should not neglect the importance of capabilities that may take a long time to develop.

Conclusions

The economist John Maynard Keynes argued that an economy moves out of an equilibrium state mainly because of the essentially irrational animal spirits of entrepreneurs. If entrepreneurs soberly calculated the risks of success and weighed these up against the resources they had to commit at the outset of a venture, they would be less likely to proceed. We would all be worse off economically if this rational approach was adopted.

One of the most fascinating aspects of cases such as Radiata's is that the odds of commercial success were, at the outset, known to be overwhelmingly low – yet the work still proceeded. The work used strategies and tactics that increased the odds of success – and this risk taking eventually paid off. The expectation that the odds of success could continually be improved by deliberate actions probably drove the risk taking. Such expectations provide an explanation of how apparently irrational and abnormal risk-taking behaviour can in some circumstances be rational.

In Radiata's case, it seems clear that the risks faced were less abnormal than they may appear, simply because its chip-design capabilities were unusually good, giving the company a lower overall investment risk than its competitors. Radiata's innovation process, in turn, was able to draw on the intangible assets and intellectual property created by the radio-astronomy and electronic-engineering communities in Australia. These intangible assets and intellectual property also helped to increase the probability of success – and in a fundamental sense made this venture possible.

Researchers and policy makers should not underestimate the value of intangible networks of people in increasing the odds of successfully completing the innovation process – even though the networks are hard to identify. They constitute a form of human capital and social capital. It is therefore necessary to achieve the right balance between informal, intangible networks and the formal legal and organisational structures that are also necessary to conduct research and innovation.

In radio astronomy, what the science can achieve is dictated by what the technology can do – which in turn is driven by advances in science. Consequently science and technology evolve symbiotically. This means that the path to market and adoption is inherent in the formulation of research objectives.

REFERENCES

Australian Academy of Science (2003) 'Australia's Major National Research Facilities: Issues to Consider for the next phase of Backing Australia's Ability', Submission to National Research Infrastructure Strategy.

Chesbrough, G C and Rosenbloom, R S (2001) 'Defining Risks and Rewards: The Dual-Edged Role of the Business Model' in Branscomb, L and Aursweld, P E (eds) '*Taking Technical Risks: How Innovators, Executives, and Investors Manage High-Tech Risks*, The MIT Press.

Cooper, D (2001) 'Radiata Inc. In Commercialising Innovation', Proceedings of a Workshop held on 10 May 2001 in Sydney, Australian Academy of Technological Sciences and Engineering (NSW Division).

CSIRO (2001) Response to the House of Representatives Inquiry on Broadband Wireless, CSIRO Telecommunications & Industrial Physics.

Dosi, G (1982) 'Technological Paradigms and Technological Trajectories', *Research Policy*, 11, pp 147-162

Frater, B (2002) 'Rome wasn't built in a day: The Pre-History of a Startup', unpublished presentation slides.

Matthews M (2007) 'Lessons from Radiata', *Innovation: Management, Policy & Practice*, Vol 9 no. 2.

Matthews M and Frater R (2003) *Creating and Exploiting Intangible Networks: How Radiata was able to improve its odds of success in the risky process of innovating*, Case study prepared for the Science and Innovation Mapping study of the Department of Education, Science and Training, Canberra. Published at and available as a pdf document from: http://www.dest.gov.au/sectors/research_sector/publications_resources/profiles/radiata_improvement_innovation.htm

Hartmann, G and Myers, M B (2001) 'Technical Risk, Product Specifications, and Market Risk' in Branscomb, L and Aursweld, P E (eds) *Taking Technical Risks: How Innovators, Executives, and Investors Manage High-Tech Risks*, The MIT Press.

Howard Partners (2003) 'Evaluation of the Cooperative Research Centres Programme', Report for the Commonwealth Department of Education, Science and Training.

Reardon M (2004) 'Cisco retires wireless chipsets', CNet on-line news item.

Skellern, D. et al (1996) 'A mm-Wave High Speed Wireless LAN for Mobile Computing – Architecture and Prototype Modem/Codec Implementation'. Paper presented at the IEEE Hot Interconnects '96 Conference, 15-17 August. Stanford, California.

Skellern D (2001) 'The Radiata story: Technology or Trees?', *Telecommunications Journal of Australia* 51(4): 15

Weste, N and Eshraghian, K (1994) *Principles of CMOS VLSI Design* (Second Edition), Addison-Wesley.

Weste, N (2002) 'Radiata's Success – Exiting from the spin-off without diluting equity'. Unpublished presentation to a conference on Spin-Off/Start-Up Companies, 27th to 29th May, Avillion Hotel, Sydney.

Marcus Spiller

Marcus Spiller is Director of SGS Economics & Planning Pty Ltd, a specialist economics and urban policy consultancy with offices around Australia. His consulting experience spans land economics, regional development, housing policy, infrastructure funding and policy co-ordination systems. He has taken up secondments as lecturer in urban economics at Melbourne University, adviser to the Minister for Planning and Housing in Victoria and senior executive in the Queensland Department of Housing, Local Government and Planning. He is an Adjunct Professor in Urban Management at the University of Canberra and a former National President of the Planning Institute of Australia. He is also a Director of VicUrban, the Victorian Government's land development company.

Innovation: Your Place or Mine?

Marcus Spiller

Marcus Spiller is a Director of SGS Economics & Planning Pty Ltd.

Increasing attention is being paid to the way in which the potential for innovation in a country is not spread evenly but tends to be concentrated in certain geographical nodes. Firms that deliver business services of an advanced nature play an important role in innovation. Because they operate best on a face-to-face basis with their clients, the fact that in Australia such firms are largely concentrated in Sydney and to a lesser extent Melbourne poses the danger that the rest of the country will struggle to be innovative. Positive policy is necessary to correct this innovation imbalance.

Introduction

There is growing recognition that advanced business services (ABS) are critical agents in the innovation process, particularly as that process becomes increasingly networked and non-linear in nature. These businesses, which also go by the names of knowledge-intensive service activities (KISA) or knowledge-intensive business services (KIBS), include enterprises providing a largely customised, problem solving service to other businesses, where the solutions in question require application of significant intellectual effort or capital. They include management consultants; specialised legal services (focusing, say, on mergers and acquisitions); strategic financial brokerage and venture capital services; marketing, advertising and public relations consultants; engineering and other technical (including IT) advisors; design services; and human resource advisory services.

Less well understood is the fact that effective delivery of ABS is particularly dependent on the formation of trust-based relationships. Face-to-face contact, personal referrals and recommendations, and mastery of local business cultures and mores are essential ingredients in such relationships. Therefore, these factors inevitably play an important part in the client firm's successful engagement in an innovation project or process.

Bringing these two strands of thinking together, the strong spatial concentration of these services in Sydney and to a lesser extent Melbourne implies that the nation's propensity for innovation may be skewed towards these two cities. This is because it is more difficult to maintain the required trust-based relationships with more distantly located client firms.

The following discussion explores this thesis. It starts with a review of why face-to-face communication remains a vital ingredient in business, particularly when it comes to advanced services, notwithstanding the advent of electronic communication technologies that, supposedly, eliminate space as a factor in commerce.

Face-to-face communication still critical

Management experts have long asserted the potency of face-to-face interaction in successful business transactions. But it is only in recent times that theoretical frameworks to explain this force have begun to crystallise.

British economist and geographer Nigel Thrift approaches this issue by reference to the rise of 'soft capitalism'. This, he explains, relates to seismic shifts in management theory driven by two iconic events: the demise of the Bretton Woods system of international monetary regulation, and the fall of the Berlin Wall. Broadly speaking, the form of capitalism that prevailed in the minds of the managerial class prior to these events was stable, knowable and given to optimisation through technological or military style strategies and tactics. Thrift refers to this period as one in which:

> *…striated spaces abounded: the buttoned-down personality of the company man for one; the enclosed, hierarchical world of the multidivisional corporation, with its monolithic goals of achieving ever-greater size and scale by means of a single corporate strategy realised through a relatively static and formal bureaucratic inner core which passed information upwards from an 'external' environment and control slowly downwards from a closed-off headquarters for another. Then there were the rigidities that resulted from rules of nation states, like fixed exchange rates, high tariff barriers and so on. And finally, orchestrating the whole, was the idea of a management 'science' which would be able to produce the cognitive wherewithal to predict and thereby control the world. At least in the rhetoric of the time, then, the world was an organised place, made up of carefully closed-off spaces which could be rationally appropriated and controlled. (Thrift, 1997.)*

Subsequent movements in management thinking have focused on notions of adaptive and learning enterprises that are led with 'soft hands' and positioned to cope with rapidly changing environments and business opportunities. Many commentators relate this thinking to the phenomenon of globalisation, in particular the uncertainties created by intensified competition. Thrift's insight was that this shift in management models owed at least as much to the greater engagement between management practitioners and epistemological academics, through the proliferation of MBA courses and the like, as it did to any apparent sea change in the competitive environment. The idea that there is no one true, 'objective' knowledge amenable to scientific exploration and documentation, but rather many, equally valid 'knowledges' that can be mediated through a variety of means, including emotional expression and social networks, came straight from the philosophy class.

In terms of management practice, this once revolutionary but now widely accepted view pointed to vast new sources of productivity improvement. It was understood that intuitive and instinctive business initiatives could often be more effective than carefully considered plans, simply because the corporation could move faster, readjust if necessary and learn in the process, while the lumbering, bureaucracy-bound organisation became a sitting target for rivals. Similarly, managers learnt that the creative talent of staff is a potentially limitless font of innovation that can only be tapped if the emotional, social and political (values) conditions in an organisation are right.

With a similar focus on the social and emotional aspects of business interaction, two more British geographers, Storper and Venables, argue that face-to-face is a highly efficient 'technology of communication', allowing forms of ideas transmission and receipt that are simply not possible through electronic and other means of remote communication. They suggest that face-to-face contact is a virtually non-substitutable means by which potential partners in a knowledge project (e.g. a business plan or a new investment) can overcome coordination problems in the presence of informational and risk uncertainty.

Storper and Venables also hold that face-to-face interaction is a key element in the socialisation process by which economic agents can screen potential partners and form cooperative groups that will exchange commercially valuable tacit knowledge at relatively low cost.

From an innovation perspective, it is important to appreciate that face-to-face interaction and trust-based relationships are strategic elements in successful transactions conducted within the ABS sector.

These services tend to be quite localised in their commercial dealings, notwithstanding their global outlook and capacity to service remote clients. This is highlighted by a survey of more than 100 service firms in Melbourne undertaken in 2005 (Spiller, forthcoming).

The survey found that a particularly high proportion (65 per cent) of work carried out by the respondent firms was conducted on the client's premises (as opposed to the respondent's offices). This is likely to be conducive to relationship building and would also have implications for where ABS firms would prefer to locate clients; if frequent or extended visits to the clients' offices are necessary, there are significant advantages – other things being equal – if these clients are located close to the service firm.

The socially driven nature of business operations in this sector is further reflected in the spatial distribution of their billings. The amount of fees earned from various classes of client can be taken as a proxy for the extent of interaction between a client class and the ABS in question.

The surveyed firms in Melbourne generated some 47 per cent of their fees from within the metropolitan area. Notwithstanding their strong inter-regional and international export sales, firms in this sector appear to be heavily preoccupied with their local patch.

This focus on the local market became even more pronounced when consideration turned to the geographic distribution of 'regular clients', described in the survey as 'those (clients) with whom you enjoy significant repeat business'. Again, while they collectively have a healthy export business, the respondent firms found 57 per cent of their regular clients in the local region (Figure 1).

The 'localism' that appears to characterise the operation of these firms is further underlined by the finding that 78 per cent of the Victorian clients of the surveyed firms were located no further than 20 km from the respondent's office. Indeed, 37 per cent of Victorian clients were located within a mere 5 km of the service provider's site.

The survey confirmed that the provision of effective advice in this sector requires good relations with the client and a high degree of mutual trust. It is, in essence, a *social* as well as *commercial* process. Accordingly these firms are drawn into much closer relationships with a local and readily accessible clientele.

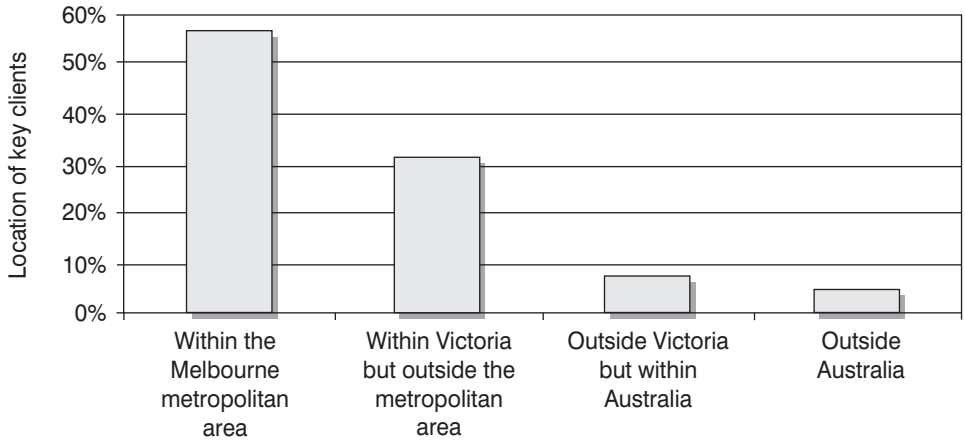


FIGURE 1: Distribution of key clients, Melbourne ABS firms, November/December 2005 (Responses weighted by number of employees)

THE LINK TO INNOVATION

The effective delivery of ABS is important to the innovation process because there is mounting evidence that these services are the critical agents in the creation and diffusion of ideas in the modern economy.

Much of the classical literature on business innovation considers the periodic introduction of new products or production processes that, more often than not, are derived from fresh knowledge created through scientific enquiry and formal research. These new products and approaches to production ultimately overwhelm competitors and establish a new platform for further innovation.

Recent commentary on the Australian innovation system, and more particularly the performance and prospects of the Australian manufacturing sector, breaks with this tradition. For example, the Australian Expert Group (cited in Kennedy, 2002) has documented the subtle but highly significant shift in Australian manufacturing since the dismantling of generic protection in the early 80s.

Many of these firms, especially those in the industrial machinery, transport and scientific instruments segments of the sector that have enjoyed relatively strong growth in export markets over the past 20 years, see themselves as providers of solutions to customer needs, rather than simply operating as designers, builders and shippers of discrete products. Thus, for example, a manufacturer of specialised industrial equipment is also likely to provide consultancy services on how best to capitalise on this investment, how to train operatives in the use of this machinery and how to monitor performance with a view to improving the next round of equipment purchases. This

establishes a mutually beneficial relationship between manufacturer and customer that supports continuous product and service improvement.

These observations regarding the re-invention of Australian manufacturing bring into focus the prospect that a great deal of the innovation occurring in competitive economies is of an organic nature, as distinct from the strategic leap phenomenon that has historically captivated commentators on the knowledge economy.

Contemporary interpretations of innovation emphasise that it requires much more than quality R&D and an efficient venture capital market. Firms need to be part of learning networks that will often stretch out to include a multiplicity of suppliers and customers, and key advisers from within the business services sector. Kolehmainen's (2004) notion of 'recursive' innovation is closely aligned with what is referred to here as organic when he explains:

> *Today innovation is increasingly seen as a 'circular' or 'recursive' process instead of the old view of innovation merely as 'commercialised invention based on technological or scientific knowledge'… [This old view] ...represents linear innovation thinking, whereas the 'recursive' innovation model stresses the versatile feedback mechanisms and interactive relationships involving producers (companies), product users, scientific and technical research, development activities and supporting infrastructure. It is also a model of continuous learning, in which the actors in different arenas learn from each other in interactive innovation processes. This means that many actors are involved in a single innovation process, and it can be triggered by many causes. Therefore both explicit inter-organisational innovation networks and social linkages have become crucially important. (p 2)*

A similar re-conceptualisation of innovation as a networked and recursive process underpins an analysis by *The Economist* newspaper (2007) of the rise and fall of corporate R&D, particularly in the US. *The Economist* relates an anecdote featuring John Seely Brown, a former director of Xerox's Palo Alto Research Centre (PARC), once an icon of the American innovation economy, renowned for creating knowledge and patents that would drive several strategic leaps in the parent company's product and service offerings. Brown is quoted as saying: "When I started out running PARC, I thought 99 per cent of the work was creating the innovation, and then throwing it over the transom for dumb marketers to figure out how to market it … and now I realise that there is at least as much creativity in finding ways to take the idea to market as coming up with the idea in the first place. I would have spent my time differently had I figured this out early on." (p 71)

The Economist (2007) also reports that modern technology firms are much less vertically integrated. They approach innovation through quite different strategies to those applied in the first four decades after World War 2. They now use "networks of out-

sourced suppliers and assemblers, which has led to the splintering of research divisions" (p 69). American firms spend around $200b on R&D annually (p 70), with most of the money going into "making small incremental improvements and getting new ideas to market fast" (p 70). In short, "old fashioned R&D is losing its ampersand" (p 69).

Whether innovation follows a traditional pathway involving, for example, commercialisation of a technological breakthrough, or whether it is more organic in nature, ABS are crucial to success. Innovation based on formally protected intellectual property requires extensive involvement by patent attorneys, research institutes, business strategy consultants, financial brokers and design engineers or scientists. Later in the innovation cycle, marketing and business development consultants play a major part as the host firm seeks to maximise the commercial advantage from its breakthrough product or service offering.

In the case of organic innovation, ABS play a different and/or complementary role. As distinct from devising strategies to trap and optimise the monopoly rent attaching to a new discovery, they become carriers of new ideas between businesses. For example, specialist business analysts engaged to assist a small manufacturing firm with its cost accounting system will, if successful, both deliver this service and put themselves in a position to replicate the strategy, perhaps in a significantly improved way, for the next client.

Camacho and Rodriguez (2004) sum up this strategic role of ABS (or KIBS in their preferred terminology) as follows:

> *They are innovative in their own right, but unlike high-innovative manufacturing activities, they also facilitate innovation in other industries …They function as holders of proprietary 'quasi-generic' knowledge, from interactions with customers and the scientific community, and operate as an interface between such knowledge and its tacit counterpart, located in the daily practices of the firm.*
>
> *… In short, what the recent theories about service innovation put forward is that KIBS are ever more knowledge-intensive and more innovative. Moreover, as a consequence of the inherent co-production that takes place in their provision, KIBS act as 'bridges' for innovation and knowledge in their client firms, and, in general, as key agents within the innovation systems. (p 5.)*

THE GEOGRAPHY OF INNOVATION

Since ABS play a critical role in innovation, and rely on *local* social networks and personal relationships for success, it's essential that we understand the geography of these services to fully evaluate the capacity for innovation in any given firm or its host region. Since the demise of what Thrift called the *"enclosed, hierarchical and multidivision corporation"*, the thinking part of the value chain has become increasingly

disembodied from the making and distribution parts of this chain. As part of this process, the concentration of 'thinking services' into major cities appears to have accelerated. Here, there are some alarm bells in the data for Australia.

A rough guide to the concentration of genuinely advanced business services is provided by a region's share of jobs in these categories above a 'Location Quotient' of 1.0. If the percentage representation of ABS in the employment profile of a region is exactly the same as that for the nation as a whole, that region will have an LQ of 1 for these services.

Using this approach, Table 1 suggests that Sydney had a dominant role in ABS in 2001. This city hosted almost half the specialised jobs in this sector, a proportion well above the city's share of national employment (22 per cent). Melbourne also held an outsize share of these jobs compared to its share of all jobs (28 per cent versus 19 per cent), but the position was by no means as exaggerated as in the case of the NSW capital.

TABLE 1: Estimated number of ABS, Australian metropolitan areas, 2001

	ABS jobs	Share of ABS jobs	Share of all jobs nationally
Sydney	65,147	49.93%	21.89%
Melbourne	36,978	28.34%	18.61%
Canberra	9,336	7.15%	1.94%
Brisbane	7,964	6.10%	8.92%
Perth	7,755	5.94%	7.31%
Adelaide	2,200	1.69%	5.63%
Hobart	756	0.58%	0.96%
Darwin	350	0.27%	0.63%

Source: Australian Bureau of Statistics Census, special tabulations (author calculations)

Leaving aside the anomalous case of Canberra, all the other state and territory capitals were under-represented in this sector.

Unpacking these figures, there are some subtle specialisations across the network of cities. Sydney appears to be strong across a broad cross-section of sub-sectors, but particularly so in respect of IT consultancy, legal services, financial analysis and brokerage, advertising and human resource management consultancy. Compared to Sydney, Melbourne has modest strengths in higher education and scientific research, perhaps reflecting the southern capital's deeper heritage in manufacturing and bio-technology and its current role as headquarters of Telstra, Australia's largest telecommunications provider.

A number of the smaller capitals are exporters of higher education services. As a largely Commonwealth function, the smaller states and territories may well enjoy a funding advantage in this area of business services because of the fiscal equalisation principles that underpin the federation.

Brisbane and Perth are major exporters of consulting engineering services, significantly bigger indeed than either Sydney or Melbourne. This reflects the resource base of the wider Queensland and WA economies.

Adelaide, Hobart and Darwin do not register in terms of significant sub-sectors of ABS, with the exception of higher education in the case of Adelaide.

Conclusion

ABS play a sophisticated and highly strategic role in the innovation process, and this role appears to be gathering potency as value chains become more unbundled in a global trading environment. Nevertheless, many aspects of doing business in these services hark back to 'primitive' models of commerce, where success is dependent upon trust-based relationships, social networks and mastery of place-specific customs and rituals. This suggests that ABS are most comfortable in, and have their greatest impact in, the local spatial domain.

The implication is that the innovation catalyst effect of these services may be subject to rapid distance deterioration. The subsequent implication is that if ABS firms are spatially concentrated, as they appear to be in Australia, the propensity for innovation will also be spatially biased to a significant degree.

The analysis in this paper suggests that, other things being equal, a business's chances of innovation success are likely to be higher if the firm is located in Sydney. Positive policy to correct for this innovation imbalance is essential if Australia is to avoid a drift towards a core and periphery economy.

REFERENCES

Camacho, J A and Rodriguez, M (2004), 'Embodied Knowledge Flows and Services: An Analysis for Six European Countries', paper presented at the International Geographical Union Annual Residential Conference on 'Service Worlds: Employment, Organisation, Technologies', Birmingham, UK.

Kennedy, N (2002), 'Our Industry is Competing on an Equal Footing', *Australian Financial Review*, 17 October.

Kolehmainen, J (2004), 'Innovation Activities of KIBS Companies and Spatial Proximity: Some Empirical Findings from Finnish New Media and Software Companies', paper presented at the International Geographical Union Annual Residential Conference on 'Service Worlds: Employment, Organisation, Technologies', Birmingham, UK

Spiller, M (forthcoming), 'Talent Quest; Advanced Business Services and the Geography of Innovation', draft PhD thesis.

Storper, M and Venables, A J (2002), 'Buzz: Face-to-Face Contact and the Urban Economy', *Journey of Economic Geography*, no 4, pp 351–70.

The Economist (2007), 'Out of the Dusty Labs: The Rise and Fall of Corporate R&D', 3–9 March, pp 69–71.

Thrift, N (1997), 'The Rise of Soft Capitalism', in Herod, A, Roberts, S, and Toal, G (eds), *An Unruly World? Globalisation and Space*, Routledge, London.

JOHN STEEN

Dr John Steen is a senior lecturer in strategic management at University of Queensland Business School, with PhDs in both biochemistry and strategic management. He was previously involved in full time medical research and has applied his interest in risk and uncertainty management to researching the impact of terrorism upon corporate activity. Elements of this were presented to a US Congress committee in 2005. He is currently collaborating with colleagues at Tanaka Business School (Imperial College) on methodologies for understanding processes of innovation and strategic change.

SAM MACAULAY

Sam MacAulay is a PhD student at the University of Queensland and the Australian Research Council Centre for Complex Systems. His research is on the complex evolutionary mechanisms behind the emergence of different patterns of innovation within organisations. Sam previously worked as a researcher in the social science stream of CSIRO's Intelligent Grid Project and as a consultant on a range of projects related to organisational change and inter-organisational collaboration.

TIM KASTELLE

Dr Tim Kastelle is a lecturer in innovation management at University of Queensland Business School and previously worked in marketing and management positions in a variety of industries, including radio, office equipment, industrial chemicals, higher education and software. His research on analysing the evolution of international trade using a complex networks approach has applications in innovation studies, strategic management and evolutionary economics.

New Tools to Map and Manage Innovation Networks

John Steen, Sam Macaulay and Tim Kastelle

The authors are at the UQ Business School at the University of Queensland and affiliated with the ARC Centre for Complex Systems. Dr John Steen is senior lecturer (strategy), Dr Tim Kastelle a lecturer in innovation management and Sam MacAulay a PhD student whose work is focused on the strategic management of innovation.

The competitive marketplace of the 21st century demands a new innovation strategy. The focus needs to shift from individuals to networks. Older models of innovation emphasised the role of the lone inventor and the subsequent process of proving the concept and eventually taking this to the marketplace. The revolution in managerial thinking away from traditional linear to non-linear innovation models has brought 'social network analysis' into the foreground. This powerful diagnostic tool means that rather than using intuition and guesswork to manage networks, executives and policy-makers can scientifically measure the effectiveness of their efforts to help foster innovation.

INTRODUCTION

There has been a resurgence of interest in innovation in Australia as both business and government become concerned about future prosperity in a hypercompetitive and uncertain world.

The 20th-century rules for competitive advantage based upon enduring differences in cost or quality have been trumped by the emergence of new competitors and nations that can match quality at lower cost.

Initially this was restricted to simple manufactured goods such as clothing and hardware tools, but over time the giant economies of China and India will turn to more elaborately manufactured products and services, with a focus on innovation as a way to compete in the international marketplace. In other words, relying on existing capabilities for sustained competitive advantage is old strategy for a more sedate economic environment.

Competitive strategy in the 21st century will be about creating value faster than competitors and continually finding new ways to use and leverage organisational resources within the firm, in conjunction with opportunities and capabilities beyond firm boundaries. In addition to being dynamic, with innovation at the core of value creation, the new vision for strategy will be outward-looking because not all of the connections required to create value will be within a single organisation. Older models of innovation that focus on internally driven R&D and the lone inventor are very hard to connect to strategy, and as a consequence very few strategy frameworks explicitly link competitive strategy and innovation.

The shift in focus from innovation-as-discovery to innovation from new connections throughout the value chain reflects a change in our understanding of the innovation process.

Older, first-generation models of innovation emphasised the role of the lone inventor and the subsequent processes of proving the concept and eventually taking this to the marketplace. Later innovation models were a little more sophisticated in recognising that the market could give signals to the innovator. Nonetheless, the process remained linear in the sense that innovation commenced with research and then proceeded through development to commercialisation. Implicitly, value was created in discovery and then unlocked through commercialisation.

Newer models of the innovation process make no such assumptions about value being inherent in any particular process, idea or technology[1]. Value is created through rearranging and recombining knowledge, people, processes and technologies. This

[1] See 'Think, Play, Do' by Mark Dodgson, David Gant and Ammon Salter for a novel discussion on the way the innovation process is changing and how this change can be exploited.

problem-solving and improvisational activity is most clearly seen in project businesses and complex product systems such as wind turbines (e.g. Vestas Wind Systems), construction (e.g. Laing O'Rourke) and management consulting (e.g. Deloitte).

It can also be seen in new Australian ventures such as Beeline. While tractors and global-positioning systems are established technologies, combining these to create planting and harvesting efficiencies in large-scale agribusiness is yet another example of innovation by recombination and connection.

In this connecting-for-value perspective, managing innovation and evaluating performance using indicators of knowledge stocks (e.g. R&D spend, patents, numbers of research-focused staff) is relatively unhelpful because they tell us nothing about knowledge flows that enable the search and recombination process to occur. Data on knowledge stocks might be easy to collect, but ultimately it reinforces the mindset of linear innovation models (e.g. more R&D spent at the front end equals more innovation at the back end) and that economic value is somehow equated to these knowledge stocks. What is needed, therefore, is a way to understand innovation as a system of forming connections and recombining knowledge and technologies. Ideally, this framework would also support quantitative analysis to enable evidence-based management and policy development.

Here we argue that innovation managers and policy makers need to make more use of social network analysis, sometimes known in the business community as 'organisational network analysis'. This is a technique that has been in existence for some time, but recent developments in visualising and understanding network dynamics have the potential to change the way that we think about, and manage, innovation.

Social network analysis: measuring the innovation process

The revolution in managerial thinking away from linear to non-linear innovation models has driven managers to focus on the role that connections between knowledge and technology play in enabling organisations to create value for customers through innovation. But how can managers and consultants measure this process? Social network analysis (SNA) provides a way forward.

SNA is a method first pioneered by psychologist Jacob Mareno in the 1930s and was aimed at analysing how patterns of social relations influenced psychological wellbeing (e.g. how the structure of your friendship network influences your happiness). Since this early development, the technique has undergone significant advancement and refinement. Today it is being embraced by fields as varied as sociology, economics, management, finance and anthropology, evolving into a robust method to investigate how different patterns of interdependency (i.e. connection) influence individual (e.g. researcher; analyst) and collective (e.g. firm) performance within different systems.

Within SNA, the objects of analysis are referred to as 'actors' (e.g. people, departments, firms) and the connections joining them are referred to as 'ties' (e.g. friendship, collaboration, shared equity, alliances).

The SNA technique is most commonly applied at two levels within business, these are known as ego networks and global networks. The term ego network refers to the localised objects and people to which an actor is directly connected, whereas the term global[2] network refers to all the actors and ties within a system (e.g. R&D department). For instance, below in Figure 1 we can visualise Tom's ego (dark circles) and global (lighter circles) collaboration networks in a network map. Until recently, our understanding of networks within business was largely focused on ego networks, but new SNA techniques are now helping us to understanding how ego and global networks interact to influence performance. However, before we begin to explore this advanced area, it's useful to discuss what we've discovered about ego networks.

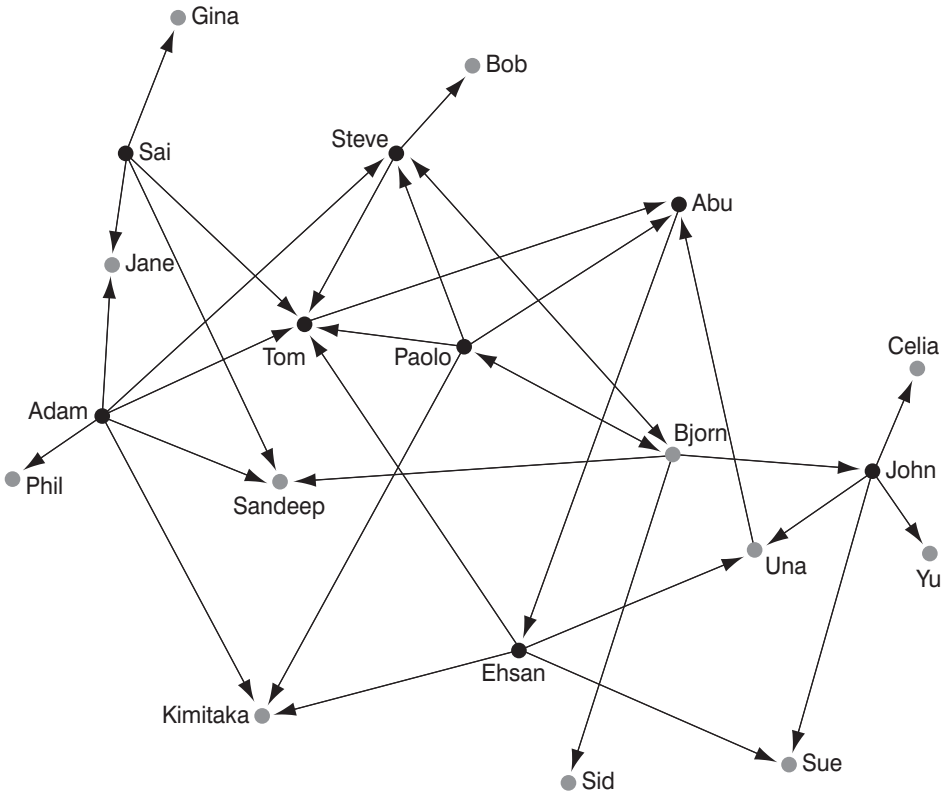


FIGURE 1: Research Collaboration Network

[2] The term 'global' in this sense should not be confused with the word 'global' in the geographic sense.

Ego networks

In addition to telling us a lot about what the innovation system within a firm looks like, an ego network approach can shed some much-needed light on factors driving individual performance. Investigation of these networks has traditionally used what is called a name-generator approach whereby individuals are asked questions about different relationships they have with their colleagues and/or people outside the firm (e.g. 'Who do you go to find the best troubleshooter for compliance issues? Who acts as an enabler in your project team? Who do you collaborate with in getting your job done?').

By throwing light on how relationships around individual actors add value to a firm, and importantly how these relationships are structured, ego-level SNA can provide unique insights into the innovation process and how it is performing.

For instance, a recent SNA study by Professors Gino Cattani (New York University) and Simone Ferriani (University of Bologna) draws on over 48 years of patent data from the large industrial firm Corning to demonstrate how different patterns of collaboration within the ego networks of researcher scientists can influence their innovation performance. Cattani and Ferriani find that the size of researchers' ego networks increased the rate at which Corning's researchers could successfully innovate.

Another key finding was that keeping a researcher's ego network stable (i.e. so they keep collaborating with the same people) not only improved the rate of innovation, but also improved the success of the innovations produced. Interestingly, the researchers also found that this stabilising effect only increased performance in the medium term, after which it began damaging innovation performance. Therefore, although R&D managers should encourage repeat collaborations during the short-to-medium term to achieve the productivity gains stemming from enhanced communication and trust between employees, it is also important to apply pressure to encourage industrial scientists to form new connections in their network. It is only through these new connections that the scientists will be able to access the new knowledge that drive high-value radical innovation.

But how should researchers decide who to form new connections with when trying to grow their networks? University of Chicago sociologist Ron Burt provided some insight into this question with his 2004 SNA study of supply chain managers at a large electronics firm. In his investigation, Burt found that the successful discovery and commercialisation of innovative ideas about how to improve the firm's supply chain were dependent on the structure of a manager's ego network. Managers whose ego networks bridged different organisational groups (i.e. connected otherwise disconnected clusters of managers) had a higher probability of not only discovering new process innovations, but also then being able to marshal the political power to get these ideas implemented.

Burt's analysis suggests that if growing your network, you should try to form new connections where none, or very few, now exist between your organisational group and others in the system (e.g. connections between R&D and marketing departments). There are, however, limitations to any sort of 'maximising' attempt to form new ties between different social groups. These limitations are driven by the costs of maintaining these diverse relationships. For instance, although there might be potential returns in getting R&D and marketing to collaborate, most experienced managers will know that engineers and marketers tend to have very different ways of working! Thus the managerial challenges (risks) in allocating joint work to these respective groups must be weighed up against potential returns when deciding on how to build networks.

Therefore, a process by which managers can weigh up these risks and rewards is crucial to ensuring that there is strategic fit between the organisation and the structure of its networks. For instance, while it might sensible for a large R&D intensive firm in the consumer electronics sector to dedicate more effort to fostering networks between engineers and marketers, the costs/risk associated with making this type of network effective may not be financially prudent for a medium size pharmaceutical firm. Instead, the pharmaceutical firm might decide that networks between different groups of engineers in R&D departments are far easier to coordinate due to shared understandings and professional culture, and may therefore represent the low hanging fruit for social network management.

The literature on ego networks is providing a number of useful 'rules of thumb' for managers seeking to organise innovation more productively. While valuable, rules of thumb do suffer from difficulties in measurability, and this is where recent research on global network is beginning to enable this calculus to be made in a more robust fashion.

Global networks

The study of global networks can provide useful insights into how to measure the trade-offs involved in the organisation of the innovation process. The primary premise behind the study of global networks is that 'the friends of friends' matter. Work within this area has led the way in thinking about the implicit trade-offs involved in various network structures, showing that businesses that can align the structure of their networks (e.g. firm alliance networks, collaboration between industrial researchers) and firm strategy can obtain a competitive advantage.

For instance, a 2007 study by Professors Melissa Schilling (New York University) and Corey Phelps (University of Washington) on 11 industry-level alliance networks revealed that firms which manage to locate themselves in dense ego networks, but also maintain links to diverse sets of other firms in their global networks (i.e. the friends of their friends are very different) perform more innovatively. By simultaneously working with a local trusted network, but also being connected to new knowledge through an

expansive global network, these firms could benefit from optimising both networks at the same time. Firms that were unable to achieve this balance became less innovative.

There are an increasing number of studies within economics, strategy, physics and sociology that report similar findings to these when investigating how changes in the connectivity of an industry network influence the performance of all players in that system (e.g. banking syndicates, the US air traffic control system, R&D alliances).

The most common way of thinking about this trade-off in global networks is the difference between local connectivity and global reach, which can be measured as the degree to which a whole network is 'clustered' and has a short 'path length'. Clustering is the term used to describe the degree to which a network has groups of densely connected actors (see Figure 2 for an example of networks with low (left hand side) to high (right hand side) clustering), whereas path distance describes the distance between actors in the network (see Figure 3 for an example of networks with high (left hand side) vs low (right hand side) path lengths). While clustering enhances trust, control and repeated collaboration, in excess it can decrease an actor's ability to search for solutions and encourage group think to emerge. On the other hand, sparse networks that have high path distances suffer from high communication costs and thus a lack of integration. However, when extra ties are added to these networks to shorten the path length this often creates excess redundancy in the network, resulting in high maintenance costs.

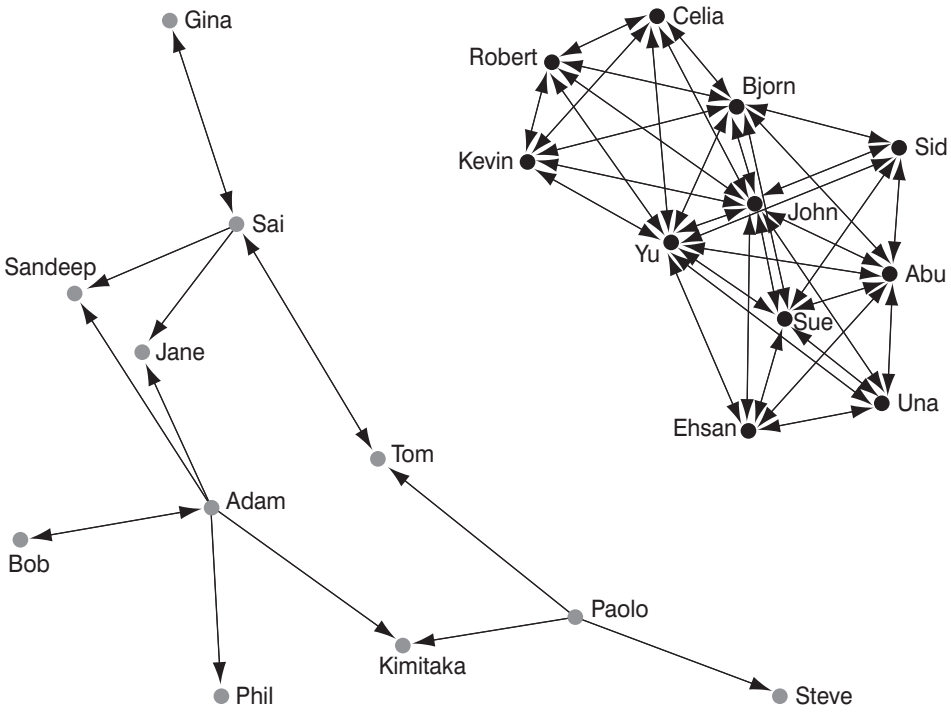


FIGURE 2: High vs. Low Clustering

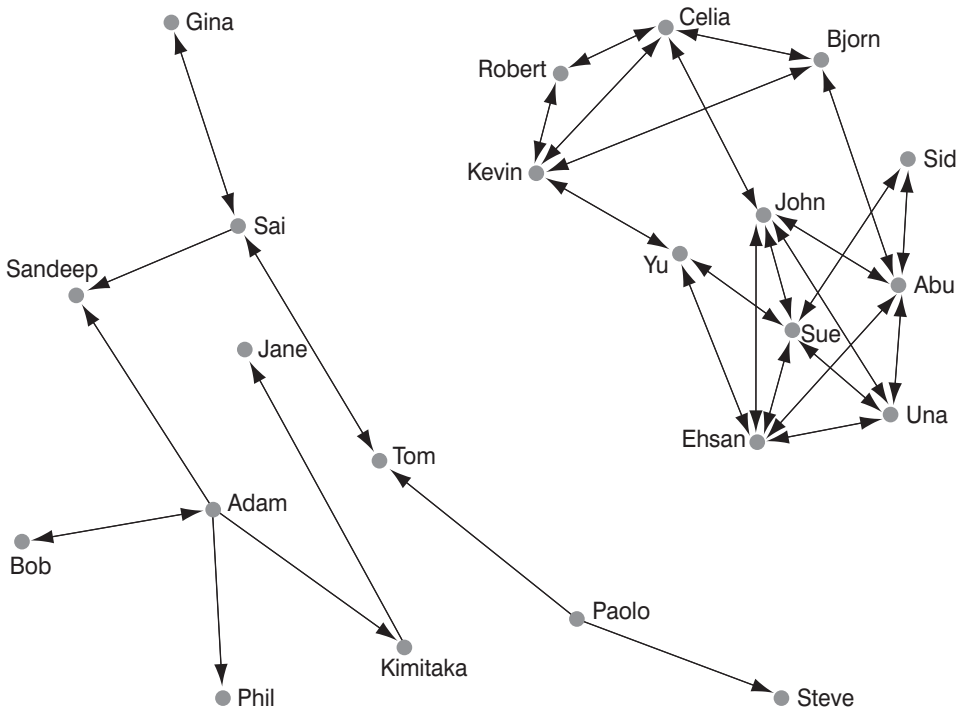


FIGURE 3: High vs. Low Path Distance

In traditional SNA people believed that both high clustering and low path length could not exist simultaneously, and vice versa. However recent research has demonstrated that not only does this sort of structure exist much more commonly than previously thought (e.g. collaboration networks behind Broadway musicals; the neural structure of the human brain), but also that it provides interesting performance advantages. This form of network structure is called 'Small World'.

Small Worlds

Most readers would be familiar with the idea of the six degrees of separation, whereby everybody in the world is connected by at most six network steps with everyone else. Another way of expressing this idea is to say that the worldwide social network has an average path length of six. Networks with a low path distance (i.e. highly integrated) tend to be efficient at rapidly transmitting information, whereas networks with high clustering (i.e. many densely connected groups of actors) are more effective at controlling and coordinating the development of specialised resources[3].

[3] For further reading on this topic the authors would direct you to Duncan J. Watts' interesting and accessible book "Six Degrees: The Science of a Connected Age" or Lee Fleming and Matt Marx's article "Managing Creativity in Small Worlds". Full references for both are available at the end of the chapter.

One recent area of intense interest in network science is the idea that some networks can have short path lengths **and** clustering at the same time. Called small worlds, these networks have been shown to exist in a wide range of systems where the rapid transmission and coordination of information are both important. These include neural networks in the brain and the World Wide Web.

In one particularly intriguing study of the Broadway musical industry, it was shown that the existence of small-world networks could be a leading indicator of blockbuster musicals, as experienced musicians and writers worked together in an environment where people were not only used to working together but also able to access new ideas from other parts of the industry.

In SNA, small-world networks can be described using a statistical measurement of clustering and path distance. This measurement provides an insight into how diversity and specialisation coexist in a system (i.e. a firm or an industry) and how this influences the innovation process. Innovation cannot happen without some form of specialisation, but in order for creativity to be set free, diversity must also flourish and be accessible. As the intensification of innovation and international competition continues to drive the Australian economy toward increasingly complex and elaborate combinations of products and services, the ability to understand and measure how specialisation and diversity interact will be crucial to ensuring Australia's competitiveness.

Fundamentally, the global approach to SNA demonstrates that instead of focusing exclusively on R&D inputs and outputs, as in first-generation innovation models, businesses must be aware of how innovation depends on interactions that support it and add value to the end product. Gaining a quantitative insight into how these patterns of interaction occur is a good starting point for a new understanding of innovation.

Managing innovation with networks

While SNA is a good starting point for understanding innovation performance, it is primarily a diagnostic tool. As always, analysis needs to be followed by actions to improve performance. In the following section, we suggest three avenues for using SNA to guide managerial intervention aimed at producing better innovation outcomes. While the focus will be primarily on firm-level performance, the suggestions could equally be applied by industry bodies or policy-makers supporting government initiatives to enhance innovation (e.g. performance of national innovation systems).

Network structures as leading indicators of innovation performance

The difference between leading and lagging performance indicators is critical for successful evidence-based management. For example, revenue per customer may be a performance indicator for a retail business, but its value as a performance metric is

diminished by the fact that it is a lagging indicator. In other words, we only get to know about how good or bad performance has been after the fact.

In the context of innovation, new products and patents may be used as performance metrics, but these are also lagging indicators. In the old innovation mindset, R&D spend might be construed as a leading indicator, but we have argued that expenditure matters less than the way that resources are used to create novelty and solutions through connections. This is where network analysis can be used as a leading indicator of innovation performance.

Through the accumulation of academic research, it has become clear that some network structures can support innovation better than others. For example, with complex products like wind turbines or aircraft engines, technical specialisation supported by a dense cluster of people working on similar components is necessary, but coordination between teams, supported by knowledge brokers who can bridge between specialisations and manage interdependencies, is vital for effective innovation. Structures such as this will look like small-world networks when they are mapped, and these statistics can be tracked over time as an indicator of network health for supporting innovation.

Diagnosing unhealthy innovation networks

Following from the idea that some network structures can support innovation better than others, we can now turn to another use for network analysis. If innovation managers are dissatisfied with the performance of their organisation, it is very useful for them to be able to understand why this is the case so they can correct the problem. One key quantitative indicator that could be associated with poor innovation performance is the average path length, which is the average number of steps required by anyone to reach anyone else in the network. Paradoxically, if this path length is very short then it could represent an overloaded network where everybody is in contact with everyone else. In this case, the quality of the contact is sacrificed for the number of contacts (a sort of 'Facebook' effect). On the other hand, a long path length through the network implies reduced connectivity where employees know people in their local area but do not know what knowledge or skills lie beyond their immediate network. In some cases the network may even be fragmented, with no connections that link different sections of the network. In this case, an average path length of infinity will be the result of the quantitative network analysis.

In addition to understanding who is connected to whom, it is also important to understand how information flows through the network. As an example, imagine a network map that shows desirable features of clustering and short path length in an R&D centre. In addition to this, the map shows that two people are very highly connected to others and that if we remove them from the map, the network becomes fragmented. At this point, we might just assume that everything is fine as long as we

can make sure that these brokers are kept happy in their roles and are well remunerated. Of course, the problem is that this map does not show the direction of knowledge flows.

A recent study of a US company found that if the direction of the tie could be mapped then it was possible to see how knowledge brokers were getting overloaded. A classic symptom of an overloaded broker is a pattern of many actors giving information to the broker, but the broker sending out very little information to other actors. This pattern is a result of information overload, as the broker struggles to deal with all of the information at hand.

Another interpretation of this pattern is that the broker is just doing their job in being selective in managing knowledge flows and thus making communication more efficient. Obviously network analysis needs to be supported with more detailed investigation to diagnose which of the two scenarios is occurring. Network analysis creates a map, but it doesn't tell us what people are doing and how they could be better managed, which leads to the final point on using networks to manage innovation.

Managing innovation networks

Some people are natural networkers and are able to talk to many members of the organisation from several disciplines. Others might find engaging with a network more difficult. In the same way that good organisations foster skill development to encourage innovation, we also believe that there is a role for managers to encourage and support healthy network structures. Networks require investment, management and infrastructure.

One recent suggestion from McKinsey is that the network should be formally recognised by the organisation and key brokers given network leadership status. Rather than an organisation being structured in terms of lines of authority, or even a matrix, it would make more sense to use the network as the unit of organisation because it represents the natural direction of work flow. If we are really serious about the prospect of creating value through new connections from innovation, then surely this network lens makes more sense than the rigid organisational structures that are a relic of 20th-century production-oriented firms.

A different suggestion from Booz Allen Hamilton is that internal databases of expertise can be used to help people find the right connections. However, in addition to the information on skills, these databases should also be personalised with information about hobbies, education and other interests to help overcome the intimidation that people usually feel when they make contact with someone they know nothing about[4].

[4] IBM have recently released a useful new piece of software specifically for this applications called Lotus Connections: www.ibm.com/lotus/connections

These investments in internal databases can involve relatively small financial investments but may make a big difference to the connectivity of the network.

Another approach suggested by Booz Allen Hamilton is to use the network map to identify successful knowledge brokers and then use these natural brokers to learn about the organisation's network and their knowledge to make the network more effective. For example, in one large US firm, knowledge brokers were identified and then used in several ways to proactively manage the network. These brokers were used to bridge the gap between knowledge silos within the network, but they were also interviewed by senior management to find out why some parts of the network performed better than others. For example, if some people were relatively unconnected, was it because they were new or because they needed better mentoring to integrate with the community? Could the brokers effectively reach out to these isolated pockets of knowledge?

The real value of the exercise was when the brokers were connected with each other and thus able to direct people to other brokers to shortcut the network. Taking a network map before and after these initiatives revealed that the overall cohesion of the network increased by 22 per cent.

Conclusion

Innovating-through-connecting means that managers and policy-makers need to be comfortable with managing networks. This is a genuine challenge because it necessitates breaking out of the mindset of old models of innovation and organisation. The good news is that the science of network analysis is evolving rapidly and that new methods are being developed to track the function and evolution of networks. This means that rather than using intuition and guesswork for managing networks, executives and policy-makers can use network analysis to adopt an evidence-based approach to see if efforts and investments are having the desired effect.

Perhaps one day, social network analysis will be used to analyse innovation performance as commonly as the standard innovation indicators such as patents, R&D spend and new product launches are used today.

References

Burt, R.2004. Structural Holes and Good Ideas, *American Journal of Sociology*, Vol. 110, Iss. 2: pg. 349.

Cattani, Gino & Ferriani, Simone (2007) Collaborative Networks and Inventors' Productivity: A Study on the Micro-foundations of Firm Innovative Capabilities, DRUID Summer Conference 2007

Schilling, Melissa & Phelps, Corey (2007) Interfirm Collaboration Networks: The Impact of Large-Scale Network Structure on Firm Innovation, *Management Science*, Vol. 53, Iss. 7: pg. 1113.

Further Reading

Dodgson, Mark, Gann, David and Salter, Ammon (2005) "*Think, Play, Do: Technology, Innovation and Organization*", Oxford University Press.

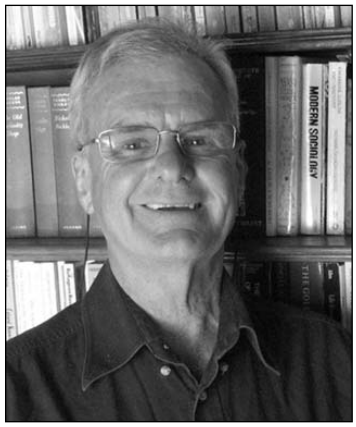
Fleming, Lee, and Matt Marx. "Managing Creativity in Small Worlds." *California Management Review* 48, no. 4 (summer 2006).

Watts, Duncan (2003) "*Six Degrees: The Science of a Connected Age*", New York: *Norton*.

JANE MARCEAU

Professor Jane Marceau is a Visiting Professor at the University of New South Wales in the City Futures Research Centre, having long term interests in urban development and current work on innovation in cities. She was a member of the Greater Sydney Metropolitan Strategy Reference Panel in 2004-2005 advising on the future development of Sydney. She is the author, co-author or editor of five books and has written more than 40 refereed articles and book chapters and the same number again of conference papers. She has also written numerous reports for Australian governments and business, and for the OECD.

TIM TURPIN



Professor Tim Turpin is a sociologist and specialist in science and technology policy, currently Professorial Fellow, Centre for Industry and Innovation Studies at the University of Western Sydney. His research interests focus on the local and global processes by which knowledge is produced, managed and diffused. He has been commissioned by international agencies such as World Bank, UNESCO, ASEAN and APEC, and his latest work centres on a series of ARC funded projects investigating the training, networks and careers of scientists in the Asia Pacific region.

RICHARD WOOLLEY

Dr Richard Woolley is a Postdoctoral Research Fellow at the Centre for Industry and Innovation Studies at the University of Western Sydney. He has been working on the training, collaboration strategies and other career dynamics of Australia's scientific research elite. He has been part of a research team studying scientific mobility in the Asia-Pacific region, and has an interest in economic sociology, particularly in relation to the construction of commercial systems through the deployment of knowledge and distribution of technologies.

The Heroes of Innovation? Scientists and Technologists in Australian Business

Jane Marceau, Tim Turpin and Richard Woolley

Professor Jane Marceau is Adjunct Professor at the City Futures Research Centre of the University of New South Wales. Professor Tim Turpin is Professorial Fellow at the Centre for Industry and Innovation Studies at the University of Western Sydney. Dr Richard Woolley is a Postdoctoral Research Fellow at the Centre for Industry and Innovation Studies, University of Western Sydney.

Innovation in the manufacturing sector in Australia, as elsewhere, owes much to the work of scientific and technological personnel. While it is now well understood that the linear model of innovation is a very partial view at best, it is nonetheless often scientific and technological personnel who provide critical innovation-related information and new ideas to their employer firms. This paper presents some results from a study we carried out in 2003–04 into the backgrounds, qualifications and careers of more than 500 publishing Australian scientists. It examines whether these scientists and technologists are being used to their maximum potential and, if not, what needs to be done to ensure this.

INTRODUCTION

Much innovation is based on new scientific discoveries or technological advances. While many new ideas derive from customers and suppliers and even competitors, and involve organisational changes, the implementation of these ideas, especially if they involve radical changes, often depends greatly on advances in the science and technology that underpin both products and processes. In other industries companies derive most of their ideas from work conducted in their own R&D laboratories (or in research companies to which they contract their R&D needs). In both cases, ultimately, it is people who innovate, and those innovators are often scientists and technologists, whether researchers in laboratories or product development personnel. It is important therefore to understand how science and technology (S&T) personnel make their careers in Australia and how well they are integrated into the product innovation decision-making process.

Overall, the proportion of funding for research and development spent by industry is lower in Australia than the OECD average (DEST 2006), especially in high-tech industrial fields. Low investment in R&D by business means that, while the stock of private sector researchers increased slowly and then faster over the decade and a half after 1990, the number of industry sectors undertaking research remains very limited and some major firms are reducing their commitment to R&D. This is especially noticeable in the mining sector, for example, where this trend has become clear over recent years (Upstill and Hall, 2006). In addition, the scale of research activity is usually small. The Australian Industry Research Group (AIRG), which represents companies and some public research agencies with research laboratories, lost members during the period 1999–2003, the number of private sector organisations affiliated reducing by half to less than 40. Although the AIRG has since had a resurgence in membership, which may reflect the increase in R&D performance by business visible over a similar period, overall these trends mean limited opportunities for S&T personnel to make careers in scientific research in the private sector.

In recent years, the Australian Government increased funding for R&D via tax concessions and through two major packages of policies with the theme 'Back Australia's Ability' (BAA1 and 2), which included industry R&D incentive programs, such as R&D Start and its successors. Despite such encouragement to business investment in R&D, in the private sector there are many forces at play and the government has little control over what is done, how many resources firms invest in R&D, or the degree of influence that private sector researchers have over the uptake of new S&T-related ideas emanating from inside or outside firms.

Product innovation is the area where scientists are most directly related to innovation and this is relatively rare in Australia. Data from the ABS (2005) also suggest that there is relatively little radical innovation in products in Australian firms, companies surveyed preferring to invest in process innovation, the purchase of new machinery and associated training, or to make incremental adjustments to existing products. This trend runs

counter to the actions of firms in many OECD countries where firms are more likely to use the skills of scientists and technologists to develop radically new products and benefit from the temporary monopolistic position gained from being first to market. It may also reflect the tendency of Australian manufacturing firms to improve their competitiveness by creating and expanding a range of services linked to their products. Some of these are technical and design services that may require good scientific and technological skills, but many are not technology-intensive (Marceau et al. 2003). This trend may be counteracted to some extent by growth in the number of firms (such as Invetech) offering technical services both to product development and sales areas.

The trends described above may be changing towards greater dependence on S&T knowledge. Given the increasing regulation of products and production methods that have adverse environmental impacts, it seems highly likely that future competitiveness and the requirement to meet new technical standards will involve closer connections with new knowledge derived from S&T breakthroughs. This trend does not necessarily mean the long term employment of basic researchers, or even engineers, however - just the need to be able to access such skills when needed and firms may be organising the development and acquisition of the essential new knowledge differently. Outsourcing R&D is becoming more frequent: some firms have moved closer to universities to provide information or test products while in others, large technology-intensive firms are creating 'nearby' sources of new knowledge, sponsoring technology parks into which specific kinds of new technology firms are invited. The automotive industry and some others depend increasingly on design for competitive success, and many elements of design involve considerable dependence on S&T, such as new materials to build lighter vehicles to reduce fuel use or emissions, but the firms concerned may not employ large teams of S&T personnel as they used to.

S&T may thus be expected to play an *increasing* role in company decisions about important product and process innovation strategies and firms will need greater capacity to understand what is needed as well as to find the right technological solutions. The question then will be how they will rethink the attractiveness of the careers their industries offer to S&T personnel and review the place of their work in innovation strategies.

It is not yet clear how this shift will play out in Australian business. Will companies producing locally have the internal skills to recognise relevant new scientific and technological knowledge, let alone to produce that new knowledge themselves? Will they be ready to make the shifts in organisational career paths and decision hierarchies that will enable those skills to be used to the maximum and increase chances of firms recognising and capitalising on the new situation? Or will science and engineering graduates entering careers in business in Australia have to expect that they will move out of science quickly and gain experience in other areas of firm activities, such as manufacturing and marketing, if they are to rise in the managerial hierarchy? Or will they have to accept the uncertainties of career paths that run through smaller and in many cases more vulnerable small and specialist R&D firms?

This paper argues that Australia's business/industrial structure currently offers S&T personnel little incentive to enter the field and, if in it, to remain either in business or in the R&D section of business career hierarchies. Current practices may need to change if local industries are to maintain and develop access to new scientific knowledge and meet new product development requirements. At present, even where research positions are available in industry, business structure trends suggest that researchers have to move from research careers in order to reach senior management levels and have little say in strategic company decision-making (personal communication with ex-industry scientists, 2003–04 and 2008). While many major technology-intensive firms such as Exxon often operate 'dual hierarchies' to give scientists and technologists better opportunities for promotion within the R&D section, smaller firms or firms that are less technology-intensive but still employ S&T personnel, seem less likely to do so.

In many companies, S&T opportunities for promotion rapidly narrow. A recent interview suggested that scientists and technologists need to make career changes very early on, the age of 28 being viewed as 'basically too late' (personal communication, 2008) and many younger scientists face acutely difficult decisions about whether to remain in science after holding several post-doctoral positions and see the future in science as essentially insecure (Marceau and Preston, 1997). Our paper presents some results of our study of publishing scientists. The study was funded by the Australian Research Council (ARC) and a survey was carried out in 2003–04 and examined the training, careers and attitudes of scientists working in Australia's traditional fields of research strength (mostly food and agriculture, earth sciences and medical sciences). Part of the study focused on respondents with present or past employment in business. The survey results were supplemented by group and individual interviews with scientists retired from industry, mostly in the food sector, in 2004 and 2008. Of the 515 respondents to the survey, 113 had worked in business at some time (the others had worked only in the public sector). This population is the focus of the present paper.

Scientists in the business sector in Australia

In 2004, 28.0 per cent of researchers in Australia were working in business, with 58.4 per cent working in higher education and 10.4 per cent in government organisations, including CSIRO (DEST 2006). This 28.0 per cent is much lower than the OECD average of 64.4 per cent of researchers working in business. Australia's private sector research science capability is primarily made up of expertise in the physical, engineering-related and IT sciences and takes place in relatively few sectors. Australian Bureau of Statistics (ABS) census data show that less than 9000 people working in natural and physical science professional occupations in Australia in 2001 had doctoral degrees, although more than may be working in research positions in industry as a PhD is less of a prerequisite there. Our study suggests that PhD-qualified S&T personnel working in business are concentrated in the minerals and energy, manufacturing, construction, transport, IT and commercial services sectors. This largely follows business expenditure on R&D in

S&T and engineering-intensive sectors which, in 2004-05, was strongest in machinery and equipment ($1.777m), mining ($1,205m) and fossil fuels ($587m) (DEST 2006).

The overall labour market for graduate-trained young scientists and technologists seems relatively strong but depends almost exclusively on the public sector. In every industry field but one only a small proportion (between 10 per cent and 25 per cent) of such graduates entered the private sector. They mostly entered the mining field. Young scientists thus seem to find relatively few career opportunities in the business field.

Where scientists and technologists with PhDs do get jobs their financial rewards have been low at entry to the labour market in relation to non-science fields. In 2003, the physical and life sciences and chemistry were amongst the lowest-paid fields of study ($43,000), along with civil engineering ($46,000), well below graduates in the non-science law ($70,000) and accounting ($64,000) fields. By 2006, however, in line with the resources boom, the pattern was changing where mining was concerned and mining engineering graduates were the most highly paid in their first jobs (GCCA, 2006). Many, of course, did not secure R&D positions (CPUR, 2003).

Careers in private sector R&D in Australia: results from an ARC-funded study

At the time of our study 113 respondents had worked at some time or were currently working in the private sector. Only eight of the 113, however, were still working there at the time of the study and only 33 chose the private sector for their first position after completing their research training.

The 113 who formed our survey population were mainly in the prime of life. Two-fifths were in their 30s (42 per cent), a further 29 per cent in their 40s, with only 25 per cent in their 50s and 11 per cent their 60s.

The years when the respondents started their first private sector jobs ranged from 1968 to 2003. Most started work in the 1990s but some started in the 1980s or earlier. At entry to the business labour market (many had held earlier positions in the public sector), 91 of the 113 worked in multinational corporations (41 per cent) or in established local businesses (40 per cent). Only a very small proportion entered start-up companies, either to commercialise their own intellectual property (12 per cent) or that of others (7 per cent).

Working in business for S&T research personnel seems to be short term and focused in one firm only. Only 38 of our respondents had had experience of two companies, including 11 in start-ups, while even smaller numbers had worked for three firms or more. Of the 33 who entered the private sector with their first position, two-fifths had got their first jobs in the 1990s and the same proportion in the 1980s. It may be that the later years of the 1980s and the early years of the 1990s were especially favourable

for research-oriented young people to decide to join business, as these are the years of the most generous R&D tax concessions. In this context it may be significant that 39 per cent joined their first companies in the years 1987–95, 45 per cent if 1996 is included.

The 113 (72 in their first firms, 27 out of 38 in their second firms) had indeed most commonly entered research roles, which many combined with product development, technical services and technical sales roles in both first and subsequent companies. Sixteen of the firms entered were in agriculture or agriculture-related fields, 27 in pharmaceutical (including veterinary products and services) or medical fields, 15 in mining and 8 in consulting, including environmental consulting.

The remaining 39 firms for which we have information were spread widely across sectors, including manufacturing, aerospace and turbine engineering, cement, glass packaging, banking and a range of other, often unspecified, services.

Most of the 113 people were men: 84 per cent to 16 per cent, with the women being slightly younger. By 1999, many had moved on, a considerable proportion (18 per cent) leaving between 1996 and 1999, with a further 12 per cent in the following three years. This period corresponds to that of the decrease in the value of the R&D tax concessions to firms and to a period of considerable reorganisation in private sector enterprises as competition increased and the economy slowed.

If we want to encourage gifted young scientists and engineers to enter the private sector and take on innovation careers it is important to understand why some young PhD-trained scientists and engineers decided, either at entry to the labour market or later, to work in that sector when in Australia the public sector (higher education or government) seems to offer more.

Eighty-seven respondents told us why they made this choice. Their reasons reflect their perception of the relative adequacy of the private sector in relation to the public sector for what they wanted to do. The reasons were more or less evenly split between, on the one hand, concern with available money for themselves or their research or a desire to gain particular kinds of research experience and, on the other, interest in the career opportunities, including job security, they saw as associated with their choices.

The positive reasons for choices included: wanting experience away from academia; seeking experience in multiple jobs; having an interest in a particular kind of product such as computer graphics; wanting the opportunity to bring science to commercial markets; or just seeing that they could be useful to the Australian community through their work in industry. Many gave several of these reasons.

Some said their choices were made for more negative reasons, notably that there was no security (tenured positions) for young scientists in the public sector, including universities.

The 46 who had worked in multinational enterprises at some point in their careers also valued the opportunity to gain international experience. Most were earning salaries in line with other positions/sectors and their age group; R&D personnel in the largest group (19.5 per cent) were earning $50–59,000 in 2003–04, with a further 14 per cent earning $60–69,000 and 15 per cent each $70–79,000 and $80–89,000. A quarter was earning more than $100,000, probably the older respondents. These figures are not very different from those earned by the sample in the public sector. Higher income therefore is not a critical component of sector choices.

Those entering business were largely in the areas of traditional strength in Australia. They were fairly even split in terms of scientific speciality between respondents trained in agriculture and soil science (19 per cent), engineering and applied sciences (21 per cent) and earth and environmental sciences (22 per cent). These were followed by biological sciences (14 per cent) and medical and health sciences (12 per cent), with only 8 per cent in computer sciences and mathematics. Once their field had been selected respondents seldom strayed from it.

Most of the 113 had undertaken their research training in Australia (70 per cent), with a further small concentration in the UK (15 per cent).

Scientific and technological research: an uncertain choice

Most of our respondents had joined the public sector on first entering the labour market, but few had obtained ongoing positions. Since a quarter of our respondents had been in the private sector and almost all moved to the public sector, it is hard to make direct comparisons between careers in the two sectors. But given what is known about the closure of R&D facilities in the 1990s and later and the consequent impact on R&D personnel in business, it seems likely that there was in practice little difference between the two sectors.

The insecurity of many R&D positions in industry was confirmed by our interviews with retired scientists. Since a considerable proportion of all respondents had been in the system for many years, these figures suggest only a slight improvement over time in terms of career security. Scientists' positions in both sectors were not among the best paid in Australia at the time of the study, which is perhaps not unusual in OECD countries, and the combination of position uncertainty and low pay must make many think twice about embarking on or sticking with a career in scientific research.

On the other hand, when compared with their *confrères* in the public sector, respondents who had worked or were currently working in the private sector seemed rather more sanguine about their job security and tended to stay considerably longer in their jobs, although the numbers concerned are very small and caution should be exercised in interpreting them.

Motivations for changing jobs

The main motivations of our 113 people for working in the private sector related to wanting to undertake more applied work and to work more closely with industry. Many who had worked in both public and private sectors also specified employment reasons and many expressed dissatisfaction with current work conditions in the public sector as reasons for moving out.

An overwhelming majority of respondents (84 per cent) in the whole population studied nominated long-term funding as *the* major issue confronting scientists in Australia but the orientation of scientific practice was also important and this was tied to their perceptions of the uncertainty apparently inherent in an S&T career in Australia in both sectors. Job satisfaction was somewhat higher than among private sector scientists but the differences were not great.

Scientists in both public and private sectors found that as their careers advanced they spent less and less time actually undertaking research. Promotion always meant even less time spent on research. The research directors and managers studied spent less than one-fifth of their time on research, devoting twice as much to research-related activity (39 per cent) and other tasks (28 per cent). This group includes both heads of university-based and government-funded research centres and some people who had worked in the private sector.

Businesses usually now recognise the importance of the ideas of customers in successful innovation but seem much less commonly to understand how to ensure that their well-staffed R&D department could tap those ideas. Our interviews, especially the most recent ones, indicate that marketing and R&D departments have no real integration, with mutual disdain a common attitude – the 'not my idea' syndrome justifying a lack of interest in others' suggestions or findings.

This attitude may be unwittingly underpinned by uncoordinated staff incentive systems and short time horizons for results that suit marketing staff but are unsuitable for R&D personnel. Competition here may be destructive and undermine broader team efforts to bring new products to market or successfully implement new production processes. This interface needs thoughtful management, with special recognition of the different resource needs and procedures in the two departments.

Existing budget decision mechanisms may also be unsuitable for scientific and technological R&D and show little recognition of time and resource horizons. In this connection, respondents were asked questions about issues that they saw as important to the conduct of science in Australia. The answers showed considerable concern about long-term funding for science even though private sector respondents saw their infrastructure as better than did the public sector ones. Less than half the respondents felt

their job satisfaction had increased over the last two years and that their jobs were reasonably secure. A *full half of all our respondents would not recommend a science or engineering career to young people*.

Science and innovation – transferring knowledge to the private sector?

In our study we defined innovation as technological innovation in product or process. There has been considerable debate in the literature about the extent to which science and innovation are connected and how technology is successfully transferred between institutional settings, notably from public sector to private. Innovation is usually an iterative process, linking public and private sectors over a lengthy period of discussions and product development-related activities such as prototype-building and testing. Some transfer involves the direct activity of scientists moving between institutional settings, from public to private.

There is some agreement that movement of people and the tacit knowledge they carry are key to successful knowledge transfer but in Australia, at least among publishing scientists, not many want to move from the public to the private sector and most of those in the public sector who had private sector interest had already moved out of the private sector or wanted to do so. This preference for the public sector may reflect their self-image as scientists rather than industrial scientists, the difference being that it is often more important to them to contribute to the advancement of their disciplines than to conduct research with industrial applications as the main goal.

Respondents indeed saw themselves principally as researchers, publishing their results so as to participate fully in international scientific discussions in their fields, and felt they could not follow their interests in the private sector.

This finding is important and suggests that Australia may be different in this respect from other competing countries. Internationally, the work of Hicks and Katz (1997) showed that in some fields, notably life sciences, UK scientists in international firms, especially Japanese ones and particularly the pharmaceutical industry, published more than their colleagues at some medium-sized universities. In Australia, however, unpublished work by John Madden in the mid-1990s suggested that it is relatively unusual for scientists working in the private sector to publish. Whether this was because they were not doing the research that could underpin publication, or because there was a greater emphasis on secrecy in the major Australian firms that undertake R&D, was unclear. That few scientists in the private sector in Australia publish their work may well also reflect the nature of Australia's industrial companies where, with some major exceptions, laboratories are both few and small and most research is applied and far from cutting-edge. At the time of Madden's study scientists at Telstra (then Telecom) and those at BHP were the most prolific and these were the firms spending most on R&D. Since then their R&D expenditure in Australia has probably reduced.

Lack of publication may be a problem for the development of the transfer of technology, as publishing scientists may not know of the interests of their colleagues in the private sector and may have few contacts with them. Networks are best established and maintained when common interests are present. Lack of up-to-date networks may mean that scientists in industry find it hard to work on cutting-edge issues and do not provide a set of capabilities for the companies that would enable them to scan the national and international scientific and technological environment as effectively as possible.

Improved international communication is, of course, important here, but there is some anecdotal evidence that access to scientists working in universities is also important and is more likely to happen where both parties to knowledge transactions are seen as contributing to the exchanges.

In any case, companies in Australia need to consider carefully how best to organise their S&T functions so their personnel have time to cultivate networks with leading-edge researchers in other sectors and build their 'receptivity' capability, an important complementary asset to their marketing and production skills but one apparently underdeveloped in Australian enterprises in many fields.

Our group, however, showed a publishing pattern rather different from that noted by Madden. A comparison of the outputs of non-industry and industry scientists showed that those who started their careers in the business sector were highly competitive in terms of their journal publications and chapters in books. This group was also the most productive in terms of business-focused output. Interestingly, this suggests that scientists most engaged with commercial activities may also be the most productive in terms of traditional academic outputs (with the exception of books) and suggests that experience in the private sector may be beneficial not only for increasing commercial output but also academic output. Over time this edge probably diminishes, bringing less of this kind of value to firms that do not specifically organise to encourage it.

Patenting is one indication of scientific and technological success and in the public sector may indicate interest in knowledge transfer to the private sector. Only a small proportion of respondents (18 per cent) in any sector of our study had patented their research findings and almost all of them held five or fewer patents. Fewer still had been involved with start-up companies (6 per cent) or the commercialisation of IP (10 per cent).

Patented ideas are still just ideas. Their transformation into products is a lengthy and complex process and our data suggests that this publishing group is not contributing directly to technological change or radical product innovation, possibly even when working in the private sector at the time of patenting. Here again, companies may wish to reconsider their use of this kind of staff expertise and check that they are fully maximising the value of their S&T investments.

Conclusion

Australia does not have large numbers of research scientists in any discipline. The small pool of scientific talent evokes the need to ensure that researchers are maximally productive and recognised as a small elite knowledge workforce on which much innovation ultimately depends. At present, we suspect, many researchers are being lost to scientific research when they could be at their scientifically most productive. The data presented here suggest major challenges for business in managing the complex trajectories that constitute careers in staff or line positions. There is little recent academic work on this issue but it is one that is still alive and relevant for S&T personnel making a career in business. The problem is not unique to the careers of the scientists but is a major management issue that seems to be receiving little attention.

That few of our doctorally qualified scientists entered the private sector for their first positions (9 per cent) is significant because, as Mangematin and Robin (2003) have shown in France, it is probably unusual for research graduates in S&T to ever join the private sector if they do not make that choice initially. This suggests that firms interested in serious research and development as a component of their innovation activities in Australia need to rethink their recruitment and internal promotion structures and policies if they are to develop the new knowledge they will need or even to have the interpretation capability that would enable them to capture the value of knowledge developed elsewhere or enable them to follow and interpret the changing requirements of their customers in a more technically demanding age.

As we have seen, few respondents in our study joined the private sector as recently trained graduates and the proportion remaining there diminished to almost nothing over time. Both initial and later career choices limit the transfer of ideas and knowledge via personnel between sectors. If companies are to keep at the leading scientific and technological edge in their fields, they again need to be sure that they are offering appropriate incentives to young graduates and more mature researchers.

In this respect, it is significant that several interviews conducted for our study with recently retired industry scientists indicated that the companies they had worked in were not interested in cutting-edge research and did not greatly value the bench scientists they employed, giving them little say in product decisions and seldom promoting them to central managerial positions as *scientists.*

This view from successful scientists has to be taken seriously. It is not just a whinge – those interviewed had successfully moved out of science – but a genuine lament that many Australian firms, even large ones, do not understand the importance of their R&D investments and the people who carry out R&D activities. Rather, in a situation faced by their *confrères* in engineering in many countries (Marceau, 1989), scientists in Australian firms felt they had to lose their close connections with bench science if they were to progress up career ladders. They shared the experience of many MBA students:

the need to learn more generalist managerial skills if they were to make a satisfying career (see for example Whitley, Marceau and Thomas, 1981; Marceau, 1989). Several of our interviewees had done exactly that.

This situation seems to be mediated by companies that operate dual hierarchies for promotion of specialist personnel and a recent interview conducted in the preparation of this paper suggested strongly that much depends on the persuasive strength and prowess of technical directors. The same interviewee also recognised, however, that even chemical firms now provide fewer powerful positions in the firm for S&T personnel than in the past. One major company, for instance, once had several scientists on the board but this would not happen now.

Part of the answer may be for firms to find more successful ways of bringing an understanding of S&T to the central marketing and financial functions of the enterprise. In other words, the challenge is to develop much more effective formal knowledge diffusion mechanisms within the company, especially where R&D functions and other firm activities are not co-located and may even be located in different countries. Knowledge management of a broad kind is the key. There are at present, it seems, too few mechanisms for knowledge transfer and the proper explanation of ideas across functional and geographic boundaries.

For Australia's S&T labour force, in both public and private sectors, our study suggests that the more rewarding career paths, in terms of income and level of organisational position, appear to lead away from research activity. Our findings have important implications for policies for human S&T resources and for the enterprises and public sector institutions on which Australia's innovation capabilities depend. In contrast to the situation too often met here, there is growing recognition in many countries that investment in basic research is essential for both public and private sectors alike. To keep the interest and retain the services of their scientists and engineers, some companies have tried to organise their operations so S&T personnel get time to follow intellectual scientific paths that have no immediate payoff. Microsoft is one such firm, Celltech in the UK another. Elsewhere in the world anecdotal evidence also suggests that forward-looking companies that rely on innovation for their competitive edge are rethinking the integration of their different functional activities and trying once more to maximise the value to the firm of their S&T investments. There is not yet enough evidence of what is working in Australia, and academic researchers as well as company controllers and analysts could usefully turn more of their attention to these emerging management models.

In an age of open innovation (Bessant and Venables, forthcoming 2008) where companies take ideas from many sources, both locally and internationally, they should not forget the need to be able to generate the knowledge needed or at least receive, adapt and exploit the new ideas coming from elsewhere. Open innovation, taking ideas from the world at large, however, may not fully substitute in the end for localised and in-house capacity.

Much industry development strategy in Australia since the mid-1980s has centred on the encouragement of companies to conduct more R&D as a means of generating industrially-relevant new knowledge as the basis of competition. Conduct of R&D in businesses, as in higher education and other areas of the public sector, is not possible, however, unless highly skilled S&T personnel are willing to enter the field, are permitted and encouraged to use their scientific and engineering research and related skills in a manner that is consistent with the goals they have set themselves and hence to remain in R&D in their existing or another firm or even in the private sector as a whole. Such personnel need to be encouraged to join fully in the companies' R&D and product development efforts by directly using and maintaining their skills, by training others in their use and by ensuring that the value of the interplay of S&T within the whole set of activities of the companies concerned. This may mean that firms need to initiate policies which make scientific personnel feel that their rewards are commensurate with their work and that they can remain in research and be rewarded for that specialisation rather than having to enter a general management or line position for promotion.

The benefits of S&T work and investments may well accrue offshore if local or international enterprises operating in Australia are not willing to value or reward high-level scientific and technological endeavour in visible and coherent ways, including provision of cutting-edge equipment for laboratories. These issues have not been much researched in this country but there is, for example, US evidence that firms that give security to their workforces are more productive and profitable (Collins and Porras, 1994). Job security is part of feeling valued and should be offered to S&T personnel as to others if the productivity of the enterprise as a whole is to be maximised.

The data gathered in our study indicate the unease many of Australia's most productive scientists feel about their investments in careers in scientific research.

REFERENCES AND FURTHER READING

ABS (Australian Bureau of Statistics) (2006), *Innovation in Australian Business: 2005*, Catalogue 8158.0.

ABS (2003) (Australian Bureau of Statistics) Special Data Service, Cat. 8149.0, Canberra.

ARC/CSIRO/National Health and Medical Research Council (2002), *National Survey of Research Commercialisation. Year 2000*, ARC/CSIRO/NH&MRC, Canberra.

Bessant J and T Venables (eds) (2008), *Creating Wealth from Knowledge: Meeting the Innovation Challenge*, Edward Elgar Publishing, Cheltenham UK.

Collins J and J Porras (1994), *Built to Last: Successful Habits of Visionary Companies*, Harper Collins, New York.

Commonwealth of Australia (2001 BAA1 and 2004 BAA2), *Backing Australia's Ability*, Canberra.

CPUR (Centre for Population and Urban Research) (2003), *Skill Utilisation of Persons Trained in Australia*, report prepared for Science and Innovation Mapping (DEST), CPUR Monash University, August.

Department of Education Science & Training (DEST) (2002, 2003 and 2006), *Australian Science and Technology at a Glance*, DEST, Canberra.

DEST (2003a), *Mapping Australian Science and Innovation – Main Report*, DEST, Canberra.

Department of Employment and Workplace Relations (2006), *Skills in Demand Lists, State and Territories – 2006*, <www.workplace.gov.au>.

Faulkner W and Senker J (1995), *Knowledge Frontiers: Public Sector Research and Industrial Innovation in Biotechnology, Engineering Ceramics, and Parallel Computing*, Oxford University Press, UK.

Garrett-Jones S, Turpin T, Burns P and Diment K (2005), 'Common Purpose and Divided Loyalties: The Risks and Rewards of Cross-sector Collaboration for Academic and Government Researchers', *R&D Management*, vol 35, no 5, pp 535–44.

GCCA (Graduate Careers Council of Australia) (2004 and 2006), Graduate destination surveys reported in *GradFiles*, <www.graduatecareers.com.au>.

Hicks D and Katz S (1997), 'The Changing Shape of British Industrial Research', *STEEP Special Report No 6*, SPRU, University of Sussex, UK.

Mangematin V and Robin S (2003), 'The Double-Face of PhD Students: Management of Early Careers of French PhDs in Life Sciences', *Science and Public Policy*, vol 30, no 6, pp 405–14.

Marceau J (1989), *A Family Business? The Creation of an International Business Elite*, Cambridge University Press, UK.

Marceau J and Preston H (1997), 'Nurturing National Talent', *Prometheus*, vol 51, no 1, pp 41–54.

Marceau J, Cook N and Dalton B (2003), *Selling Solutions: Emerging Patterns of Product-Service Linkage in the Australian Economy*, Australian Business Foundation, Sydney.

Tijssen R (2001), 'Global and Domestic Utilization of Industrial Relevant Science: Patent Citation Analysis of Science-Technology Interactions and Knowledge Flows, *Research Policy*, vol 30, no 1, pp 35–54.

Upstill G and Hall P (2006), 'Innovation in the Minerals Industry: Australia in a Global Context, *Resources Policy*, vol 3, no 3, pp 137–45.

Whitley R, Marceau J and Thomas A (1981), *Masters of Business*, Routledge, London.

Wilensky H (1960), 'Work, Careers and Social Integration', *International Social Science*, 12, pp 543 –60.

GERHARD VORSTER

Gerhard Vorster leads the innovation program at Deloitte. He is Managing Partner, Deloitte Consulting Australia, and Asia Pacific leader for Deloitte Consulting. Prior to being appointed to the role of Managing Partner Consulting in July 2003, Gerhard was Regional Managing Director for Deloitte South East Asia Consulting from 1999, with responsibility for consulting operations in South East Asia and Korea. Prior to that, he was Regional Managing Director for Deloitte Consulting in South Africa. Gerhard joined Deloitte in 1987.

JENNY WILSON

Jenny Wilson has been with Deloitte for ten years and her expertise is in digital and online strategy consulting. Jenny heads up the Eclipse business in Sydney, one of Australia's largest web developers. She assists clients in the development and implementation of digital channel strategies across industries including telecommunications and media, financial services, primary industry and government. This includes the evaluation and design of innovative business models for driving new revenue growth. Jenny leads Deloitte's Innovation service offering nationally and has assisted numerous organisations with driving and sustaining innovation as a key enabler for growth and market differentiation

How Deloitte Embedded Innovation in its DNA

Gerhard Vorster and Jenny Wilson

Gerhard Vorster is Managing Partner, Deloitte Consulting Australia, and Asia Pacific leader for Deloitte Consulting. Jenny Wilson is a chartered accountant at Deloitte Australia specialising in the analysis, development and implementation of business strategies.

For an organisation to become truly innovative, it has to transform the way it is structured and organised in order to foster innovation at every level. At the personal level, talented individuals need to be attracted to the organisation and given permission to be different. Teams need to be formed that tap into the power of 'tribal' communities and cut across hierarchies and business units. And at the highest organisational level, traditional relationships between customer, supplier and even competitor need to be redefined to facilitate the emergence of unique corporate capabilities. In this way, an organisation can embed innovation in its very DNA.

INTRODUCTION

> *DNA [deoxyribonucleic acid] is often described as the blueprint of an organism because it enables various cells to develop and work together to form a functional body … (Biotechnology Australia website)*

Weaving together the rich strands of many cultures, societies, intellects and behaviours to grow and work together to form a functional body takes a very special kind of alchemy – some call it magic. At Deloitte we call it innovation.

Deloitte's story is one of finding the courage to support intersections of corporate, team and personal DNA to cause a cultural shift internally. And then to build this collective intelligence and collaboration to create a paradigm shift in market demand.

In this paper we will illustrate the powerful impact of innovation by sharing three stories showing how the innovation 'gene' truly pushes the boundaries at Deloitte and creates the opportunity to achieve market exclusivity in service.

Personal DNA: unique talent and choice

This story captures the importance of understanding who an individual is, as opposed to what he or she does. Giving an individual permission to be different enables an organisation to truly extract unique innovations. In a market where scarce talent has the privilege of choice, giving individuals permission to contribute becomes paramount to retaining the talent essential for sustained innovation.

Team DNA: re-shaping the institution

The rediscovery of the power of tribal communities in an organisation stimulates the culture for successful innovation. The power of combining individual intellect and talent across hierarchies and business units helps evolve, develop and accelerate innovations.

This story follows a journey from forensic accounting to SleepWorks™ to Deloitte Digital. It relates how Deloitte in Australia becomes adept at breaking down and reforming operating models. Transitioning from mere product and technology innovation through to true business model innovation requires a shift in financial, political and cultural modes of operation. By embracing the interactive world of change, or as Deloitte Digital Chief Peter Williams says, by leveraging it, we explore its infinite possibilities.

Corporate DNA: the organisation as a networked model

This is the story of what the accounting industry, a university, and an iconic Australian airline have in common; where innovation pushes the boundaries of the organisation and redefines the traditional relationships between customer, supplier and even competitor to facilitate the emergence of unique corporate capabilities.

Innovation is this amazing intersection between someone's imagination and the reality in which they live. The problem is, many companies don't have great imagination, and their view of reality tells them that it is impossible to do what they imagine. (Senior Vice- President, Retail Operations, Apple)

Personal DNA: why a physics genius chose Deloitte

The unfortunate reality for many organisations is that innovation often sits with individuals or in a single business unit as an isolated competency. It rarely evolves and develops into an organisational capability. Existing operating models often stifle an individual's movement and interactions across the organisation, tying a person to a prescribed role and responsibilities that pre-define their potential to contribute.

Why does this matter? Because it is the unique talent of individuals that enables an organisation to differentiate itself from its competitors, to harness the currency of its ideas and to be innovative.

Let us take Duc Ngo as an example. Duc's everyday job is as a software engineer in the Melbourne office of Eclipse, Deloitte's online strategy, design and development group.

Duc went to a primary school in Vietnam that specialised in advanced mathematics. He was the silver medallist in the International Physics Olympiad in his final high school year. Duc founded a technology company that pioneered text messaging on interactive TV as part of a university assignment, and co-developed a technology that takes pulses from the brain for computer gaming.

At Deloitte, Duc became famous for the innovative interactive SMS technology now marketed as J-Mango™. He now plays a critical role in furthering many of Deloitte's technology-based innovations.

So how does someone like Duc get attracted to Deloitte? Firstly, he was mentored prior to joining Deloitte by Peter Williams, then CEO of Eclipse and the present CEO of Deloitte Digital. Peter took a special interest in Duc because he could see Duc's unique talent. This mentoring led Duc to consider Deloitte as a place to work, and he joined Eclipse as an engineer.

But it was Deloitte's Innovation Program that enabled the firm to get to know and benefit from Duc's talents as an inventor. Duc had an idea and needed the infrastructure and support to build a prototype of an SMS-based technology. Duc and Deloitte, though the Innovation Program, were able to explore and develop J-Mango™. In this way the firm and the individual both benefited from a unique and special talent.

J-Mango™ sits on your mobile phone to enable you to send or respond to option-based messages. This means that you can tick the box for your favourite pop idol, fill out a marketing questionnaire, do your footy tips, complete a time sheet or pick the winning horse all within seconds.

Developing the functionality into a commercial application may have started with Duc the individual, but was moved forward by a team of equally talented individuals.

Today, Duc has a dual role: as a traditional employee within Eclipse and the role he plays across Deloitte through access to the accelerated program of work within Deloitte's Innovation Program.

The Innovation Program includes an online tool to capture ideas – the Innovation Zone – and a process for managing the innovation and growth of those ideas. Where appropriate ideas are converted into a business case and funded to take to market.

The Innovation Program provides support and development for employees to dream up new products and services to bring to market as well as to generate innovative ideas about how to improve internal processes and service delivery to clients.

This program enriches Duc's work and challenges him. In return it gives his ideas 'legs' and helps them grow. Duc teams with others across Deloitte to help develop new innovations that are technology-orientated and need his unique insight. As Duc's contributions develop Duc, they also enrich Deloitte and Deloitte's innovation DNA.

Recognising and then fostering this unique individual talent in Deloitte adds real value to the organisation. It leverages the currency of ideas, and in words from *Funky Business*: 'Talent makes capital dance' (Ridderstrale and Nordström, 2000, p200).

Too often, both competition and the need to contain costs will drive organisations to give up on harnessing their talented individuals to bring innovative ideas to the fore. These competitive pressures tend to encourage copycat strategies in product and price, causing differentiation based on cost. Without realising it, organisations commoditise their industry and, tragically, breed a task-orientated culture that has no room to think innovatively.

These organisations lose two-fold: their potential for growth stagnates and they lose the interest and talent of their people. In a time where talent is become increasingly hard to find, this is a dangerously myopic approach to business.

Maximising the use of talent – a scarce resource for future growth – will be the economic prize of the few. To get talent to choose them, organisations need to create an environment that fosters passionate entrepreneurship and a drive for change.

TEAM DNA: RE-SHAPING THE INSTITUTION

Extending from the individual to the organisation, Deloitte's Innovation Program tests the status quo. It builds communities of individuals who seek each other out and form 'tribes': communities of diverse and passionate individuals whose cumulative capabilities sustain innovations that are truly breakthrough in thinking and application.

Deloitte's tribes cut across service lines and its hierarchy to form a unique blend of individual talents. The Innovation Acceleration Team (IAT) is a good example. Its combination of talents and shared passion for innovation cements its tribal sense of belonging. For Deloitte, this intriguing tribe of innovators is a competitive advantage that clients are now seeking to leverage. For the IAT team their productive talents are beginning to cause Deloitte's 'capital to dance'.

The IAT is charged with developing ideas that demand innovation at all levels of product, process and business model. The skill of exploration, prototyping and commercialisation are core capabilities of a team required to nurture innovation. In fact the IAT could be described as a protected haven for innovative development.

Team-based innovation, however, goes beyond the boundaries of the IAT. Deloitte's innovation approach, including its funding model, encourages such teams in or across existing businesses to collaborate and explore on an approved project basis.

There are currently 20 such teams in action, and progress is tracked and managed by the Innovation Program under the executive leadership of Gerhard Vorster and his Innovation Executive.

The challenge is that combining a group of individuals in this tribal form is not easily defined by role or position in an organisational hierarchy. Nor is the process of value creation easily identified by the organisation. Ambiguity is prevalent, and it can be tempting at times to devolve rather than evolve the unique combination of skills.

However, ambiguity for the organisation is also ambiguity for competitors and is a key means to obtaining sustained market differentiation.

Deloitte's challenge, and that of any organisation pursuing innovation, is that tribal communities require unique performance measurement and value analysis. Measures such as failure rates will exist within a team of this nature, but they must be structured within measurable drivers of value. These measures of value are best defined against the innovations being managed and commercialised by the team; at Deloitte such teams are not constrained by timesheet entries for value measurement, but bound to create value through ideas.

Seeking operational innovation

The Innovation Program is also testing the operational status quo within Deloitte – politically and operationally. The program is seeking out new business models, new leadership roles and new means of earning and recognising revenue.

Not the sort of innovation* (*according to CFO magazine) that fantasizes that 'it is a live beast stalking the corridors and pinning down partners by the weight of projects and ideas' . . . but the sort that requires leadership courage to give people permission to play and 'think up ideas that the market wants to buy'.

In fact, CFO magazine awarded Deloitte 'Accounting Services Firm of Year' largely for its demonstration of, and its commitment to, innovation.

Some of the innovative ideas penetrating the market include an Anti-Money Laundering / Counter Terrorist Financing compliance tool from the Deloitte Forensic practice, AMLcheck™, and SleepWorks™, a facility that makes money while we sleep! SleepWorks™ is an alternative business model where new online products are developed such as Deloitte Forensic's whistle blowing service which uses a 24/7 operations centre supported by the state of the art technology of SleepWorks™. It has been invaluable in assisting corporations better manage their corruption, fraud and integrity risks.

The revenue is earned in a per-transaction setting as opposed to the more traditional total service. The operation includes a 24/7 support desk, and Deloitte is learning what it means to market and sell products rather than traditional professional services.

The new Deloitte business, Deloitte Digital, recognises the need to take innovations like SleepWorks™ and XBRL® or eXtensible Business Reporting Language, a globally accepted data standard for financial reporting, to a new level. Deloitte Digital is extending the alternative online business models of functions like these across the whole organisation and delivering professional services online to existing and new customers.

Being willing to re-shape Deloitte is much like pulling apart and re-assembling blocks. This is inevitable if, in the words of the *Funky Business* authors: 'we want to be in a place where people can be creative risk-taking entrepreneurs; a place where talent wants to live; where ideas happen and exciting products happen even faster; and then change.' (Ridderstrale and Nordström, 2000, p152)

It also means that as an organisation we must welcome the discomfort of ambiguity that innovation will inevitably promote. The systems architecture of Deloitte, from how revenue is measured to how staff members are deployed, is tested in an environment of business model innovation.

Coping with ambiguity requires strong collaboration built on trust. Such trust is needed if an organisation is going to really change the game for its clients. Deloitte believes it must be ready to break the rules to drive innovation, and support its colleagues as it invests in unique options for future growth. This requires constant communication, reinforcement and accountability for the investment made.

CORPORATE DNA: THE ORGANISATION AS A NETWORKED MODEL

The accounting firm, the university and the airline

At the corporate level Deloitte sees its responsibility to entrench innovation as threefold:

- To act as a corporate network maker.
- To manage innovation and its outcomes as a primary value driver in the business.
- To play a leading and defining role in the economic and political agenda for innovation in Australia.

Within this third layer of DNA, let's explore the responsibility of Deloitte as a corporate network maker, in other words as a market *maker* rather than market *follower*.

Like most of Deloitte's innovation stories, this one begins with individuals. There were two individuals in this case, who separately submitted a very similar idea to Deloitte's Innovation Zone: Tom Richardson, a partner in Consulting who worked with the Australian airline Qantas, and Jay Claringbold, a business analyst in Eclipse with expertise in online business models.

Their idea was to bring in-flight learning into Qantas' in-flight entertainment program. They lodged their ideas in the Innovation Zone when all Deloitte employees were encouraged to think of ways to leverage Qantas' offering in the market, whether on the ground, in flight and or online.

With a good incentive offered by Qantas, almost 1,000 of Deloitte's people entered their ideas into the Innovation Zone during 'Qantas Week'. This intellectual energy resulted in many good ideas in addition to that of Tom and Jay.

Through the Innovation Program, Tom and Jay were connected. With the support of senior partners within the firm their idea was taken to Qantas, which saw its value and put the idea to tender.

Driven by a passion for the idea, Tom decided he needed to do more than just respond to the tender and went to Harvard University to see if together they could provide Qantas with an exciting offer. The proposal was that Harvard University would provide learning content and Deloitte and Eclipse would provide the design and build the in-flight learning system. The resulting networked model created was a market maker.

Innovation to transform the accounting industry

Some 30 separate ideas were submitted to the Innovation Zone on a core issue besetting accountants: the complexity of financial reports and tax returns preparation. The Deloitte Innovation Program gave Bevan McLeod from Deloitte Australia, one of those who had submitted ideas, the task of developing a streamlined online financial reporting system using the global XBRL® accounting standard.

Initially developed in 2000 by the American Institute of Certified Public Accountants, XBRL® is a standardised way of representing financial data electronically. It is set to transform the accounting industry, because it enables financial reports from any number of systems to be prepared, analysed, verified and shared with a standard set of tools. It is already being used by a number of governing regulatory bodies around the world.

The Deloitte XBRL® team is currently rolling out the program in industry as the new technology, combined with XBRL® standards, is reducing times by 86% and transforming the current clunky year-end financial reporting process into a streamlined system.

However, the team is not working alone; it has identified software partners in the market to assist in the development of an XBRL® solution, and as a result has spawned additional commercialisation opportunities as part of the wider solution. The team has also collaborated with other Deloitte member firms across the globe to share and gain knowledge.

Corporate DNA: managing outcomes as a primary value driver in the business

This third layer of DNA, the concept of Deloitte as a networked model, as a market maker rather than follower, is made possible through building on the individual, the team and the broader network of market alliances and capabilities.

In both of the examples described above, Deloitte in Australia is shifting the boundaries of what it defines itself to be – how it interacts with the market and who it interacts with – to create value.

The example of Deloitte, Qantas and Harvard working together to offer in-flight training demonstrates a unique combination of capabilities to create new value. And it differentiates all three players from their respective competitors in the market.

Leveraging network models in this way creates exclusivity from competitors. And in essence it helps an organisation take its place as market maker – thinking and acting innovatively to create value that sets it apart.

Creating a unique and innovative space

> *The corporate world has to be a more interesting place to be. A place where people can be creative risk taking entrepreneurs; a place where talent wants to live; where ideas happen and exciting products happen even faster; and then change. (Ridderstrale and Nordström, 2000, p152)*

Innovation at Deloitte is firmly based on a culture that encourages people to explore innovative ways of thinking and different perspectives for solving business issues. Some of its most senior managers in Australia – Giam Swiegers, Chief Executive Officer; Keith Skinner, Chief Operating Officer and Consulting Managing Partner; Gerhard Vorster, Head of Innovation – together with the rest of leadership team, are all passionate advocates for the Innovation Program, which was started by the Australian firm in mid 2004.

They have invested considerable resources and time into ensuring the awareness and penetration of innovation across the company. Swiegers and Vorster see the commitment as a long-term strategic focus that offers sustainable growth for the company.

Innovation winning the war for talent

Innovation is fundamentally a personal thing. Embedding innovation in organisational DNA requires a shift in mindset for an organisation; it is a matter of capability development, not the competency of the few. Correctly managed, innovation will deliver differentiated growth, and this means understanding the implications at an individual, organisational and market network level.

Contrary to the widely held view that people are no longer loyal to an organisation, innovation has the power to win the war for talent by fostering individual contributions and a community of passionate innovators. Increasingly, Deloitte is bucking the trend of staff attrition as the Innovation Program retains talent that was at risk of choosing to work elsewhere.

The effectiveness of this sort of approach in attracting talented staff is shown by the fact that graduate applications to Deloitte have increased threefold over the last two years as the Innovation Program, along with cultural initiatives like 'Inspiring Women' and 'Cultural Diversity', gain recognition in the market.

It is the very real emphasis that Deloitte is placing on innovation that scores the most interest from graduate applicants.

Loyal talent will be the platform for sustaining innovative and differentiated growth. To achieve this means investing in the innovative DNA of your organisation. As people move through their career journeys they need to know that their organisation cares

about their individual talents. At Deloitte, the innovation story is told, honed and retold. The leadership is encouraged to challenge each team and share this story to retain talented individuals.

Checklist: Putting innovation into your DNA

If your organisation wants to identify whether is has innovation embedded in its DNA, it should challenge itself with the following questions:

- Are you seeking out individual talent – observing, learning and providing the opportunity for people to use their greatest strengths?
- Are you providing the flexibility for tribal exploration, facilitating communities that cut across service lines and geographies to bring unique sets of capability to bear?
- Are you embracing new business models for growth that extend and open the boundaries of your existing organisation?
- Are you creating market making opportunities that change rather than conform to traditional rules of the game?

The answers to each of these questions will give you a clear indicator as to your organisation's capability to innovate effectively. If you are not there yet, then building this capability will require a framework that encourages, invests in and measures the innovative performance of your organisation.

References

Australian Business Foundation and Deloitte (2006), *The Reality of Innovation Unzipped*, Australian Business Foundation and Deloitte.

Christensen, C M and Raynor, M E (2003), *The Innovator's Solution – Creating and Sustaining Successful Growth*, Harvard Business School Press.

Christensen, C M (1997), *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, Harvard Business School Press.

Ridderstrale, J and Nordström, K (2000) *Funky Business*, Bookhouse Publishing AB Sweden.

Dodgson, M, Gann D and Salter A (2005), *Think, Play, Do - Technology, Innovation, and Organization*, Oxford University Press.

Additional reading

The Innovation Leadership Forum's working manifesto for promoting an innovative Australia Melbourne, 6 December 2006

Looking for Innovation Leadership – BRW 19 October 2006

Leaders unite create a blueprint for an innovative Australia – media release 13 November 2006

Time for Action – BRW 30 Nov – 6 Dec 2006

Innovation Leadership Forum – University of Queensland Australia UQ Business School – Dr Terry Cutler/Prof Mark Dodgson Brisbane Innovation in Small & Medium Enterprises 03 Sep 2007

Innovation Leadership Forum – University of Queensland Australia UQ Business School Canberra Innovation & Procurement Policy 03 Oct 2007

Innovation Leadership Forum – University of Queensland Australia UQ Business School Melbourne - 2nd Annual Innovation Leadership Summit 30 Nov 2007

http://www.biotechnologyonline.gov.au/biotec/whatisdna.cfm, accessed 18 January 2008

Ron Johnson at the ThinkEquity Partners conference in San Francisco on 13 September 2006
http://www.ifoapplestore.com/stores/thinkequity_2006_rj.html, accessed 18 January 2008

Mehrdad Baghai

Mehrdad Baghai is Managing Director of Alchemy Growth Partners, a boutique advisory and venture firm in Sydney. He is co-author of the international bestsellers *The Alchemy of Growth* and *The Granularity of Growth*. For the last three years, he has served as a senior advisor to Deloitte. Previously, he was a partner in McKinsey & Company's Sydney and Toronto offices and was co-leader of the firm's global growth practice.

Giam Swiegers

Giam Swiegers is Chief Executive Officer of Deloitte Touche Tohmatsu in Australia. He began his career as an auditor with Deloitte in South Africa, and since then has worked for Deloitte on three continents and six cities. He moved into his current position on 1 June 2003. His stewardship of the Australian practice has led the firm to achieve the 2005 BRW/St George Client Service award as the 'Most Innovative Firm' in professional services in Australia, and the 2006 CFO magazine 'Accounting Services Firm of the Year' award. Giam was awarded '2005 best CEO for the advancement of women in business'.

Rebecca Watson

Rebecca Watson is a Director in Deloitte Consulting's Strategy and Operations practice. She specialises in assisting clients with strategy development and performance improvement based on rigorous financial analysis. In addition to her client facing role, Rebecca is working with Deloitte leadership on implementing the next phase of its growth strategy. Prior to joining Deloitte, Rebecca held positions as a Strategy Manager at the Commonwealth Bank of Australia and as a Consultant at PA Consulting Group.

Learning from the Market in Triple Time

Mehrdad Baghai, Giam Swiegers and Rebecca Watson

Mehrdad Baghai is Managing Director of Alchemy Growth Partners and has been a key advisor on Deloitte Australia's growth strategy. Giam Swiegers is the Chief Executive Officer of Deloitte Australia. Rebecca Watson is a Director in Deloitte Consulting's Strategy and Operations practice and has a part time role working on Deloitte's growth strategy.

To grow, professional services firm Deloitte Australia needed a new approach that would enable it to adapt swiftly to changing market needs. It found it in Intensive Learning Campaigns (ILCs), specially adapted sales campaigns with the primary objective of learning from the market. At first glance they look similar to normal sales campaigns that are run faster or harder. In fact, an ILC is a very specific form of market-based learning through active testing. Deloitte's case study highlights how complex organisations operating in mature markets can become adaptable, increase their pace of learning and start running at full speed.

INTRODUCTION

Several years ago, Deloitte Australia embarked on an ambitious growth strategy. Growth objectives for the core business focused on improving margin and strengthening market share, but Deloitte neither had a sufficiently unique set of offerings to achieve this, nor sufficiently distinctive business development capability to consistently win new clients.

Significant effort was required to encourage collaboration among organisational silos and to develop truly integrated offerings that responded directly to market opportunities and client needs. A new approach was needed: an approach that could transform Deloitte from a less responsive organisation to one that could learn quickly, gain insight from the market and adapt core offerings to changing client needs. This new approach also had to help create superior business development capability and enable Deloitte to gain more than its fair share of sustainable client relationships. And it had to be sufficiently different to avoid the 'same game, different name' attitude that quashes momentum.

Deloitte Australia succeeded in creating just such an approach, and called it Intensive Learning Campaigns (ILCs).

This paper describes ILCs and highlights how they are different from typical sales campaigns. In addition, we discuss the four main learning opportunities associated with ILCs and their associated benefits. Finally, specific techniques for breaking down organisational silos and fostering collaboration are presented.

HOW DO INTENSIVE LEARNING CAMPAIGNS DIFFER FROM NORMAL SALES CAMPAIGNS?

An ILC is a small-scale effort involving up to a dozen people, focused on selling a specific solution to a targeted list of clients and prospects. It lasts for 10–12 weeks. The solution must be replicable and the sales decision cycle must be relatively short.

At first glance, ILCs look similar to normal sales campaigns that are run faster or harder. In fact, an ILC is a very specific form of market-based learning through active testing. It differs from a normal sales campaign in its emphasis, team size, team formation and central coordination mechanisms. The primary objective of ILCs is learning.

Whilst short-term sales will be an obvious benefit from running the campaign, the insight gained from testing the market and refining offerings over a longer period will have a much greater benefit.

An ILC consists of the three typical campaign phases: planning, business development and learning. The distinctiveness of the ILC model lies in the relative emphasis of these

TABLE 1

An intensive learning campaign *is*:	**An intensive learning campaign *is not*:**
• Driven by a theme and go-to-market message	• Unrelated activities that have no common theme/issue
• Driven by business objectives	• Driven by a 'whim'
• Measurable and accountable (team and personal KPIs)	• Going to be successful unless you measure it
• Distinct (it has a proposition)	• Simply listing products and services
• Targeted (defined audience)	• Untargeted, solely focused on existing clients
• Integrated (different activities that work together)	• A single piece of collateral
• Executed within a specific time period.	• Loosely connected activity that takes place simultaneously.

three activities – the planning phase is truncated, while the learning phase is extended relative to the norm.

Team size is also an important distinction. Rather than involving a large number of executives to promote a particular service, ILCs operate with a small team of up to 12. The small team size ensures rich learning from the marketplace. If 40 clients were each approached by a different partner, then each partner would have very limited pattern recognition. By ensuring that each team member has at least five client interactions, accompanied by different team-mates, an ILC will generate sufficient pattern recognition for meaningful insights to be formed and enable different selling styles to be observed and learned. Larger teams would diffuse the richness of this learning too much.

Experience suggests ILC teams should be self-forming rather than having their composition dictated from above. To this end, partners can nominate particular products or service offerings for an ILC. The nominating partner will typically take on the Campaign Leader role, but it is up to the nominating partner, not the service line lead or product owner, to determine their Campaign Manager. The Campaign Manager in turn works with the Campaign Leader to determine team members.

This approach encourages the spirit of enterprise and innovative competition. In addition, the control mechanisms around business development activity are loosened. Involving a wider range of partners and directors on ILC teams means business development is no longer the domain of a few (usually more senior) partners. It also enables a much broader 'surface area' of contact with clients.

As ILC team sizes are small and can be nominated by any partner, dozens of campaigns can be running concurrently. The variety and number of ILCs dramatically increases the complexity of coordinating this activity.

Several key mechanisms are necessary to pull all this activity together. Firstly, a Campaign Central group needs to oversee all campaigns, provide supporting tools, facilitate training and measure the performance of campaigns. Campaign Central also directs traffic by ensuring the same partners are not committed to too many campaigns and that the same clients are not being targeted by too many campaigns.

Secondly, all campaigns should run according to a national calendar at defined periods throughout the year. There are several important benefits of sticking to a national calendar for ILCs. The structured approach will streamline both the staffing and reporting processes associated with the large number of campaigns. The structure will permit Campaign Central to compare results more easily and identify the real winners among the propositions. The calendar also allows the ILCs to reinforce any national Deloitte campaigns running in parallel. All of these factors, along with the natural organisation-wide energy unleashed by multiple campaigns running concurrently, outweigh the benefit of granting the teams complete flexibility with respect to the timing of their campaigns.

In summary, the ILCs are a mechanism for creating a real-time training environment for the partners involved, as well as rapid iteration of product and service offerings and go-to-market strategy. This intensive environment is necessary to drive the behavioural change that some partners and directors need. Importantly, the team nature of the campaign creates a safer environment for dealing with the fears and rationalisations that had been preventing some partners from succeeding in client development.

How does the learning translate into tangible business benefits?

The key objective of ILCs is accelerated learning. There are four main types of learning that have been identified and actively supported:

- Learning during a campaign.
- Learning over multiple campaigns.
- Learning across campaigns.
- Learning about campaign oversight.

Learning during a campaign

One of the key components of the learning phase is a team reflection session where market insights are discussed. By creating the space for in-depth reflection and learning to take place, the firm can benefit from the deep pattern recognition that an intensive campaign team gains.

Beyond reflecting on what worked and what did not, the team consults on how to improve the hit rate the next time the campaign is run. The team may consider updat-

ing its target market boundaries, key features of the offering and/or pricing strategies. Importantly, it is the team's responsibility to enhance the offering and its pitch materials, incorporating the wisdom acquired from the campaign. This helps increase the success rate next time the campaign is run, whether or not by the same team.

Learning also takes place at the individual level. The frequency of campaign cycles and the volume of ILCs in each cycle ensures that all partners are involved in at least one ILC per year. This creates a real-time opportunity for all partners to enhance their business development capabilities by engaging in an accelerated period of cold calls, sales meetings and proposal activities.

At the regular ILC team meetings, partners are able to further refine their business development capabilities by sharing tips and techniques with their peers. Additionally, the performance measurement data captured during the campaign provides partners with targeted feedback and can help create personal capacity-building programs. This type of learning increases the business development capability of the whole firm and creates benefits for all future sales activity regardless of whether it is business as usual or an ILC cycle.

Learning over multiple campaigns

By running three ILC cycles a year, a specific campaign can be repeated and evolved based on the market insights. Our experience is that while some campaigns are terminated for good reason, others progress through a natural set of stages. Early on, the campaign is in many ways a pilot that may be refined over time. At some point, it makes sense to extend the campaign and scale it up to reach more and more organisations.

It is critical to ensure that every campaign idea has a long-term owner, who is likely to be someone other than the Campaign Leader and who takes an evolutionary perspective on how to ramp up the campaign over time.

Learning across campaigns

Multiple ILCs are run during any campaign cycle. At Deloitte, there are around 30 campaigns each cycle. The performance of all ILCs is measured using the same metrics, so it is relatively easy to determine which ILCs are more successful than others and to identify market hotspots.

Armed with this knowledge, the firm is able to capitalise on these hotspots by more actively managing its portfolio of offerings and ensuring that effort is focused appropriately. Internal and external marketing activity can continue to promote the hotspots beyond the duration of the ILC. Internal resources can also be reallocated within business units to focus on the hotspots. This learning enables the firm to react quickly to the market and direct effort where it will get the most return.

Learning about campaign oversight

Critical to the success of ILCs is Campaign Central. This is responsible for setting campaign parameters, providing supporting processes and tools, facilitating training and measuring the performance of campaigns. Campaign Central also ensures the right ILCs are selected and there are not too many overlaps in required resources during any one campaign cycle.

During and after campaigns, Campaign Central undertakes its own learning activities to ensure the support it provides improves for the next cycle. For example, during a campaign cycle, Campaign Central holds regular meetings with Campaign Managers to share learning, uncover issues and explore potential improvement ideas. Campaign Central also holds its own learning and reflection discussions to further improve the administrative processes for the next campaign cycle. This learning ensures the ILC process is continuously improved and campaign participants are provided with the right support to deliver a successful campaign.

How did Deloitte break down its organisational silos and foster collaboration?

Like many professional service organisations, Deloitte has traditionally focused on and organised itself according to technical specialities such as tax and audit. Conversely, most clients think of issues and problems they are facing rather than the service lines of a professional firm. In many cases, the best solution to a client's problem will involve an integrated set of services from across the firm.

By launching ILCs, Deloitte has progressed down the path of collaboration by forcing partners to nominate targeted market offerings focused on specific client issues. However, the initial ILC cycle highlighted a significant challenge with this approach: getting people from different areas of the business to not only understand unfamiliar service offerings but to feel comfortable identifying and approaching potential clients with these offerings. One of the mechanisms used to overcome this challenge was the Street-Fest concept.

A Street-Fest can be likened to a trade show on steroids. It features a booth for each key campaign offering, and runs for a very short period of time (a maximum of three hours). The booth owners compete for crowd attention (and booth glory) by using a mix of costumes, themes, games and competitions. Booth owners repetitively deliver concise, high-impact presentations to visitors, explaining the value proposition and potential audience of their respective product or service. In essence, the Street-Fest condenses the pace of learning and opportunity identification from several weeks into less than three hours. Partners come away from the Street-Fest with an already populated list of potential clients on whom they can focus when the ILC cycle begins.

Conclusion

Deloitte's approach to ILCs is continuously evolving. However, the initial cycles have already accelerated normal learning patterns, better positioned the organisation for change and delivered an immediate return on investment. The organisation is starting to sprint.

By 2010, if Deloitte has become truly proficient at running intensive campaigns, it will have increased average margin, achieved a leadership position in priority market segments, trained well over 100 partners in client development, dramatically improved the quality of its offerings, and learned to work across silos without friction. The combination of these sources of competitive advantage should translate into rapid growth and overall market share gain.

REFERENCES

Baghai, M A, Coley, S C and White, D (1999), *The Alchemy of Growth*, Orion Business, London.

Eisenhardt, K M and Brown, S L (1998), *Competing on the Edge: Strategy as structured chaos*, Harvard Business School Press.

Foster, R and Kaplan, S (2001), *Creative Destruction: Why companies that are built to last underperform the market—and how to successfully transform them*, Currency, New York.

Olson, M (1965), *The Logic of Collective Action: Public goods and the theory of groups*, Harvard University Press.

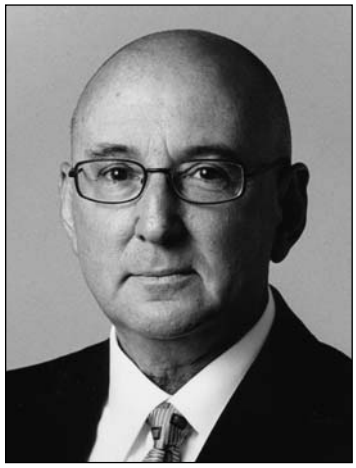
Viguerie, P, Smit, S and Baghai, M (2007), *The Granularity of Growth*, Marshall Cavendish, London.

VERITY BYTH

Verity Byth is a business strategist whose career has spanned the IT industry, management consulting, and consumer research. As a co-leader of the KPMG Centre for Consumer Behaviour, she developed with Ross Honeywill the social typology that defines the New Economic Order. Her practical experience covers a range of industries, from airlines and banking to energy and retailing. At the Centre for Customer Strategy, Verity specialises in project design and implementation, consumer research, and knowledge transfer.

Both former directors of KPMG Consulting (Asia Pacific) Ross Honeywill and Verity Byth founded the Centre for Customer Strategy in 2001 to continue their research linking discretionary spending and psychological profiles so that practical knowledge about consumer value would be available. They are both foundation directors of Neo Group which commercialises the research knowledge of Centre for Customer Strategy.

ROSS HONEYWILL



Consumer behaviourist Ross Honeywill became an internationally recognised authority on the impact on Australia of a rapidly changing social fabric through his leadership role at KPMG (Asia Pacific) between 1997 and 2001. As a business strategist, he has played a central role in large-scale transformation projects for global brands. Prior to working at KPMG, Ross was a senior executive for national retail brands. He has won business and marketing awards in the tourism, property development, telecommunications, and retail sectors.

Managing the Innovation Faultline

Verity Byth and Ross Honeywill

Verity Byth and Ross Honeywill are foundation directors of Neo Group, a privately funded think tank based in Melbourne, Australia.

Seven years of Australian workplace profiling research have revealed that there are two completely different types of employees when it comes to innovation. While some employees are natural innovators drawn to challenge, change and innovation, others are natural stabilisers drawn to hierarchies and the status quo. The key to successful innovation is managing to draw out the best from both types. This paper outlines how this typology of employees offers managers a simple yet powerful tool for differentiating the critical tasks of recruiting, leading, communicating with and rewarding employees of both the innovating and the stabilising kind.

INTRODUCTION

It is the human chain of interactions that transforms a great idea into a successful business innovation. And it is the ability to use human differences effectively that turns a single cycle of innovation into a sustainable innovative culture.

An Australian innovation in workplace profiling, the 'new economic order' (NEO) typology, provides a tool for identifying, recruiting and managing the two different innovation propensities in any group of employees. Based on seven years of research and over a million interviews with Australians, the findings show that there are two fundamentally different groups of employee capabilities when it comes to innovation. And they are like chalk and cheese.

The first group are the NEOs, named after the typology. They are natural innovators, with a profile that includes a higher propensity for challenge, change, complexity and paradox, new technologies and new ways of living. While they are only about a quarter of the population, they account for over half of all white-collar jobs and are six times more likely to hold executive roles. Importantly for an economy that relies on innovation rather than size to stay relevant in the global marketplace, these people are twice as likely to start and run a small business than their more conservative colleagues.

The second group, the 'Traditionals', are natural stabilisers, with a psychological profile that includes conservative social values, a fondness for organisational hierarchies and a belief in maintaining the status quo. They thrive on certainty and structure. About half the population, this group is more strongly represented as employees in blue-collar, manufacturing, public and military service organisations.

Recognising that two such different mindsets coexist within one workplace is a breakthrough in management thinking and an essential precursor to understanding innovation.

Putting these two distinct sets of capability to work are critical management tasks in a sustainable innovation culture. It means creating appropriate workplace settings, with job roles and rewards that motivate involvement in innovation initiatives, as well as understanding how to work more effectively with each other on those initiatives.

The NEO typology has identified one other type of employee – 'Evolvers'. Like the NEOs, they make up about a quarter of the population. They have many of the NEO characteristics, but not enough to qualify them as NEOs, and they have lower spending power.

In this paper we have focused on the two truly distinct groups, NEOs and Traditionals. We describe them and the relevant management tasks in enough detail for managers of innovation initiatives to create successful teams.

NEOs ARE NATURAL INNOVATORS

So who are the natural innovators? They are people who are unafraid of challenge and change, are interested in what lies beyond the routine, and are willing to question and bend the status quo to achieve an overarching vision. There are over four million of them in Australia, and they drive the economy forward with their relentless search for the next challenge and the next discovery.

Called NEOs because they represent a 'new economic order', these people have been identified in a comprehensive profile of variables covering employment, consumption and lifestyle values, attitudes and behaviour. They are considered a new economic force because they represent a small but powerful force for change. They are change-creators, not fad-followers. They are economically and socially confident, well-informed and pro-active. While they are present in all age and socio-economic groups, they are statistically overrepresented in the 20–45 age group and at above-average income levels.

As citizens, they are life's economic rationalists, believing that sound economic management is a cornerstone of the good life. But they are also socially active and have a strong belief in social justice. NEOs exhibit a strong sense of individual determinism – being clear about what they stand for as an individual and demonstrating a willingness to take responsibility for their own actions. As a consequence, NEOs have higher levels of confidence about the state of the world than others. In times of political, military and environmental uncertainty they report a consistently more confident outlook. Partly this is because they are better informed and partly because they have a strong sense of being able to control, influence and manage what life throws at them. They are the architects of their own life outcomes.

As consumers, they spend more than anyone else on discretionary goods and services. This spending is driven by a search for quality, design, experience and authenticity. With their strong sense of individuality, they are motivated by opportunities to purchase products and services that deliver a personally relevant outcome, rather than badges of belonging to a specific group or trend. This bias for personal relevance leads them to seek out the new and edgy opportunities that exist outside the mainstream. And this makes them very influential in leading consumer trends because they put their money where the new and interesting and counter-intuitive ideas are.

As employees in large organisations, they dominate white-collar positions and influence over 70 per cent of business expenditure decisions. They are almost twice as likely to be a small business owner as their Traditional colleagues. Many NEOs are driven to start their own business by the force behind a single, enduring question: 'Why can't I?' Their drive to find a better, more relevant service or product often leads them to find market gaps and new opportunities. And that's what makes them a critical part of any innovation project and the best people to be leaders of the longer-term development of an innovation culture.

TABLE 1

NEOs – Natural innovators	Traditionals – Stabilisers
• NEOs earn more, know more and expect more from service providers and employers. • NEOs dominate white-collar occupations. • NEOs are influenced by personalised communication and whispered secrets that make them feel like individuals making their own contribution. • NEOs are innovative employees who thrive on change and complexity.	• Traditionals operate in the status quo and favour traditional communication channels. • Traditionals dominate blue-collar and public service occupations. • Traditionals are happy with generalised communications and a unifying message that makes them feel part of the team. • Traditionals thrive on certainty and structure.

INNOVATIVE WORKPLACES NEED A BALANCED WORKFORCE PROFILE

It's obvious that an organisation needs a workforce that can meet its needs throughout the innovation cycle in each of the markets it serves. In some industries, the innovation cycles are short, almost continuous. In others, the cycles, from disruption to maturity, can last decades. The first strategic challenge, from a human resources standpoint, is to be clear about where in the cycle the organisation currently is and what proportion of innovators to stabilisers is required. As Tom Kelley, of renowned US innovation firm IDEO points out, "innovation is ultimately a team sport" (Kelley, 2005, p262). Every workforce needs both types of employees but workforces with short innovation cycles will need a greater proportion of NEO innovators than workforces with long innovation cycles.

The second strategic challenge is to set an overall target for the proportion of innovators in the workforce that will support the organisation's long-term innovation objectives. Innovators need more than a job description and a personal challenge: they need clear and consistent signs that the organisation values their mindset, even if it doesn't share it! Creating a target for the proportion of innovators across the organisation keeps innovative people on the executive agenda, and therefore provides the acknowledgement that is needed to keep NEOs confident that their efforts are valued.

With these two important framework decisions agreed and included in the set of performance targets, managers can move on to the more challenging task of creating a culture and infrastructure that will attract, motivate and retain NEO innovators for the longer term.

Can your organisation discern and develop natural innovators?

The first task for managers is to be able to discern the difference between the two types of employees. This is a relatively simple step of being trained to see the differ-

ences and develop the personal skills to communicate effectively with each type. In addition, large organisations will be able to classify their employee population using surveys and data-modelling to provide managers with a map of the distribution of NEOs and Traditionals in every team.

With a clear idea of what they're looking for, managers wanting to increase the accuracy and rate of success at recruiting NEOs need to understand how their current recruiting practices will be viewed by NEOs with relevant job skills in the marketplace (or internally, if there is a job market that operates within the organisation).

The nature of work is changing, and the relationship between employer and employee is changing. Many organisations will be shocked to learn that NEOs regard the job market much as they do the consumer market: as a set of options and experiences that need to be relevant, engaging and worthy of attention. They do not apply a different set of criteria for evaluating job opportunities to any other opportunities in life. Therefore, understanding what motivates NEOs at a personal level becomes critical to understanding how to recruit, place and evaluate them.

NEOs view work not as a separate and distinct activity that happens between the hours of nine and five but rather as an extension of their lives. For NEOs, work has little to do with time-keeping and the separation between work and leisure is increasingly blurred. NEOs are not workaholics – they are lifeaholics. So organisations that describe themselves as having a strong collective culture, with working hours that are deemed the most appropriate for 'the majority', will be sending a message to NEOs that their individual ways of working may not be acceptable.

NEOs want challenge, responsibility, accountability and stimulation. They define themselves not by their work but by their interests, talents, and achievements. Who happens to pay for those talents is less important than the talents themselves. And there will be many things NEOs do that they will not get paid for. For example, a NEO may be a well-paid stockmarket analyst in a large broking house, as well as being an author or composer or a landscape designer. A NEO may be a business analyst in an energy company by day, while also splitting 'spare' time between a voluntary position on the executive of a national homeless youth initiative and a private business that creates and distributes fashion t-shirts.

NEOs do not aspire to 'belong' to an organisation. They want to work with a group of people who share a common set of values and who stand for a clear set of goals and principles. They will not settle quietly within the organisation boundaries and accept that 'this is the way we do things here'. They have strong professional and personal relationships that endure longer than most jobs. These networks are vital for innovating as they provide a view of the world as it is, not as the organisation would like it to be. The benefits of an 'open source' approach are evident to natural innovators, but unfortunately rarely articulated or practised by organisations.

These NEO motivations need to be built into a recruiting and job design process. Even at this early stage, the employee value proposition (the statement of the benefits that the organisation has to offer the employee) must be tailored to individual, independent, well-connected and well-informed candidates.

CHECK LIST FOR RECRUITING

Does your recruiting process:

- Use smart technology to process applications and personal, peer-based interactions to process applicants?
- Communicate the value of unlocking the potential of individuals rather than the status and achievement of the organisation?
- Uncover the relevant innovative practices of the candidates outside of their formal job experience?
- Demonstrate an understanding that good work happens outside the workplace and outside traditional working hours?
- Use an employee value proposition that addresses NEO motivators?
- Reassure NEOs that they will be able to continue to develop their professional networks and 'open source' activities?
- Engage NEOs in their initial job design and goal-setting – specifically on the innovation challenges?

Does your organisation sustainably harness the talents and outputs of natural innovators?

The obvious way to retain and reward NEOs is to pay them well. NEOs are ambitious but not for status and traditional perks. They aspire to richer and more satisfying experiences. Money is important because it fuels their next experience. Financial reward is perceived as a measure of their employer's regard for their talents and contribution. If it doesn't parallel their self-worth, they simply change jobs in pursuit of better recognition. It is this ability to take calculated risks at a personal level that make NEOs both more likely to leave and more valuable in innovation projects. They want to stand for something and that streak of determination is what carries many innovation projects through a difficult period.

Models of reward in the marketplace have evolved dramatically in the last couple of years. From setting up shop on eBay to sharing revenue with myspace, or selling virtual assets in Second Life, individual contributions that reap rewards for others are being more widely shared. The democratisation of reward has not yet arrived in the organi-

sation, but it is changing employees' ideas about being rewarded for their individual contributions to a larger revenue model. With NEOs this has always been true – that there is a delicate balance between the amount of revenue that they take responsibility for generating and the proportion they share in.

The work that NEOs do is never simply regarded as 'just a job' or as a way to fill in time. No matter how much balance they promise themselves and no matter how many promises they make to finish work at a reasonable hour, responsibility always gets in the way. They can never escape the deep sense of accountability and commitment they feel. They do, however, insist on a relevant way of being rewarded in return for this deep dedication. Recognition of the influence that they have and the contribution they make is deeply satisfying in itself.

NEOs believe in learning a living rather than earning a living. Opportunities such as time-off for study or reimbursement of course fees are a basic benefit that NEOs expect to be provided in a modern workplace. Unfortunately many of these developmental programs are perceived by NEOs as having strings attached – for example, only being reimbursed for 'approved' courses of study. NEOs will discount these if they are perceived to put the organisation in control rather than genuinely providing personal benefits.

The challenge is not for the organisation to find the perfect set of development options for every individual but to find a way to put individuals in control of their own professional development and share the benefits with the organisation. Google's performance plans, for example, explicitly include 20 per cent of employer time dedicated to personal projects, to harness the creativity and productivity of innovators at work. Most of their new product ideas come from this pool of unstructured, off-the-organisational-mainstream, personal time and energy (Tapscott and Williams, 2006, p260).

Workspaces count. How the workplace is structured affects how NEOs do their work. NEOs constantly blur the line between work and play and work and home. They don't need to make the distinction because they're always engaged in what they're doing. The experience is as important as the achievement they're seeking.

They're less interested in coming to work at all. The idea of a long commute to a crowded workplace is much less attractive when a home office or local business café provides all the communications facilities as well as a sense of the real world. NEOs can't easily accept that when it's possible to have a video conference using SKYPE on a home PC at any time of the day or night, one must still book a time in a limited calendar for a corporate video conference!

The old idea of a creating a 'skunk works' outside the formal organisation was always credited with creating a sense of being lean and hungry for success. It worked because it released NEOs from the workplace structures that suited the organisation's *idea* of productivity more than the natural innovators' *practice* of productivity.

The conventional workplace, with its traditional authority and structure, is less and less popular with NEOs. An employer who offers NEOs a traditional workplace runs the risk of losing their natural innovators. NEOs need a workplace culture that recognises and manages talent and imagination. And while this might appear difficult for a large institution to undertake, it is absolutely essential in the fostering of innovation. Smaller workplaces manage this much more effectively, because they have the flexibility to adjust to individual differences.

CHECK LIST FOR DEVELOPMENT & REWARD

Does your development and reward process:

- Provide enablers for innovative work to happen outside the workplace and outside traditional working hours?
- Recognise contribution and influence as well as provide financial rewards?
- Have a way to recognise and reward in proportion to organisational success?
- Help NEOs to achieve their development goals in a personally relevant way?
- Actively work to integrate NEOs' personal interests with organisational development goals?
- Encourage individuals to work in spaces and rhythms that maximise their productivity?
- Provide NEOs with organisational tools that keep pace with their personal connections to the world?

Sustaining one big happy innovation family means recognising and celebrating difference

Once the reality of the new economic order in the organisation is clear – that the individual is critical to the success of an innovation culture – then the corporate imperative must be to come to grips with having two distinct types of employees. At first glance, it might appear that two completely different approaches are required for every management process. But in fact, what is typically required is a more balanced and inclusive version of the current approach, ensuring that the organisation's point of view (as it is expressed in communication and reward systems) acknowledges and celebrates the differences in their innovation context.

The starting point is to recognise that employees in an innovation culture are no longer usefully defined by their jobs (engineers, product managers, marketing people) nor by their age (young innovators vs older reactionaries). They need to be recognised as having a bias for change or for the status quo, and rewarded for achievements that contribute to both of these goals as they contribute to the organisation's performance.

Contrary to the sweeping generalisations from demographers that are so prevalent in the business media, our data shows that people from Generation Y, for example, are not all characterised with a bias for change, technology and challenging authority. How could such characteristics be distinctively explained by just one factor, age? But targeting Generation Ys who demonstrate natural innovator characteristics (i.e. Generation Y NEOs, who represent about 27 per cent of Generation Y) will be an important part of a sustainable recruitment plan, as will targeting NEO Baby Boomers (who make up about 23 per cent of Baby Boomers in Australia).

In order to attract and retain NEOs and Traditionals at any level or job role, the organisation's processes need to work effectively with both NEO innovators and Traditional stabilisers. For independent, information-seeking and self-managing NEOs, the communications and reward processes will have the most impact on retention. NEOs need a sound, consistent and well-supported rationale for the organisation's forward direction so that they can align their efforts to an overarching decision framework. With a strong organisational mandate, they will manage their own progress towards these organisational goals and their own personal achievements.

Keeping NEOs for the longer term is simply a matter of recognising and rewarding those achievements and keeping the challenges fresh. They don't need to be clear about boundaries and 'the rules' (they'll bend them along the way), they don't need an externally stimulated sense of team coherence or 'belonging' (they'll create it themselves if it's necessary to achieve the challenge) and they don't need detailed job descriptions (they'll reinvent the job to make it fit the goals).

Communicating

NEOs and Traditionals hold very different perspectives on the role of work. Understanding these differences is a fundamental starting point for constructing messages about organisational and innovation initiatives that resonate with each group. These attitudes drive workplace behaviour. NEOs value taking leadership and responsibility, success and new experiences more than the population as a whole, and up to 40 per cent more than Traditionals.

Messages about innovation that appeal to these attitudes will be well received by NEOs. The classic messages that invoke being the best or largest organisation amongst competitors, being part of a team that is valued by the wider community or being part of a longstanding brand or social heritage are messages that will all appeal directly to Traditionals.

Motivating

In successful innovation initiatives, a differential reward system is fundamental to unlocking the potential of the two different types of employees. Most reward systems are built up from roles and job descriptions that are differentiated by degrees of scope,

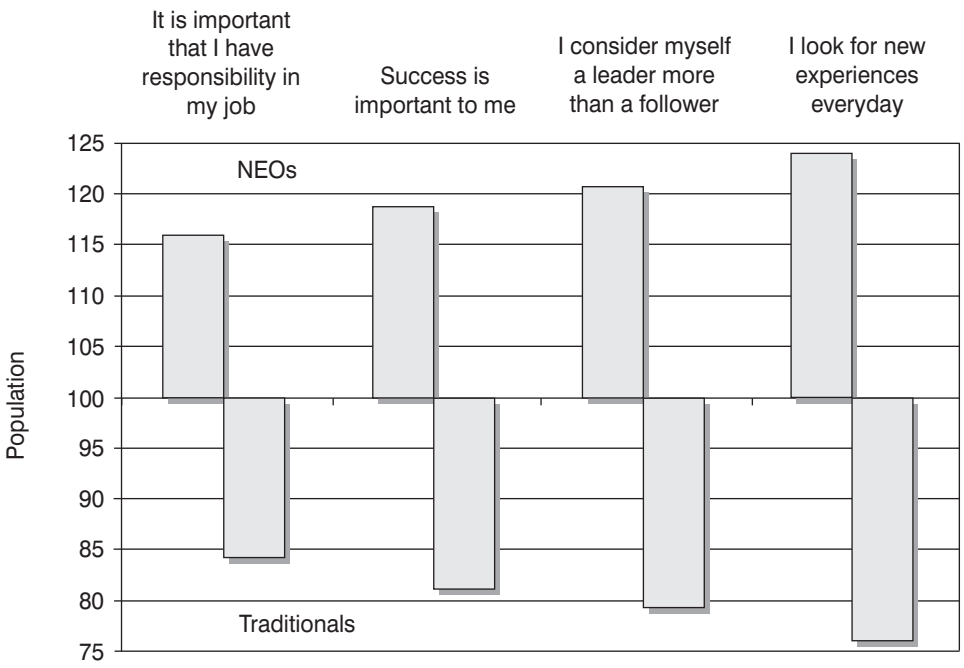


FIGURE 1: NEO attitudes are not those of Traditionals

Source: Roy Morgan Single Source – March 2006

responsibility and contribution. But to recognise the two different employee motivations, it is necessary to move to the next level of management finesse by being able to create different rewards for, say, a NEO accountant and a Traditional accountant in the same innovation initiative.

If both an innovator and a stabiliser are critical to success, then the reward system must recognise the different motivations of these different employee types sharing the same role. It must appeal to both types, by offering elements that are both motivating and perceived as recognising and valuing different styles of contribution.

NEO reward structure	Traditional reward structure
• Individually relevant – project- or goal-based	• Collectively relevant – role- and task-based
• Individual recognition (idiosyncratic benefits)	• Team-based recognition (group-defined benefits)
• Flexible	• Rule-based
• Changes regularly	• Slow to change
• Creates lateral challenges and opportunities	• Creates hierarchical challenges and opportunities

Conclusion

As the world grows more complex, the success of innovation initiatives requires a more complex approach. But with a clear understanding of the different employee profiles for innovation work, this does not need to make management more complex or more difficult. Being able to see a team or a workforce through the robust lens of the NEO typology offers managers a simple yet powerful tool for differentiating the critical tasks of recruiting, leading, communicating with and rewarding innovating or stabilising employees.

REFERENCES

Honeywill, R and Byth, V (2006), *NEO Power: How the New Economic Order is Changing the Way We Live, Work and Play*, Scribe Publications, Melbourne, Australia.

Kelley, T (2005), *The Ten Faces of Innovation*, Currency Doubleday NY.

Tapscott, D and Williams, A (2006), *Wikinomics*, Portfolio, NY.

The principal reference for this paper is the authors' own book, the first-mentioned in the above list. As encapsulated in that book, NEO typology is informed by data from 120,000 in-depth interviews each year in the Roy Morgan Research Single Source database. The data covers employee attitudes, behaviours and lifestyles to create an algorithm with 196 variables that distinguish between three main groups of behaviour; NEOs, Evolvers (a subset of NEOs) and Traditionals. The typology has been adopted by leading Australian and global organisations for use in communications, marketing and business planning initiatives. The authors note that it would be disingenuous to suggest that the complexity of the Australian workforce can be practically reduced to two groups. In the detailed application of their typology to a workplace, there is a breakdown to the 20th percentile (groups of 5%) for the defining characteristics of "NEOness". The Evolver group, which represent 26% of the population and 24% of discretionary spending, is characterised in the typology by people who possess many, but not enough, of the NEO characteristics to qualify them as NEOs. Their spending behavior is not as frequent or as high as NEOs. However, their characteristics remain distinct from Traditionals. For the purpose of this paper, NEOs and Traditionals have been used to illustrate two distinct, discriminating groups.

For more information about the NEO Typology, visit www.neogroup.net.

Leslie Butterfield

Leslie Butterfield is the Chief Executive Officer of McLahlan Lister Pty Ltd. Leslie is on the Boards of the Queensland Microtechnology Centre, the Australian Business Foundation, and the Australian Literacy and Numeracy Foundation. She is a member of the University of Technology, Sydney's School of Engineering Industry Advisory Network and the Australian Institute of Arbitrators & Mediators, and she is also an Associate Fellow of the Australian Institute of Management. She was one of a panel of three industry representatives appointed by the nine government ministers to review the progress, strategies and future direction of the National Building Codes Board. She was inducted to the Inaugural Australian Businesswomen's Hall of Fame, and was Telstra Businesswoman of the Year.

Dafydd Wyn Owen

Dafydd Wyn Owen has a background spanning the public and private sectors in the UK, Europe and Australia. Dafydd has delivered numerous complex engineering projects and provided extensive strategic advice in project and program management, asset management, strategic planning, business planning, performance improvement, and project delivery in the transport and infrastructure sectors. Dafydd is presently with McLachlan Lister Pty Ltd.

Factors Behind Successful Creative Project-Based Teams

Leslie Butterfield and Dafydd Wyn Owen

Leslie Butterfield and Dafydd Wyn Owen are with McLachlan Lister Pty Ltd.

The quality of the teams that manage projects is key to whether they will come up with innovative solutions or simply replicate tired old approaches. While project management as a discipline is utilised in almost every business sector, it often lacks appropriate implementation. Project teams need to have strong leaders, and be combined of a diverse range of people if new ideas are to be sparked. The right physical and mental environment has to be provided; one that not only provides the right tools and is free of historical constraints, but which fosters openness and a sense of common purpose.

INTRODUCTION

With very few exceptions, the realisation of any innovative idea, product or process will rely on a group of individuals coming together to develop, plan and execute a scheme. The participants in this process will vary enormously, and may well change significantly over the duration of the process. Creative, functional, technical, financial, legal and marketing skills are only some of the talents required. These skills often reside in individuals with very different operating styles and views of the world. It is our belief that the strength of the project management of this team will bear directly on the success of the innovation.

Project management, as a discipline, was largely conceived and developed in the construction, engineering and defence sectors. These days, project teams and project management methodologies are heavily referenced in almost every business sector, although their appropriate implementation and utilisation is often sadly lacking.

The adoption of a project-based approach to problem solving has obvious and proven advantages, but often those managing and working on the project have been thrust into it with little project management education or training. Many are even given the title Project Manager for the simple reason that they are responsible for the attainment of a particular goal, but they are given neither the skills to deliver nor the clear outline of deliverables required by any seasoned project manager. Accordingly, in too many cases those involved in projects don't understand, and therefore don't realise, the true benefits/results that can be achieved from a high-performing project-based team.

As well as understanding the actual project management discipline, it is critical that the interactions of people, and the role that these interactions have on the outcome of the project, are understood and developed in order to drive creativity and achieve improved project outcomes. A successful project cannot be delivered purely by process; it is the expert management of the people within that process that will provide good results.

From our extensive experience managing large-scale, complex projects involving numerous diverse stakeholders, we have encountered a plethora of issues that impact a project team's ability to successfully deliver the project outcomes. By working through these issues time and time again, we have been able to identify key actions that can be taken to address and overcome these shortcomings.

COMMON PITFALLS/PROBLEMS

When selecting and forming a project team, there are a number of common traps that people fall into.

Picking the team

Firstly, individuals often pick the same people they have had in a previous team or working relationship, whether they are the best person for the role/project or not. It is easier to deal with known quantities, via existing contractual or personal relationships, and with deadlines looming, time-poor managers will select the simplest option. They do not have to spend the time learning about a new person, or establishing working protocols.

Additionally, picking people with similar personalities and operating styles to their own appears to offer an easier road, as there should be little conflict or disagreement along the way. Either through design or through a general lack of awareness, people fall into the cliché that 'people like people like themselves'. People consciously or unconsciously choose to sit safely within their comfort zone, as it is easier to work with people with whom they get along. This is often compounded further by project teams being formed of people from the same sphere of knowledge, interests and background. This is dangerous as it limits creativity and innovation, and generally leads to a less than optimum solution.

Further, selecting known quantities with limited capabilities, just because they believe that these team members already have the answer to part of the problem on the table, is also an attraction. 'Why reinvent the wheel?' you may hear these managers proclaim. As a result, a new team can in effect be a roll-forward of existing relationships, knowledge and group dynamics, rather than a fresh group with a new approach.

Progress, creativity and achievement are often stifled, and teams tend to stagnate. Moreover, using the same people will lead to the same types of results, and although there may be slight improvements on a project-by-project basis, usually the quantum leap that can be achieved when a project team 'clicks' will not occur. On a previous project an outcome may have been achieved doing things one particular way. The method may not have been optimum, and the outcome merely acceptable, but in search of an easy life, humans tend to do the same things time and time again, sitting firmly inside their comfort zone, delivering just enough. Business, however, does not survive, and certainly doesn't innovate, by doing just enough.

Picking the right leader

An equally common pitfall is not providing strong enough team leadership. This lack of leadership can often be a result of inexperience, or people being promoted to or used in positions beyond their capabilities. This is increasingly apparent in times of skill shortages where there is a lack of industry resources, or unforeseen or unplanned-for level of growth or investment. In most cases, however, this is due to a lack of understanding of the potential power of the team, or at least how to get the team to realise its potential.

Team communication

With the advent of information and communication technology, global markets and supply chains, there is an increasing tendency for team interactions to occur remotely, rather than face-to-face. Using technology to manage remotely leads people to take shortcuts and further reduces effective communication. People quite happily send an email, an electronic buck pass, believing that this solves the problem, or at least makes it go away. This seemingly convenient form of communication can lead to ambiguity and misunderstanding, and can create enormous issues for managing people's styles, interactions and the human dynamic. By not being able to see a physical reaction, it is easy to miss out on 90 per cent of a story, or at least the subtle nuances and discreet messages attached to that story. Without a personal framework upon which to build, distance communication is fraught with peril.

These pitfalls are nothing new, and in many cases they are the very things that the project management discipline has been introduced to overcome. In order to foster a more collaborative approach, and to drive mutually beneficial project outcomes, new contractual approaches and structures have been conceived such as alliance and partnering contracts or joint ventures. However, trying to force collaboration through a rigid organisational structure or contractual arrangement tends to lead parties to focus on the legalities of the arrangement rather than the softer practical elements of the relationship.

To demonstrate in concrete terms the complexity of managing an alliance contract, let us recount a project where we were called in to act as project manager because it was not proceeding well. This was a top-end development in New South Wales.

The parties responsible for delivering the project had embarked on an alliance contract in a conscious attempt to innovate through skills sharing, thus giving better value for money. Unknown to the parties, however, both had very different drivers and measures for the success of the project. These factors had not been explored by the two parties at the outset, and each assumed that the other was seeking the same outcomes. Neither party understood the other.

The complexity of these mismatched drivers meant that the project teams were running in circles trying to achieve outcomes that varied according to which of the partners was directing at the time. This made success almost impossible to achieve, given two entirely different sets of solutions being sought.

From our experience, we have found it essential to gain a common understanding of the project goals among all key project stakeholders. These goals cannot be dictated – they must be arrived at. Once the goals of each stakeholder have been determined, it is essential that these goals are discussed and tested with all other stakeholders, and further developed to ensure that buy-in from all is achieved. It is crucial to understand

that 'stakeholders' may not include only obvious suspects. They are any group or individual that has a vested interest or influence on the project or its outcome.

This approach may be relatively time consuming and, in many situations, extremely testing, but without this structured approach it is impossible to achieve the desired 'good for all' project outcomes. Also impossible is any real innovation, since those involved in the project don't understand the problem they are trying to solve or the boundaries within which they can develop a solution, and they frequently divert their energy into managing politics or just finding a way through the project rather than creatively addressing the issues arising.

Mitigators for success

These commonly encountered traps can be addressed through a few simple measures.

Get the right people into the team

Rather than forming a project team consisting of the same type of people with the same operating styles and familiar faces with limited capabilities, we find that significantly better results can be achieved by forming project teams consisting of many different kinds of people with the resultant cross-pollination of ideas. This does not mean just allocating one person to fulfil each specific role (i.e., one person for planning, one for commercial, etc.); it means that the team should be comprised of members with significantly different operating styles, different professional backgrounds, and most critically, different viewpoints. This will inevitably lead to some stormy disagreements, but a good team guided by strong team leadership (see under the next heading) can achieve radically different, innovative results.

Additionally, we have found that our most successful teams tend to include new blood. This can mean new to the team, new to the project, new to the industry, or even new to the workplace, but provided that this new blood is given a voice, they can bring fresh thinking and new ideas and dramatically alter the team dynamic. Similarly, the addition of new blood after the project is already underway can lead the existing project team to focus on what they are doing as they attempt to explain and justify the project approach and integrate the new members into the project.

We recognise that because of the technical complexity of certain projects, and certain industry-specific requirements and peculiarities, teams still need to have technical experts. However, to bring the best out of these, we find that there is real value in the expert being challenged with new ideas and thinking. At the very least the solution may end up the same, but will have been tested. More often than not, though, a simple question can spark a chain of improvements and innovation, leading to very different and much better outcomes. One of the biggest killers of innovative ideas is the response of 'because we have always done it that way'. New blood repeatedly asking why it cannot be done in a different way can highlight the inadequacy of an age-old solution.

Successful teams need strong team leadership

For a project team to be successful, a strong team leader is required. The approach of a particular team leader can vary, but generally strong team leaders are individuals who understand the interactivity of the team dynamic and the technical and human elements of the project. The best technical leader is not necessarily the best team leader, and the skills of people management must rank high on the selection criteria.

We have found that the most able team leaders are strong enough to say 'lets do it', or 'lets not', and most critically can communicate what is happening and why. They need to bring the entire team along on the journey, and drive the communication process at all levels. They need to balance the varying levels and validity of team members' contributions. They must strive to ensure that everyone is equally valued whilst recognising, although not necessarily conceding publicly, that not all contributions are equally valuable.

In relation to the human element, there is a definite need to concentrate on soft skills, particularly in making sure that everyone is involved, that there is an open environment, that there is a clear statement (and understanding) of expectations, and that the varying team dynamic is managed. The need for this is compounded further when a team is formed of different personalities, with differing methods of operation. The team leader must play a crucial role in balancing the varying inputs and ensuring that the team's focus remains on achieving the project outcomes.

In order to maintain focus on innovative outcomes, the team leader must be willing, where necessary, to confront people and stop anti-productive behaviour. The majority of people will shy away from this approach as it is generally easier to step away from confrontation and let anti-productive behaviour continue. However, if left unchecked it will proliferate throughout the team, as people get demotivated and realise that they too can get away with these behaviours. The same logic applies to bullies taking over, which is always a risk when forming a diverse project team.

Another imperative for a strong leader is to focus not just on managing the project outcome, but to manage the milestones along the way. As part of this, the leader needs to encourage collaboration and innovation in the team, and to do this needs to put in place 'gates' for innovative ideas.

The team leader must have clear, explicit rules of engagement that are laid out up front. All members of the team must be aware of these rules and agree to them. The rules must be consistent and reinforced.

Develop creative thinking

To prevent a team from stagnating as a result of working with the same people and taking the same approach time and again, we have found that one successful solution

is to remove people from their day job, either on a part-time basis or a temporary full-time basis, and give them other issues to tackle, using a new or even an uncomfortable approach.

Performing these out-of-the-norm tasks stretches capabilities and thinking and stimulates creativity. These newly harnessed capabilities can then be taken back and applied to the day job. It can also provide enormous value if the lessons learned by the individuals in question can be shared with the project team to enable transfer of knowledge. Individuals are re-energised and bring this energy back to their teams. They can present differing points of view as learned from new associates, and spark debate and discussion.

There is also significant value in letting non-creative people participate in a team with highly creative people, in order to witness the creative process and to learn how the process works, but also to balance the creative output.

Most crucially, however, in order to stimulate further creativity and innovation it is imperative that individual and team contributions are recognised, and credit is given to people who have contributed, showing that innovation and creativity are valued.

Fluidity is key

One of the pitfalls of forcing collaboration through partnering agreements and alliancing contracts is trying to manage and innovate in a rigid organisational structure. The challenge therefore is to create an ever-changing collaborative environment, one where the same project team is not doing every project, to avoid the same solution being used every time. Building on the example above, in these collaborative working environments it is crucial that the drivers for success are first arrived at, understood and bought into before trying to develop innovative solutions or deliver project outcomes.

Overcome barriers created by technology

As team interactions become increasingly remote, a conscious effort must be made to resist the technology shortcut and seek to foster relationships in person. Obviously, not all communications need to happen this way, but in order to get the team dynamic working, especially in the initial stages of the project, there must be regular face-to-face communications.

In a situation where it is physically impossible, or particularly imprudent, to meet face-to-face, there is a compelling argument to at least have a video conference or teleconference to get personal communications going. As a general principle it is not a good idea to send emails to team members before meeting them, though this happens with alarming frequency.

Create a Creative Environment

As we have established, often people only access those they already know. Once a dynamic project team has been formed, the team leader needs to establish effective ways to get people with different work/life experiences and different views to spark off each other. From experience, we have found that to do this it is essential that an environment be created that allows creativity and innovation.

This means both a physical environment that has the requisite tools available and is free from unnecessary distraction, and one where openness is encouraged and a common purpose can be arrived at. To establish this mental environment the team leader will need to set specific, unambiguous goals and definite rules and boundaries to control the scope of discussion and innovation.

Within this environment team members must be encouraged to challenge and contribute to any brainstorming session. However, it must be recognised that innovative ideas do not only arise on such structured occasions. Thinking time is essential and a mechanism is needed that allows for out-of-the-blue outputs to be captured. Numerous creative solutions are spawned from chit chat and other unstructured conversations. Accordingly, less formal forums like after-work events and going off-site for a coffee should be encouraged.

One key challenge that we have noted in our experiences, but have not been able to sufficiently address, is the mechanism for capturing ideas that are not appropriate for addressing a particular solution or specific project, but may be useful for providing solutions on other future projects. We believe that the ability to do this would be of great benefit, but the practicalities of capturing, sharing and transferring such solutions have proven to be very challenging.

Conclusion

Referencing and applying a project management approach to problem solving can be highly effective, but the introduction of a process is not sufficient to deliver really innovative solutions. Understanding the common shortcomings and addressing these through the expert management of people is where the real benefits lie.

Each of the measures suggested above can, in isolation, provide a stepped improvement in the management of project outcomes. Truly innovative and lasting outcomes can result from the right people, led by strong leaders, creating an environment that fosters creativity, strives for collaboration and establishes a framework for effective communication.

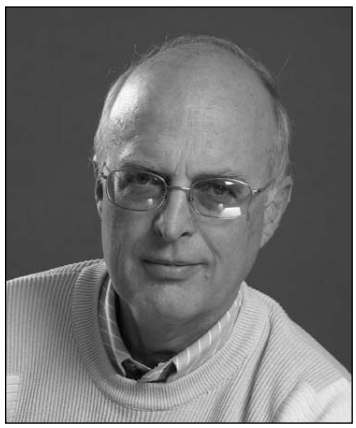
Catherine Killen

Catherine Killen is a Senior Lecturer and the Program Head for Innovation in the Faculty of Engineering at the University of Technology, Sydney (UTS), Australia. Catherine coordinates technology and innovation management subjects in the postgraduate Master of Engineering Management and Master of Engineering Studies programs and the undergraduate Innovation Engineering programs. She has published over 25 papers and her current research investigates the project portfolio management processes for both tangible and intangible (service) product development.

Robert (Bob) Hunt

Associate Professor Bob Hunt is Associate Professor in Management and Director, Centre for Management Innovation and Technology at Macquarie University's Graduate School of Management. His current research is concerned with shortening cycle times and improving the processes of innovation, strategy and operations so that organisations become more flexible and responsive to stakeholder needs in today's increasingly turbulent global business environment. Bob has published more than 50 papers, books, management monographs videos and case studies.

Elko Kleinschmidt



Professor Elko Kleinschmidt is the Professor of Marketing and International Business and past Director of the Engineering and Management Program at McMaster University, Hamilton, Ontario, Canada. With over 60 publications, Elko is a leading expert and recognized researcher in the fields of new product development, portfolio management for new products, success factors for new product programs and the impact of the international dimension on new products.

The Human Factor in Innovation Project Portfolio Management

CATHERINE P KILLEN, ROBERT A HUNT AND ELKO J KLEINSCHMIDT

Catherine Killen is the Program Head of Innovation at the University of Technology, Sydney. Associate Professor Robert Hunt is at the Macquarie Graduate School of Management, Macquarie University, Sydney. Professor Elko Kleinschmidt is Professor of International Business at the De Groote School of Business, McMaster University, Canada.

Organisational survival in a dynamic competitive environment often requires the ability to produce a continual stream of successful new products and services. Project portfolio management (PPM) capabilities can improve innovation decisions and new product outcomes and are therefore receiving increasing prominence in organisations. This paper presents findings from a recent study of six successful Australian organisations that highlights the importance of human dimensions in the establishment and evolution of effective project portfolio management capabilities. Guidance is provided to help managers apply these findings to improve innovation outcomes.

INTRODUCTION

Key findings from a recent Australian study highlight the importance of human factors in the establishment and evolution of innovation project portfolio management (PPM) capabilities.

Organisations need to decide which new projects will receive funding and resources and whether ongoing projects still deserve funding. The processes used to make these ongoing decisions form the basis of a PPM capability. Established and effective PPM capabilities are linked with improved innovation outcomes. The findings presented in this paper provide guidance for managers to assist with the development of an effective PPM capability.

Effective PPM capabilities provide a holistic perspective for decision-making to ensure that projects align with strategy, a balance of project types is maintained, and that the project portfolio fits with the available resources. An effective PPM capability is a source of competitive advantage through its ability to enable the organisation to gain the maximum value from project investments (Cooper et al., 2001, Dawidson, 2004).

Organisations that maintain a portfolio of innovation projects for the development of the new products face particular challenges. In today's rapidly changing competitive environment, the survival of these organisations depends upon a continual stream of successful new products. Large sums are invested in projects for the development of new service products as well as new manufactured products; however a significant proportion of these products are not successful.

To meet these challenges, some organisations with a strong new product and service development strategy have developed leading practices for PPM. Best-practice research studies have shown that organisations with established PPM capabilities have superior innovation outcomes compared to organisations with less established capabilities. Therefore, organisations are increasingly investing in developing their PPM capabilities in an effort to improve the 'strike rate' or success rate of their new product development projects.

In this paper we highlight the importance of the human dimensions in the establishment, development and implementation of an effective PPM capability and provide some guidance for managers. The findings presented in this paper are based on our recent Australian research focused on understanding the PPM capabilities used by successful innovators.

STRUCTURES, PROCESSES AND PEOPLE FOR PPM

Organisational PPM capabilities are composed of the organisational structures, the specific processes, and the people that are involved as shown in Figure 1. The figure also shows how the PPM capability is typically integrated with a structured project management process.

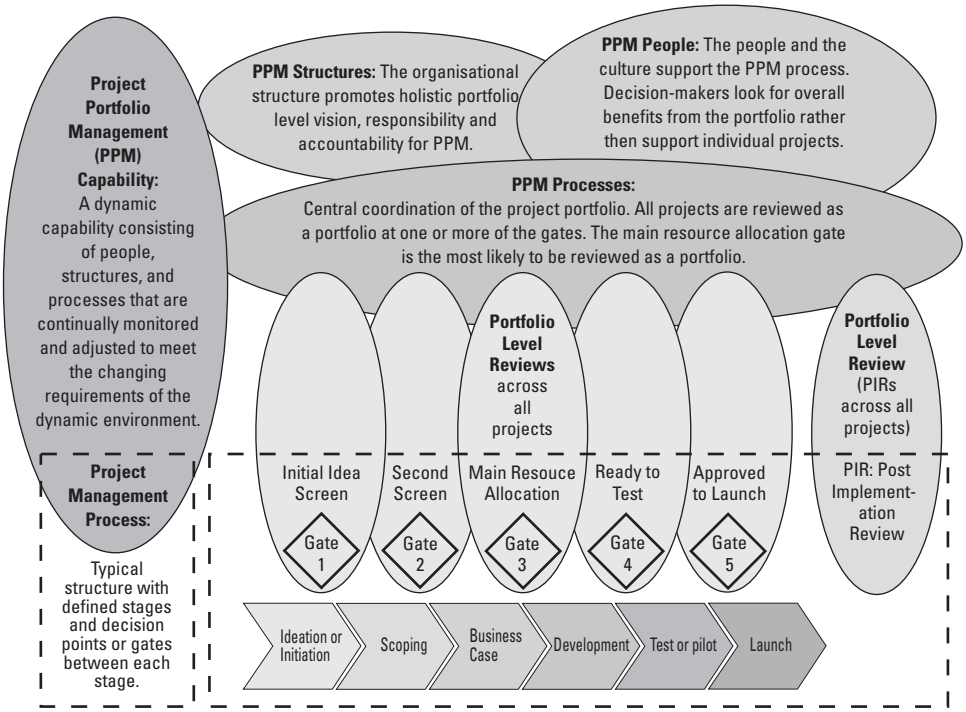


FIGURE 1: PPM Capability integrated with typical structured project management process [built upon (Cooper et al., 2001:291)]

PPM is a high-level capability that usually involves a team of strategic decision-makers to align project investment and decision-making with strategic priorities, with the aim of generating a high return from project portfolio investments.

Research repeatedly indicates that although there are common elements in many PPM capabilities, each organisation must customise and adapt their PPM capability to their individual situation (see for example Cooper et al., 2001, Crawford et al., 2006, Killen et al., 2008c, Loch, 2000, McDonough III and Spital, 2003).

The Australian study reported in this paper reinforces these earlier findings, and also introduces the importance of organisational learning in the continual evolution and adaptation of the PPM capability to keep it aligned with the continually changing competitive environment.

PPM structures

Although there is no standard structure that is used for PPM, it is common for organisations to invest in adjusting their organisational structure and role descriptions to reflect the increasing importance of new products and to enhance PPM capabilities (Blomquist and Muller, 2006).

Often an organisational locus is created for PPM, moving these decisions to a higher organisational level and clarifying roles and responsibilities. In some organisations it may be appropriate to define a specific role for a project portfolio manager or set up a separate project portfolio management office.

In the successful Australian organisations that this paper focuses on, the PPM responsibility is most commonly shared between a marketing or business development executive and a product development executive and executed by a multi-functional management team. This approach ensures close involvement of the functions and people directly engaged in the new product and service development process.

PPM processes

There are many types of methods and tools that are regularly used to evaluate, select and monitor projects as part of a PPM process. There is also a significant stream of research dedicated to developing new tools for PPM.

Although many researchers propose mathematical modelling techniques and software optimisation programs to improve the management of innovation portfolios, the research shows no evidence of adoption of these mechanistic methods (Cooper et al., 2001, Hall and Nauda, 1990, Killen et al., 2008c, Liberatore and Titus, 1983).

PPM best-practice research reveals that the typical methods and tools used for PPM include: financial analysis (through financial indicators such as net present value); structured product-development processes (such as a gated process to manage individual projects); portfolio analysis to balance project aspects such as risk and return (often through graphical means such as portfolio maps, bubble charts or pie charts); top-down strategic funding allocation methods; and checklists or ranking methods that incorporate several elements of the PPM decision.

Financial methods are the most commonly used in a PPM process, but are not the best method to use as the primary decision criteria. Improved product outcomes are associated with the use of other criteria for primary decision-making. For example, effective PPM processes often include 'fit with strategy' as a primary 'Go' or 'No Go' criterion, and strategic considerations are often part of checklists or decision templates used during a PPM process (Cooper et al., 2001, Killen et al., 2008c).

A subset of these commonly used tools and methods are selected, customised, documented and applied to form the PPM processes that are currently being used in successful organisations, but the process is not static. The evidence suggests that these PPM processes undergo continual re-evaluation and evolution and that the capability to keep the PPM process changing and improving is an important part of the process (Killen et al., 2008a).

The research also shows that successful organisations apply the PPM tools and methods through team-based structures and face-to-face meetings. The use of cross-functional teams and tools such as graphical displays that aid group decision-making are particularly important in effective PPM capabilities.

PPM people

Structures and processes aside, in the end it is the people who are responsible for the PPM capabilities and the team-based decisions that are central to an effective PPM capability. The above overview of PPM structures and processes provides the framework for understanding the importance and role of people in the PPM capability. These human dimensions are the focus of this paper and are discussed in more detail after a discussion of relevant strategic frameworks and an outline of the research methodology.

PPM CAPABILITIES, STRATEGY AND COMPETITIVE ADVANTAGE

PPM capabilities focus on the decisions about how best to spend or invest resources that are central to organisational strategy. Strategic frameworks, in particular those based on internal resources and dynamic capabilities, help to explain how PPM capabilities can enhance competitive advantage.

In the past few decades strategic literature has been dominated by approaches focused on the external competitive environment and strategic conflict and positioning such as Porter's competitive forces approach (Porter, 1980). These externally based approaches focus on the factors in the organisation's market and environment to determine appropriate competitive strategies. This external focus does not fully explain why some organisations are more successful in these markets than others, and does not help organisations understand how to develop sustainable competitive advantages (Teece et al., 1997).

To better understand the organisational basis for competitive success, the resource-based view (RBV) (Smith et al., 1996, Wernerfelt, 1984, Wernerfelt, 1995) or core competency models (Prahalad and Hamel, 1990) of organisational advantage offer internally focused frameworks that are gaining popularity. These internal resource-based strategy approaches and the externally focused competitive strategy models complement each other to provide a rich picture of the organisation within its environment that is often applied in practice. For example, some popular strategy tools such as SWOT and the environment-strategy-capability gap framework (Hubbard, 1996) incorporate both perspectives.

This study focuses on PPM practices as an organisational capability and draws upon the internal resource-based strategic frameworks to better understand the ability of PPM capabilities to influence organisational competitiveness.

The overall ability of an organisation can be viewed as "what it can do as a result of resources working together" (Grant, 1991:120). From this perspective, differing organisational success rates can be explained by differing levels of organisational ability and the fact that resources are not uniform across competing organisations. These differing resources can be tangible or intangible. Differences in the levels of finance or tangible assets, the size and loyalty of the customer base, the experience and knowledge of employees or in the organisation's processes and routines: these can all be used to explain and understand organisational performance differences.

Capabilities are a specific type of organisational resource that enables the organisation to perform activities. Dynamic capabilities have been identified as a class of organisational capabilities that enable organisations to effectively respond to changes in the dynamic environments in which they compete (Eisenhardt and Martin, 2000, Teece et al., 1997). They can be defined as a "pattern of collective activity through which the organisation systematically generates and modifies its operating routines in pursuit of competitive advantage" (Zollo and Winter, 2002:340). Even in slow-moving industries, innovation is unpredictable and dynamic and requires an ever-changing mix of resources (Danneels, 2002, Tatikonda and Rosenthal, 2000, Zollo and Winter, 2002).

The dynamic capabilities approach focuses on the processes used in organisations to integrate, build and reconfigure their resources to compete in dynamic environments. PPM capabilities are a dynamic capability due to the role they play in the organisation's ability to adjust its portfolio of projects and resource allocation for the best innovation outcomes.

AUSTRALIAN RESEARCH STUDY OVERVIEW

This paper includes findings from our recent Australian research study as well as from previously published research on PPM capabilities. It also draws on the literature and findings from previous research in the areas of organisational capabilities and strategy, organisational learning and the establishment and evolution of capabilities, and new product and service development practices.

We conducted a multiple-case study research project involving six successful Australian organisations during 2007 to develop a deeper understanding of the role of PPM capabilities in enhancing organisational competitive advantage.

Due to confidentiality requirements, specific organisational details are not provided here, but it can be said that each organisation represents sustained innovation leadership, growth and/or success within its industry over at least a 10-year period. The cases have been selected to represent a diverse range of industries covering both intangible (service-based) and tangible (manufactured) products.

The six organisations each have a minimum turnover of 800 million AUD, with several of the organisations achieving multiple billions of dollars in revenue. Table 1 provides an overview of the diverse range of industries represented.

TABLE 1: Industrial categories for the six Australian case study organisations

Type of project portfolio	Service-product focused			Manufactured-product focused		
Industry type	Professional services	Telecommunications	Finance	Heavy industrial machinery	Medical equipment	Building materials

A series of semi-structured interviews conducted at each organisation were evaluated through a cross-case analysis focusing on the establishment, evolution and use of PPM practices in these organisations. In addition publicly available documents and publications as well as confidential documents, internal memos and process diagrams were analysed and reviewed to understand the role of the PPM capability in the overall organisational environment.

This in-depth Australian study is the first to look in detail at PPM capabilities across diverse industries. Although this study did not set out to focus on the human dimensions of PPM, one of the key outcomes of the research is the strong influence that human dimensions have on the establishment, evolution and application of PPM capabilities. The remainder of this paper focuses on the findings from this research related to the human dimensions of PPM. Other findings from this research have been published in Killen, Hunt and Kleinschmidt (2008a, findings on organisational learning investments and PPM, and 2008b, general findings and industry comparisons).

HUMAN DIMENSIONS OF PPM

The human dimensions of PPM have been highlighted in each of the Australian organisations studied. While human factors have also been revealed in previous PPM publications and research, most of the literature and research focuses on the methods and procedures used for PPM (Killen et al., 2007).

The human dimensions of PPM are presented here in five interrelated human-centred themes: (1) commitment and support; (2) idea generation and creativity; (3) structure and staffing; (4) organisational learning processes; and (5) human versus mechanistic approaches. The quotations included in these sections are comments made by the executives and managers that participated in the recent Australian research study.

Commitment and support

The level of commitment and support for the PPM capability is the most important factor that has repeatedly been identified in previous publications and has strongly

emerged in the current Australian research. Commitment and support are shown to be important at all levels of the organisations studied.

A PPM capability requires that decisions are made transparently by a multi-functional team of people that can provide a holistic perspective to make the best decisions. While the commitment and support of all involved is important, the research findings highlight the fact that support from senior management is most important and must come first.

As with most organisational change processes or improvement activities, senior management support has repeatedly been shown to be important for an effective PPM capability (Cooper et al., 2004, Killen et al., 2008c).

Previous research and publications have regularly highlighted the fact that senior managers must show their commitment through providing resources and guidance and by embracing and adopting the PPM processes.

Unfortunately there are many instances where senior management say they support the PPM process but still believe that their ideas or pet projects should be able to circumvent the process. Sometimes this is justified by the fact that senior management takes responsibility for the outcomes in the end, or by the fact that some senior managers have strong track records of innovation success; however the Australian research findings show that this approach can undermine the entire organisation's respect and support for the PPM process. The organisations studied emphasised that it was this respect and support that was essential for the PPM process to work effectively.

Furthermore, if the PPM process is well designed and has the respect and commitment of the members of the organisation, then going through the process is the best way to gain support, resources and commitment for the idea or project. An effective PPM capability removes the temptation to circumvent the process to try to fast-track initiatives or gain advantage.

The Australian case studies highlight the fact that for effective PPM, team members must engage with the process and not just go through the motions. As one manager pointed out, "you can have all the tools in the world but it is all about how people use them" – it is the "diligence and commitment" of the participants in the process that make the process work.

Another manager reports that "what became clear to us early on is that success or failure was not a matter of having [the right book or software], it was about getting the commitment of people to be part of it and getting the right people [on the teams]. That then gives it the authority that is required to make [the PPM capability] robust and sustainable."

Several of the organisations studied found that evidence of positive outcomes and successes play an important role in the establishment of a PPM capability that is robust and sustainable. They noted that it can be difficult to gain buy-in for the process at first, but once it has been consistently and transparently applied and people can see the results, it becomes easier.

The need to get the capability established and to produce measurable successes was highlighted by research participants in several organisations. One manager explained that "once it becomes clear to people that the process is really objective, has a necessary level of rigour about it and brings about important things that wouldn't have otherwise necessarily happened, then they will be able to say 'ok, I see why it is important' … [success] gets people to put their other agendas aside and support the process in a practical way."

Another manager put it succinctly: "There is nothing better for entrenching the culture and the processes than success". The organisations credited strong senior management support and a dedicated sponsor with getting the process established, and the positive outcomes from that effort were in turn credited with the development of wide and sustainable organisational support.

Commitment and support for PPM sets up a circular organisational learning pattern where support breeds success, which breeds more support (Senge, 2006). This support must start with senior management who have a strong commitment and belief in modelling the behaviours that they expect of other members in the organisation. Methods to facilitate organisational learning include effective communication of the goals, expectations and procedures for the PPM processes as well as the results.

Politics and power

The top management of an organisation can use their power to exert a strong influence on the organisational culture and support for the PPM capability. However organisational politics and power can become negative forces when managers feel that the PPM process takes away their power and influence, or if they perceive that the process will hinder their ability to see their ideas develop.

These decision-makers may feel threatened that the requirement for information transparency and team decision-making will erode their power base – as many may feel that information is power and that they must hold on to the ability to control that information.

Several research participants emphasised that decision makers must understand their important role in the process and how PPM will improve the organisation's capability to make the best decisions for the best organisational outcomes. They believe that senior management have a strong role to play to keep politics and power struggles from undermining the PPM process.

Idea generation and creativity

PPM capabilities have a central role in the creation and capture of new ideas as well as in the filtering of those ideas. The innovation process is often modelled as a funnel where many ideas are required to generate each successful new product (Schilling, 2005).

In addition, while most new products represent incremental improvements to existing products or services, it is the less frequent radical or really new products that are required to generate organisational renewal and sustainable competitive advantage.

Some estimates suggest that thousands of ideas are required for each successful innovation (Stevens and Burley, 1997). Therefore a main emphasis for a PPM capability is to ensure that large numbers of ideas are generated and captured to increase the chance of innovation success. Additionally, a high level of quality and diversity of ideas is essential to provide the ability to generate radically new products and processes as well as the more common incremental changes to existing products and processes. A diversity of ideas is best achieved through a variety of methods and by extending the search for ideas outside organisational boundaries.

Three interrelated themes have emerged in the Australian research study that influence idea generation and creativity within the PPM capability: creativity tools, culture and motivation.

Creativity tools

In order to generate innovative ideas, organisational and individual creativity tools are often included in the front-end of a PPM process. As one manager put it: "Ideas come from people. The challenge is to be able to tap the brains of all of the people in the organisation".

To meet this challenge, several creativity and idea generation tools as well as idea capture and logging systems are used within the Australian organisations studied. Specific idea generation and creativity methods and tools are used in facilitated workshops or sessions periodically at most of the organisations. These workshops often include people from outside the organisation such as customers or experts. All but one of the six organisations uses a system to capture a large number of ideas at the front-end of the process. In some organisations this 'idea management' function is implemented in a web-based interface that allows information input, transparency and comment as well as idea development.

Culture

The organisation's culture plays a large role in its ability to generate a steady stream of new ideas. Many organisations make deliberate efforts to establish an innovation cul-

ture. The desired culture is one that "removes the fear of failure" and "encourages debate and the challenging of ideas". The culture also needs to place a high importance on innovation and can be developed by "processes where innovation is always on people's minds".

Some of the methods used to enhance the innovation culture by these Australian organisations studied are:

- Engaging consultants to evaluate the organisational culture.
- Improving communication and increasing the visibility of innovative activities.
- Conducting training and workshops to improve teamwork and foster a culture for effective meetings.
- Developing and implementing key performance indicators (KPIs) for innovation to encourage and reward innovative activities. Innovation KPIs include measures such as the numbers of ideas generated or innovation projects sponsored, the levels of innovation success and the amount of revenue generated.

The organisations recognise that changing organisational culture is one of the hardest things to do and that it takes time and requires concerted effort. Some organisations emphasise culture change through their recruitment policies, and often look to change the culture through the introduction of new people rather than by moving people around within the organisation.

Motivation

Several managers made specific comments on the importance of reward and recognition for motivating staff to engage in innovation. The establishment of an innovative culture can be enhanced and reinforced by regular recognition for innovation efforts and successes. Recognition takes place through innovation award programs or enhanced opportunities at several of the organisations studied.

Awards are found to be a strong incentive for people to engage with the innovation or idea generation process in several of the organisations. Although some organisations offer innovation awards that include a small monetary value, they all feel that the motivating value of the awards is the recognition and the visibility the awards give to the individuals or teams.

Another benefit of a regular innovation award program is the increased visibility and awareness it provides to the PPM process and its results. This visibility in turn enhances the innovation culture by providing regular events where "innovation and innovation success is on people's minds".

Linking opportunities with innovation activities is also found to increase motivation and enhance the innovative culture. For example, innovation participation and success rates are known to enhance promotion opportunities in one organisation, and to

enable innovative staff members to join desirable teams and projects in another. These opportunities increase involvement in the innovation programs in these organisations.

Organisational structure and staffing

All but one of the successful Australian innovators studied have altered their organisational structure within the past three years. In most the new product and service development function has been moved to a higher level within the organisational hierarchy in order to gain the required support and visibility for a successful innovation capability. This relatively recent elevation of these functions was explicitly linked to the increasing importance of new product and service development and has strongly affected the establishment or evolution of the PPM capability.

The PPM capability itself is an important vehicle for communication and visibility of innovation projects. The establishment or enhancement of a PPM capability has accompanied each of these organisational changes and has also occurred in the one organisation that did not have a significant organisational structure change.

PPM capabilities have a significant role not only in deciding which projects will be included in the project portfolio – and therefore shaping the new products that will be relied on for future success – but also in developing the required organisational resources and skills to remain competitive in new product and service development.

Many specialist skills are required for innovation in all the industries studied, and each organisation invested in developing the skills of existing staff as well as acquiring staff with skills. In these organisations, the development of organisational resources (primarily skills) is greatly influenced by the types of projects in the project portfolio, and in turn affects the types of development projects that the PPM process is able to select and support.

This aspect of the PPM capabilities reinforces the fact that they are dynamic capabilities. They have a strong role in configuring and altering the resource base of the organisations, both through the decisions about the actual product development projects that the organisation will undertake (and deploy its resources to) and in the continual development and reconfiguration of those resources.

The allocation of staff members to the innovation decision-making teams and to the innovation projects themselves is considered very important to the Australian organisations. As one manager said: "One of the keys to a successful process is getting the right people on the [decision-making team]." The teams are composed of a variety of high-level managers representing diverse functional areas of the organisations and "it is important for the people to have a wide range of experience and to be senior enough to be able to make decisions at the team meetings".

The organisations studied also employ processes to ensure that the best people are allocated to the development teams for innovation projects. In particular, special attention is paid to staffing for risky or high-profile/highly important projects. In one organisation such projects are given to the most experienced staff; however in another organisation they have found that these projects benefit from a combination of experienced staff and relatively new but motivated staff. The newer staff members bring a higher level of innovative thinking to such projects while the experienced staff members provide the experience necessary to steer these projects towards success.

The research found that innovation processes need to nurture and develop staff members, and that it is dangerous to deplete the goodwill of staff by making ongoing demands that are not sustainable in the long term. One manager commented that motivated and capable staff members will "do what it takes" to bring an important or high-profile project to success, but need to be rewarded and recognised.

Importantly, the research highlighted the fact that employees should not be expected to go from one high-stress project that requires extreme time commitments to another. The successful organisations realised that they had to balance the demands on their valuable and experienced staff and were aware that they could easily damage the goodwill and lose valuable staff if they are not careful.

Staffing for projects is seen as a delicate, complicated and very important diplomatic exercise involving consultation, negotiation and strong awareness of the importance of human motivation, skills and goodwill.

Organisational learning processes

All the Australian organisations studied are engaged in ongoing efforts to monitor, analyse and improve their PPM capabilities. The PPM processes clearly have a central role in each organisation's ability to dynamically adjust its resource allocation and project activities to meet ever-changing environmental demands and organisational capability evolution.

One of the differences in the PPM capabilities between the manufactured product-focused industries and the service product-focused industries is the length of time that the capability has been established in the organisation. The three manufacturing-based industries have longer-established PPM capabilities and have always relied on new product development as a central pillar of the organisation. The three service-based industries have not traditionally been as strongly focused on new products, and although the level and importance of product development activities are increasing at each of the service-based organisations, new product development is still not the primary focus for these organisations' operations. However, all of the service-based organisations see new product development as an important vehicle for the future growth and survival of their organisations, and they are investing in their PPM and product development capabilities.

While the service-based organisations are newer to PPM, they have come up a steeper learning curve and have made stronger learning investments, and are now operating effective PPM capabilities. This finding reinforces findings from our earlier research that also indicated that service-based organisations were newer to PPM, but that they had similar levels of maturity and formality compared to manufacturing-based organisations (Killen et al., 2008c).

Ongoing monitoring and adjustment of the PPM capabilities is evident in all cases. One of the primary reasons for the case organisations to make adjustments to their PPM process is to improve the balance between the short-term 'exploitation' projects and long-term 'exploration' projects. For example, one of the organisations has recently instigated a new element to their PPM process to enhance idea generation and promote exploratory projects, and another is currently redesigning their PPM process because the current process has produced an imbalance of short-term incremental projects.

The cases illustrate how, while dynamically managing organisational innovation processes and resources, the PPM capabilities themselves are very dynamic, changing and adjusting regularly. This supports assertions throughout the literature that organisational capabilities that dynamically manage the use of other organisational resources must continually adapt to the environment to create a series of temporary competitive advantages (Eisenhardt and Martin, 2000, Fiol, 2001, Helfat and Raubitschek, 2000, Teece et al., 1997). An organisation's ability to learn and adjust their PPM practices is an important capability for sustained innovation success (O'Regan and Ghobadian, 2004).

The case study organisations each exhibit a combination of tacit and explicit organisational learning activities in the evolution of their PPM capabilities. Tacit learning activities are largely experiential and involve trial and error, while explicit learning activities include deliberate processes for the articulation and codification of knowledge. An example of an explicit learning activity for PPM is a feedback loop where the processes and outcomes are evaluated, discussed and modified (knowledge articulation) and then documented (knowledge codification).

The case studies show that organisations make learning investments that enhance both tacit and explicit learning processes for the evolution of their PPM capabilities, and that PPM capabilities evolve through the co-evolution of tacit accumulation of experiences and explicit articulation and codification processes (Killen et al., 2008a, Zollo and Winter, 2002).

Human versus mechanistic approaches to PPM

The literature describes many software-based comprehensive modelling and weighting systems that attempt to quantify the many competing factors that are considered in

the PPM process. This research study confirms previous findings that indicate a low level of adoption of such tools and methods.

The managers interviewed see PPM as a human-centred process and do not believe there is an advantage in applying a method that requires complex input on many factors. The managers do not believe that attempts to capture all aspects of the decision in a computer system can replace the need for managerial oversight and analysis or the role of intuition and gut feel in decision-making. In addition, managers at one organisation felt that the dialogue generated by the human-centred process was essential to its success and that any change that reduced the opportunities for face-to-face dialogue would jeopardise the process.

None of the Australian organisations studied use a computer-based comprehensive PPM system, however some of the organisations use a web-based tool to promote idea input and to manage the idea bank. In the case organisations, a range of tools and methods are used to support a largely-human centred process. Project data is generally stored and presented using generic spreadsheet applications and evaluated in face-to-face meetings.

While rejecting the notion that computers might become central to the PPM decision processes, some of the managers did acknowledge the potential benefits that computerising additional aspects of the process could deliver. For example, if the data that the decisions are based upon are stored in a computer database, this will aid the generation of effective displays for viewing project data and projections. These graphical displays are especially useful for communicating and displaying information at meetings. Portfolio maps or roadmaps are used at most of the organisations in some form to help PPM teams to overview the portfolio of projects and to make decisions.

The main changes projected for PPM methods in the future at the organisations studied involve improved portfolio view and idea management capabilities.

Conclusion

An effective PPM capability is an important dynamic capability that can enhance an organisation's competitive advantage. A multiple case study research project reveals that human dimensions play a significant role in the establishment, development and use of effective PPM capabilities within successful Australian organisations.

Managers interested in establishing or improving their PPM capabilities should consider the following human-focused implications that have been drawn from the research findings:

- Start with high-level management support and commitment for the PPM process – this is the best mechanism to set the organisation on the right course for PPM success.

- Take steps to establish an organisational culture that encourages creativity and keeps innovation on everyone's mind. Senior management have a large influence on organisational culture and need to lead by example.
- Consider implementing regular and well-publicised awards for the recognition of employees' innovative activities and successes. Such an award program will enhance employee motivation for innovative activities and will contribute to the establishment of an innovative culture at the organisation.
- Ensure that your PPM capability has a visible and clear place within the organisational structure and that a team of high-level managers representing different perspectives are involved in PPM decisions.
- Consider investing in activities that enhance the learning capability of the organisation. Such activities include gathering, communicating and evaluating information from a variety of sources or setting up and using feedback loops to improve processes. Organisational learning is essential for the ongoing evolution and development of the PPM capability and will enable it to continue to contribute to competitive advantage in a dynamic environment.

REFERENCES

Blomquist, T and Muller, R (2006) 'Practices, roles, and responsibilities of middle managers in program and portfolio management', *Project Management Journal*, vol 37, no 1, pages 52-66.

Cooper, R G, Edgett, S J and Kleinschmidt, E J (2001) *Portfolio management for new products*, Perseus.

Cooper, R G, Edgett, S J and Kleinschmidt, E J (2004) 'Benchmarking best NPD practices -1', *Research Technology Management*, vol 47, no 1, pages 31-43.

Crawford, L, Hobbs, B and Turner, J R (2006) 'Aligning Capability with Strategy: Categorising Projects to Do the Right Project and to Do Them Right', *Project Management Journal*, vol 37, no 2, pages 38-50.

Danneels, E (2002) 'The dynamics of product innovation and firm competences', *Strategic Management Journal*, vol 23, no 12, pages 1095-1121.

Dawidson, O. (2004) "Expectations to be fulfilled by R&D Project Portfolio Management". EIASM Product Development Management Conference, pages 331-346.

Eisenhardt, K M and Martin, J A (2000) 'Dynamic capabilities: What are they?', *Strategic Management Journal*, vol 21, no 10/11, pages 1105-1121.

Fiol, C M (2001) 'Revisiting an identity-based view of sustainable competitive advantage', *Journal of Management*, vol 27, no 6, pages 691-699.

Grant, R M (1991) 'The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation', *California Management Review*, vol 33, no 3, pages 114-135.

Hall, D L and Nauda, A (1990) 'An interactive approach for selecting IR&D projects', *IEEE Trans Eng Man*, vol 37, no 2, pages 126-133.

Helfat, C E and Raubitschek, R S (2000) 'Product sequencing: Co-evolution of knowledge, capabilities and products', *Strategic Management Journal*, vol 21, no 10/11, pages 961-979.

Hubbard, G (1996) '*Practical Australian strategy*', Prentice Hall Australia.

Killen, C.P, Hunt, R A and Kleinschmidt, E J (2007) 'Managing the New Product Development Project Portfolio: A Review of the Literature and Empirical Evidence', Proceedings of PICMET 2007.

Killen, C P, Hunt, R A and Kleinschmidt, E J (2008a) 'Learning investments and organisational capabilities: Case studies on the development of project portfolio management capabilities', *International Journal of Managing Projects in Business*, vol 1, no 3, pages forthcoming.

Killen, C P, Hunt, R A and Kleinschmidt, E J (2008b) 'New Product Project Portfolio Management and Competitive Advantage: Cases from Diverse Industries', Proceedings of the International Association of the Management of Technology Conference.

Killen, C P, Hunt, R A and Kleinschmidt, E J (2008c) 'Project portfolio management for product innovation', *International Journal of Quality and Reliability Management*, vol 25, no 1, pages 24-38.

Liberatore, M J and Titus, G J (1983) 'The Practice Of Management Science In R&D Project Management', *Management Science*, vol 29, no 8, pages 962-974.

Loch, C (2000) 'Tailoring product development to strategy: case of a European technology manufacturer', *European Management Journal*, vol 18, no 3, pages 246-258.

McDonough III, E F and Spital, F C (2003) 'Managing project portfolios', *Research Technology Management*, vol 46, no 3, pages 40-46.

O'Regan, N and Ghobadian, A (2004) 'The importance of capabilities for strategic direction and performance', *Management Decision*, vol 42, no 1/2, pages 292-312.

Porter, M E (1980) *Competitive strategy : techniques for analyzing industries and competitors*, Free Press.

Prahalad, C K and Hamel, (1990) 'The Core Competence of the Corporation', *Harvard Business Review*, vol 68, no 3, pages 79-91.

Schilling, M A (2005) *Strategic Management of Technological Innovation*, McGraw-Hill Irwin.

Senge, P M (2006) *The fifth discipline : the art and practice of the learning organization*, Currency Doubleday.

Smith, K A, Vasudevan, S P and Tanniru, M R (1996) 'Organizational learning and resource-based theory: an integrative model', *Journal of Organizational Change Management*, vol 9, no 6, pages 41-53.

Stevens and Burley (1997) '3,000 Raw Ideas = 1 Commercial Success', *Research and Technology Management*, vol 40, no 3, pages 16-17.

Tatikonda, M V and Rosenthal, S R (2000) 'Successful execution of product development projects: Balancing firmness and flexibility in the innovation process', *Journal of Operations Management* vol 18, no 4, pages 401-425.

Teece, D J, Pisano, G and Shuen, A (1997) 'Dynamic Capabilities and Strategic Management', *Strategic Management Journal* (1986-1998), vol 18, no 7, pages 509-533.

Wernerfelt, B (1984) 'A Resource-based View of the Firm', *Strategic Management Journal* (pre-1986), vol 5, no 2, pages 171-180.

Wernerfelt, B (1995) 'The resource-based view of the firm: Ten years after', *Strategic Management Journal*, vol 16, no 3, pages 171-174.

Zollo, M and Winter, S G (2002) 'Deliberate Learning and the Evolution of Dynamic Capabilities', *Organization Science*, vol 13, no 3, pages 339-351.

KAREN BECKER

Dr Karen Becker is a Lecturer in the School of Management, Faculty of Business, Queensland University of Technology. Her research focuses on the attraction, retention and development of people in the workplace and in particular, how effective people management can impact upon the innovation potential of organisations. She has been involved in a number of research projects funded by the public sector and private industry into skills shortages and employee attraction and retention. Her doctoral research was on unlearning and change management and she has published over 25 peer-reviewed journal articles and conference papers relating to her research.

PAUL HYLAND

Professor Paul Hyland is a Professorial Research Fellow in the School of Natural and Rural Systems Management at The University of Queensland. His research is predominantly on innovation management and business development. He has been involved in a wide range of funded research projects including an Australian Research Council Grant to examine knowledge intensive businesses, an EU funded project on New Product Development, and projects for Queensland State Government departments. He has also worked on research projects and consultancies for industry partners to assist with regional development and business improvement issues. Professor Hyland is a board member of CINet (the Continuous Innovation Network).

Overcoming Barriers to Innovation by Facilitating Unlearning

Karen Becker and Paul Hyland

Dr Karen Becker is at the School of Management, Queensland University of Technology. Professor Paul Hyland is at the School of Natural and Rural Systems Management, University of Queensland.

The literature on innovation tends to concentrate on tapping into new ways to do things. Yet if people resist change, innovation is unlikely to flourish. And to accept change, they have to unlearn their set ways of doing things. So unlearning is a critical part of the innovation process. This chapter presents a model to help managers to engender and support unlearning at both the individual and group level. It draws on case studies and empirical research to highlight key lessons for businesses and managers on how to manage both innovation and unlearning.

INTRODUCTION

Innovation requires individuals, groups and organisations to embrace change and draw on all available talents and capabilities to do new things or to do old things in new ways. What may be overlooked or ignored in many organisations are the inhibitors to innovation, most often found in the people within the business. A key inhibitor is the inability and unwillingness of people, both individually and in groups, to relinquish past behaviour and practices and embrace the new ways needed to successfully implement innovations.

Of increasing concern is the focus in the innovation literature on strategy and process, ignoring, or at least minimising, the people issues related to innovation. Kahn (2007) reports that in the literature published in 2006 relating to product development and innovation, the two areas of strategy and processes alone account for 60 per cent of the published research output. In contrast, only 8 per cent of the published literature during the same period focuses on people issues relating to product innovation.

This chapter begins to address this gap, and starts by arguing that focusing on what innovation means for people management in the organisation is critical. A model is presented to assist managers to identify the capabilities they need within their organisations to engender and support the development of capabilities such as unlearning at both the individual and group level. We draw on recent empirical research conducted across Australia in organisations undergoing change and innovation, present two case studies with tangible examples of the elements of the process of unlearning and conclude by highlighting key lessons for businesses and managers.

THE LINK BETWEEN INNOVATION AND UNLEARNING

Unlearning is the process by which individuals and organisations acknowledge and release prior learning (including assumptions and mental frameworks) in order to accommodate new information and behaviours that lead to, or facilitate, innovation. Most managers now recognise that innovation is important, if not critical, for the survival of their business. However, few managers are aware of the impact of unlearning on their innovation capacity, and even fewer managers know how individuals and groups unlearn and what capabilities and structures are needed to support unlearning.

Whilst the term ‘unlearning’ is foreign to many, some managers are recognising signals that indicate old ways have not been fully relinquished by employees or groups, which is inhibiting innovation. This might be seen when employees are reluctant to move to new processes, or find ‘reasons’ why new procedures won’t work. Even when such employees appear to have embraced a change, behind the scenes old practices often persist.

Employees may simply not be prepared to unlearn, or something is preventing them from moving to a new way of doing things. If the speed of unlearning can be increased, individuals become more adaptable and agile and therefore able to keep pace with innovations and contribute more to the innovation process and organisational performance.

In times of rapid and continuous organisational change, it is imperative to understand how individuals unlearn and what influence both individual and organisational factors have on this process. Hedberg (1981), one of the early authors in the field of unlearning, eloquently summarises the challenge facing many organisations:

> *There is too much waste of human resource, capital, knowledge, and enthusiasm in letting organizations develop with learning abilities only. Such organizations build walls around them, and grow defensive. They become insensitive to signals from the environment, and they accumulate so many resources that they cannot afford to move when times are changing. That is why abilities for learning, unlearning, and relearning must be equally developed. (Hedberg, 1981, p 23)*

People make the difference

For the purposes of further analysing the concept of innovation and particularly for exploring the implications for people management, innovation is defined as the introduction and successful implementation of new and useful products, services, methods, practices or processes that add value to the organisation.

At the organisation level, innovation involves both learning and unlearning, and it requires strategic direction to focus this process (Tidd, Bessant and Pavitt, 2001). Innovation needs to alter market conditions either through increasing the competitiveness of an organisation or in other ways, such as by displacing a product or service from the market with a better offering.

So, innovation can encompass any and all aspects of an organisation, from the nature and design of the goods and services it offers to the world to its production processes and internal service processes, and includes how it is organised and structured. Regardless of the type of innovation however, the one common element is the existence of people within the development and implementation of any innovation.

Innovation is about change: changing product and service specifications, changing process and systems requirements, changing markets and customers, and changing the ways that the business operates. On the other hand, managing effectively and efficiently is concerned with reducing variation and standardising processes, products and services. So, innovation is about changing those very same things that the manager is attempting to standardise.

In this sense, innovation is often considered a continual disruption to operational efficiency and effectiveness. Any change to processes or products requires changes to individual and group behaviours and practices if it is to be effectively implemented. Therefore, if individuals or groups are not prepared to relinquish previous practices, innovation will fail to deliver, regardless of how excellent the innovation promises to be.

Each type of innovation requires unlearning in order to truly embed new behaviours for individuals and groups. Product/service innovation calls for those designing products or services to develop the capability to think more broadly about what they are offering the consumer, and for those at the customer interface to unlearn previous delivery techniques and embrace a new product or service. For example:

- Kodak and its employees have had to turn their minds to understanding digital rather than chemical technologies with the advent of the digital camera.
- In the hospitality sector, the rise of companies such as Wotif.com, Quickbeds.com and Lastminute.com has meant that hotels have had to totally rethink their pricing strategies and unlearn conventional sales thinking while developing skills in dynamic pricing of rooms and services.
- In the engineering and design field, moving from manual drawing to computer-aided design impacted the daily work practice of individuals and meant substantial unlearning challenges. Designers and draughtsmen no longer needed the skills to draw components and create designs from scratch. The new technology required that they learn to operate keyboards and search libraries online and create 3D drawings while unlearning all the old tricks of the trade. This involved time for training and development and support during the transition to the new technology.
- Mobile telephones are no longer a business tool; they are a fashion item and recreational aid, with considerable associated incremental product and process development such as ring tones, displays, text messaging and digital cameras emerging as a result of such positional innovation. Consequently, the market has changed from the busy, time-poor executive to technology-savvy teenagers, forcing evolution of marketing approaches.

Time frame also has a material impact. Radical innovation, regardless of whether it is a product, process or market innovation, involves a dramatic departure from existing product offerings and processes or their logical extensions. Radical innovation is high-risk and high-return. Uncertainty plagues radical innovation projects, whether the uncertainties are of a technical, marketing, organisational or resource nature.

When radical innovations occur in products, services, markets or processes they typically require more aggressive unlearning within the organisation. For example, the MP3 player has altered the media market in a way that evolving from audio tapes to CDs did not. While both evolutions represent significant technology advances, moving to MP3 formats has enabled a speed of delivery and reach of new content in a way that calls for fundamentally changed behaviours (and hence significant unlearning) for a range of media professions as well as amongst users of resulting products.

However, not all innovation is large-scale and radical. Innovation can occur gradually or incrementally, involving small improvements to a process, product or service. Incremental innovation can have a significant impact on a business's competitive position in the market. Unlearning can occur in a gradual, adaptive manner during incremental innovation.

Consider the evolving word-processing technology and its impact on users. Each time a new version of software is released, incremental modifications have been made to menus, layouts and formats. High-end users who developed their own shortcuts and used 'quick keys' find themselves having to let go of the old ways in order to work with the modified technology.

Whether innovation is radical or incremental, unlearning will be necessary. Newstrom (1983, p 37) suggests that individuals carry with them a "deeply entrenched behavioural pattern that has been reinforced for years" and that the extent to which behavioural change is required will have a bearing on the level of unlearning required.

The behaviours of individuals determine how well an organisation functions and therefore behavioural change is a critical factor in the development of organisational capacity and capabilities. If people make the difference to the success of innovation, then their capabilities as individuals and groups is a key issue for managers.

As an integral part of wider organisational and individual capabilities, the ability and willingness to learn and unlearn offers managers a way to speed the process of innovation adoption. However, developing capacity and capabilities in an organisation is not always considered as extensively as needed. To improve organisational performance, building capabilities in both individuals and the organisation as a whole needs to be a priority, and understanding how individuals and organisations unlearn enables facilitation of innovation by more appropriate and timely support.

Capacity, capabilities and behaviour

Understanding the differences between organisational capacity, capabilities and behaviours can enable managers to better plan for development of the essential building blocks of innovation. Figure 1 provides a framework showing the link between these concepts.

Few would argue that the goal of innovation is improved organisational performance, as is shown at the top of Figure 1. Improved performance flows from organisational capacities, which in turn flow from capabilities that can be sourced either internally or externally by acquiring resources, skills and behaviours.

Bessant (2002) argues that organisations need to have routines for 'doing what we do better' and at the same time allow space for another set of routines for doing things

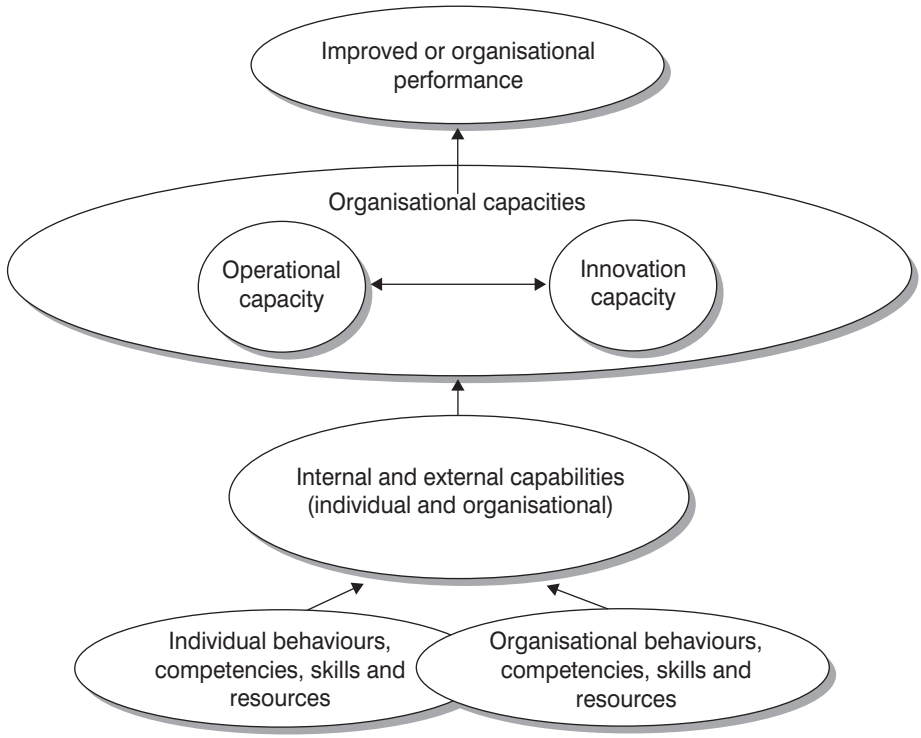


FIGURE 1: Capacity, Capabilities and Behaviours Framework

(based on Hyland and Boer, 2006)

differently when moving into new and uncharted territory. To do things better and do things differently requires two very different capacities: an operational capacity and an innovation capacity as shown in Figure 1. Improved operational or innovation capacity leads to improved organisational performance.

Organisations therefore need to have suitable sets of capabilities contributing to overall capacities to function effectively and efficiently and to innovate. Capabilities are integrated resources (such as people, assets, behaviours, skills and information systems) that the organisation deliberately draws together (Gieskes and Langenberg, 2000). These resources include tangible and intangible assets ranging from behaviours and skills to information systems. Capabilities can be viewed as one of the main components of the core strengths of an organisation, being at the centre of the accumulation of relevant intangible resources, such as technological knowledge and human capital.

Organisational capabilities however can only be built upon the capabilities of the individuals who make up the organisation. As Hedberg puts it (1981, p 6), "individuals' learning is doubtless important in organisational learning. Organisations have no other brains and senses than those of their members." So managers first need to understand what innova-

tion requires of individual employees and then consider how they can assist individuals to unlearn past behaviours in order to continue to enhance capabilities for innovation.

The bottom level of the model as illustrated in Figure 1 is not always as widely explored and is the focus of this chapter. Developing individual and organisational behaviours, competencies and skills is critical in building capabilities, and in turn, capacities. Engaging in effective learning and as a part of this, effective unlearning, is a key part of these capabilities.

As the Capacity, Capabilities and Behaviours Framework shows, to develop both individual and organisational capabilities specific behaviours are required. Behaviours are described by Karnoe (1995, p. 430) as a "repertoire of experiences, skills, and beliefs" and by Drejer (2000, p. 206) as "a system of technology, human beings, organisational (formal) and cultural (informal) elements and the interactions of these elements". While capabilities may be latent in that they can be dormant or even suppressed by people in the organisation, behaviours are only evident when they are demonstrated by individuals or groups within the organisation.

Newstrom (1983) suggests that unlearning is more significant in certain learning situations than others, as represented in Table 1. Unlearning is identified as playing a critical role, particularly in situations where individuals are being asked to totally replace one behaviour with another, or to a lesser extent, when they are required to increase or decrease the amount of behaviour or skill.

TABLE 1: A typology of learning situations (based on Newstrom, 1983, p 37)

Objective of change	Significance of unlearning
Create a new behaviour	Negligible
Sustain a previous behaviour	Low
Increase amount of behaviour or skill level available	Moderate
Decrease amount of behaviour or skill level available	Moderate
Add a new behaviour to existing repertoire	Low
Replace one behaviour with another	Maximum

Having considered the link between organisational capacity, capabilities and behaviours, with unlearning being a critical component, it is then important to ask how unlearning can be facilitated in order to build innovation capacity. In facilitating unlearning, it is also useful for managers to understand what factors may enable or inhibit the unlearning process.

An unlearning model

A model of unlearning (Figure 2) has been developed to show both the process of unlearning and the factors at the level of the individual and the organisation that may

enable or inhibit unlearning (Becker, 2007). In particular, the model highlights the factors at the level of the individual employee that are often ignored and can serve to either enable or inhibit unlearning.

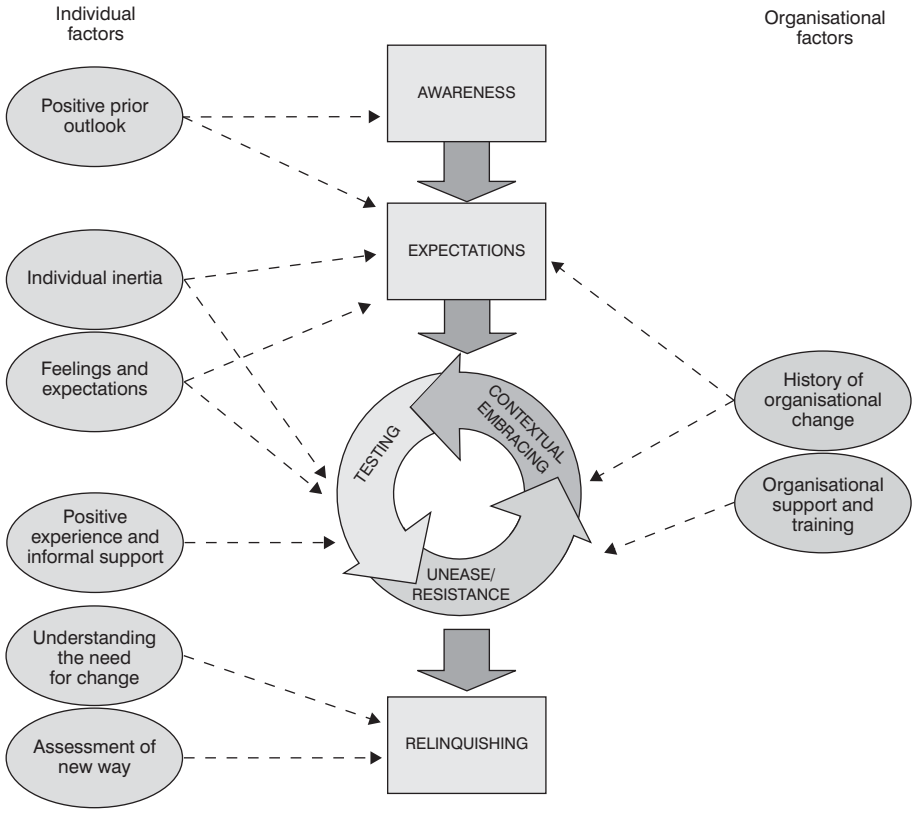


FIGURE 2: Unlearning Process Model (Becker, 2007)

The central focus of this model is on the individual and the process by which they unlearn including testing, unease or resistance (either active or passive) and contextual embracing.

Prior to the commencement of this process, there must be an increased level of awareness in the individual that there exists an 'old way' and a 'new way'. This may be facilitated by either internal or external forces, and does not mean that the individual necessarily agrees with the new way, but is aware of its existence. Awareness then leads to certain expectations by the individual which may be based on previous experience, messages from co-workers or managers, or other formal mechanisms.

The cyclical process of unlearning then commences. The individual will test the new practice or behaviour in some way and encounter a level of discomfort. This may take the form of active resistance of the new way, or for those who are embracing the change, it will be a time of unease as they begin to release their previous practices or behaviours.

Once through this phase, individuals begin to embrace the new way in contexts where they believe it applies. At the end of this cycle, the individual will eventually relinquish past behaviour, which is the outcome of the process of unlearning. The length of time it will take an individual to move through this process will depend on a wide range of individual and organisational factors. Sometimes, the individual may slow down or come to a standstill, depending on individual or organisational factors acting as enablers or inhibitors.

FACTORS AFFECTING UNLEARNING

The unlearning process model shows not only how unlearning occurs, but also highlights the factors that are potential enablers and inhibitors of the unlearning process.

These factors are explained further using examples from two organisations. Case 1 is about unlearning required as a result of incremental process innovation in a mining and processing environment. Case 2 concerns a radical process innovation in the heavy industry service sector.

At the individual level of the unlearning model, a *positive prior outlook* will have an impact at the early stages of unlearning, at the point where awareness of the change is raised and expectations begin to form. This positive prior outlook is heavily influenced by the individual's history with the organisation and its record of successful or unsuccessful changes. It is also a reflection of an individual's personal style.

CASE 1. EMBRACING SAFE BEHAVIOUR (INCREMENTAL PROCESS INNOVATION)

A minerals extraction and processing company began exploration in the early 1980s and commenced operations in 1991 as part of a larger group of companies. Ownership of the organisation has changed a number of times. The site is located in a regional area, reporting back to a corporate office in an Australian capital city. The operation is comprised of a mine, a processing plant and relevant support functions.

At the time of the study, the operation had 213 staff, including full-time, part-time and casual employees. In addition to this core workforce, the organisation also had a relationship with three key contracting firms that provide an additional 130 contract staff to the operation. Labour turnover at the site was 20 per cent and had stabilised following a period of higher turnover of up to 25 per cent. The management of the operation attributed this high turnover in part to the uncertainty accompanying overall ownership and possible buy-outs, coupled with a resources boom attracting staff away from their organisation.

(Continued)

Eighteen months prior to this study, the organisation embarked on a lengthy culture change process to change the way safe work practices were viewed and used in the organisation. This change was driven more by a growing awareness of potential safety risks and the occurrence of minor incidents in the workplace than by legislative compliance. The organisation developed a comprehensive strategy for the change, commencing with strategic commitment to the process from senior management. The organisation then commenced a process of employee workshops, communication, involvement and ongoing development to implement a behaviourally based safety system.

The change project had the following key attributes:

- Sharing of safety records in order to emphasise the urgent need for change.
- Groups of employees chosen to be involved in the choice of the most appropriate safety system.
- Communication back to the workforce via the chosen employees.
- Training for all employees throughout the implementation of the system (facilitated by employees trained in facilitation skills).
- Collection of data relating to the system implementation and results.
- Ongoing and regular communication by senior managers.

Results to date indicate that this system has had significant impact on safety indicators within the organisation, reducing the lost time injury frequency rate (LTIFR), a common measure in industrial settings, to below industry average for the first time in the history of the organisation. Ongoing commitment to this system and the continued enhancement to the system have lead to widespread adoption throughout the workforce.

Case 1 involved an organisation which had been exposed to many previous changes often not brought about by business needs for innovation but simply due to changing ownership and questions about the organisation's viability.

With this background, individuals were concerned about the implementation of a new safety system, particularly when it was seen as a personal assessment of an individual's behaviour. The managers responsible recognised this situation, and emphasised employee involvement from the outset, even before a decision on which safety system to implement. As a result of this approach, employees – even those not directly involved in the working parties – reported a feeling of engagement with the process.

CASE 2. A NEW WORKFORCE (RADICAL PROCESS INNOVATION)

Case 2 concerns an engineering maintenance and manufacturing organisation which is part of a global firm. The lengthy history of ownership of the organisation involves previous UK ownership followed by control by US interests. Recently, the organisation merged with a competitor in Australia.

The organisation is located in a large regional centre, servicing a broader area of regional Australia. At the time of the research, the organisation employed between 120 and 150 staff, fluctuating with work demands. The operation services the mining industry, renowned for tight production schedules and expecting fast turnaround times from such contract service organisations.

The structure at this site includes three sections: an engineering, sales and service function; a production coordination and planning function; and an operations function. The operations function is by far the largest sector of the workforce and is separated into operational areas such as machining, electronics, fabrication and hydraulics. The work cells within these areas have team leaders, leading hands and an operational workforce including tradespersons and trades assistants. Even though labour turnover was relatively low, there was an increasing shortage of skilled tradespersons available to staff the operation. A radical solution was needed to meet the business demands.

The operations manager implemented a new strategy to increase the numbers in the workforce by recruiting part-time trades assistants to work school-friendly hours. This strategy mainly targeted women with school-age children who would be able to work for limited times during the working week. Employed in teams, these new employees were trained to perform routine tasks which were previously done by tradespersons. This allowed for those with trade qualifications to be more effectively used for higher level skilled work.

Prior to these changes, the culture of the organisation was heavily impacted by the extremely high percentage of males. The introduction of this new workforce therefore had more impact than simply a redistribution of work; it involved a radical redistribution of duties, restructuring of work patterns and a review of all internal processes, particularly those relating to quality assurance.

The key steps taken to implement this change included:

- Analysis of the tasks within the operational units.
- Redesign of jobs to reallocate tasks not requiring trade qualifications.

(Continued)

- Communication with and input from the workforce in relation to the redesigned positions.
- Recruitment and selection of appropriately skilled work teams to undertake trade assistant tasks.
- Training of new work teams.
- Supervision and mentoring of new work teams.

The approach resulted in fewer bottlenecks in internal processes and the full use of tradesmen, and also had a positive impact on the organisation's cost structure. Penalty rates were no longer required on a regular basis so there was a 35 per cent saving in the cost of production hours.

Much of the change management literature is devoid of recognition of the emotional impact of change at the individual level and this has been recognised as a shortcoming (Balogun and Jenkins, 2003; Goodstone and Diamante, 1998). However the issue of feelings has emerged as the strongest and most enduring factor in successful unlearning.

Two factors affecting emotions before and during the unlearning process are individual inertia and feelings and expectations. These are both a reflection of the personal style of the individual involved.

Case 2 provides an example of the types of emotional issues and inertia that might be experienced during innovation. This radical change to the way work was conducted proved confronting to many employees.

As the manager pointed out:

> *What is stopping us spreading the distribution of jobs similar to the normal distribution of the male/female ratios in society? Attitudes mainly …*

This case showed that particularly in times of radical innovation, the feelings of individuals towards the potential changes must be considered. However, it is also a cautionary tale: some employees may never come to terms with changes and innovation and will need to move positions either within the organisation, or outside.

Said the manager:

> *The guys had a mixed reaction. Most believed it would never work out and didn't know what to think when it did. Some could not swallow their pride and moved to other work cells. A couple … actually left the business.*

As the unlearning model shows, two factors impact during the cycle of unlearning: the individual factor of *positive experience and informal support*, and the organisational factor of *organisational support and training*. Both these factors relate heavily to support mechanisms provided during the change to allow individuals the chance to unlearn both formally and informally. Many change models recognise these two factors, although often the formal is emphasised to the exclusion of informal support.

The formal and informal support mechanisms built into the implementation of the safety system in Case 1 provided a clear example of the benefits of considering these issues. Key individuals across the organisation were chosen to select the new system and then present back to their workgroups, giving all employees the opportunity to obtain informal support within their own workgroups. At the same time, the senior managers recognised the need for regular communication. They scheduled onsite briefing of all employees during all shifts, to ensure that information and formal communication mechanisms were available to everyone.

Finally, at the individual level of the unlearning model, *understanding the need for change* and *assessment of the new way* are both factors that impact towards the end of the unlearning process. Much of the change management literature emphasises understanding the need for change at the commencement of the change process (Kotter, 1995; Mento, Jones and Dirndorfer, 2002). This is important, but it is also important, once innovation has occurred, to ensure that individuals see the benefits of the new approach and thus reduce their likelihood of reverting to old ways.

During implementation of the new safety system in Case 1, the managers took a great deal of time to share with employees the outcomes of the implementation of the system, including the impact on safety results. This process required additional record-keeping and tracking of performance, but was reported as critical to showing the employees why the change had been implemented and how it was affecting their workplace in a positive way.

The final organisational factor in the model relates to the *history of organisational change.* This factor is a direct reflection on previous change experiences in the organisation and shows strong links to organisational memory. This factor reflects not only an individual's experience of past changes but will also reflects the memory that exists within the organisation.

Case 2 presents an example of an organisation which had encountered a lengthy history of organisational change, often as a result of mergers and change of ownership. This history provided an additional challenge to the implementation of new systems and processes, and many individuals reported additional resistance to innovation because of it.

As one employee highlighted:

> *I think in this company when they decide to do things like change procedures, policies, [for example]) the old [system] upgrade we had not long ago – their training is not always very good… they don't seem to provide enough support.*

This legacy of previous changes then had to be addressed during the implementation of new processes and systems.

Discussion and conclusions

If innovation is critical for the survival of a business then it needs to be managed as a process. Managing the innovation process is concerned with managing people and their behaviours. All changes in an organisation impact on the employees in that organisation, so employees are able to influence the outcomes and success or failure of innovations.

For innovation to occur, people need to change their behaviours – they way they work, what they produce, the service they deliver and the customers with whom they interact. Successful innovators recognise the need for behavioural change that ensures innovations – both radical and incremental – are accepted by people in the business.

Successful ongoing, long-term innovation is not simply about behaving differently and adopting new behavioural routines, it is also about unlearning old behaviours. However, many managers are unaware of the impact of unlearning on the innovative capacity of their businesses and even fewer managers know how individuals and groups unlearn, and what capabilities and structures are needed to assist this unlearning.

While some managers and employees see innovation as an event – for instance the launch of a new product or the opening of new markets – these events are just one element in a complex process that is influenced by many factors. Similarly, unlearning is not a single event and is strongly influenced by both organisational and individual factors.

Organisations with a history of successful innovations and the necessary leadership and support structures are more successful and benefit more from innovation than businesses without these factors. In some innovative organisations the factors needed to support unlearning exist through chance or luck; in others they have developed as managers recognise the need to develop capabilities that enable ongoing change.

Organisations that seek to better manage unlearning and increase their innovation capacity need to have a positive history of organisational change and the organisational support and training necessary to engender and encourage unlearning. It is not

good enough for organisations to leave the development of unlearning abilities to chance; managers must understand and invest in the capabilities, structures and processes to support unlearning.

However, unlearning and innovation have both individual components as well as organisational components. Just as a businesses need to access people with skills such as creativity, idea generation, problem-solving, design and change management to build a successful innovation process, they need people with the appropriate skills for successful unlearning.

It can be that if people do not have the ability to unlearn and are unable or unwilling to alter their behaviours, it is in the best interest of both the business and themselves that they move on.

In the unlearning process model discussed in this chapter, the individual factors that can enhance unlearning are a positive prior outlook, understanding the need for change, and positive feelings and informal support. But these factors do not exist in isolation; other factors such as individual inertia, feelings and expectations, and assessment of the new way can act either as inhibiters or enablers of unlearning. In practical terms, managers should:

- Provide realistic views of the potential change or innovation and demonstrate the value of new practices.
- Identify and engage with those considered the experts in previous practices; they are often the most resistant to change, as they have the most to lose.
- Provide managers and supervisors with skills to address the emotional impact of change; many will not have these without formal development.
- Send positive messages about the change and provide opportunities for all those experiencing change to be supported both formally and informally.

Apart from the individual factors, the unlearning model also suggests that the history of organisational change and the formal training and support mechanisms will also play a role in helping or hindering unlearning. This leads to the following areas which also need to be addressed:

- The history of organisational change and its success or otherwise; individual and organisational memory is strong and previous events must be acknowledged.
- An organisational communication strategy that involves communicating clearly, regularly and often.
- Training and development for all those impacted by the change.
- Preparation for the inevitable short-term decline in outcomes and performance due to interruption to established procedures.

It is the role of management to put the resources, organisational support structures and training in place that engender unlearning at the pace required to sustain radical

or incremental innovation. It is also the responsibility of managers to ensure that they have the appropriate people with the appropriate skills at all levels of the organisations to support innovation and engender unlearning whenever there is a need for change.

This responsibility has implications for the longer-term strategic human resource management of the organisation as well as individual functional areas such as human resource planning, employee attraction and retention, performance management and human resource development.

The effective management of people is arguably one of the greatest challenges for the future of innovation.

References

Balogun, J and Jenkins, M (2003), Re-conceiving Change Management: A Knowledge-Based Perspective', *European Management Journal*, vol 21, no 2, pp 247–57.

Becker, K (2007), 'Unlearning in the Workplace: A Mixed Methods Study', unpublished thesis. QUT, Brisbane.

Bessant, J (2002), 'Developing routines for innovation management within the firm', in J Sundbo and L Fuglsand (eds), *Innovation as Strategic Reflexitivity*, Routledge, London.

Drejer, A (2000), 'Organisational Learning and Competence Development', *The Learning Organization*, 7(4), pp 206–20.

Gieskes, J and Langenberg, L (2000), 'Learning and Improvement in Product Innovation Processes: Enabling Behaviours', paper presented at the INCOSE (International Council on Systems Engineering) Conference, Minneapolis.

Goodstone, MS and Diamante, T (1998), 'Organizational Use of Therapeutic Change: Strengthening Multisource Feedback Systems through Interdisciplinary Coaching', *Consulting Psychology Journal: Practice & Research*, vol 50, no 3, pp 152–63.

Hedberg, B (1981), 'How Organizations Learn and Unlearn', in P Nystrom and WH Starbuck (eds), *Handbook of Organizational Design*, vol 1, Cambridge University Press, London.

Kahn, KB (2007), 'Abstracts', *The Journal of Product Innovation Management*, vol 24, no 4, pp 392–403.

Karnoe, P (1995), 'Competence as Process and the Social Embeddedness of Competence Building', *Academy of Management Journal* (Best Papers Proceedings).

Kotter, JP (1995), 'Leading Change: Why Transformation Efforts Fail', *Harvard Business Review*, 73(2), pp 59–67.

Mento, AJ, Jones, RM and Dirndorfer, W (2002), 'A Change Management Process: Grounded in Both Theory and Practice', *Journal of Change Management*, vol 3, no 1, pp 45–59.

Newstrom, JW (1983), 'The Management of Unlearning: Exploding the "Clean Slate" Fallacy, *Training and Development Journal*, vol 37, no 8, pp 36–39.

Tidd, J, Bessant, J, and Pavitt, K, (2001), *Managing Innovation: Integrating Technological, Market and Organizational Change*, John Wiley & Sons, New York.

Oliver Freeman

Oliver Freeman is a career publisher and a scenario planning consultant with over twenty years experience in futures and foresight work. He founded GBN Australia (with Richard Bawden) and the Neville Freeman Agency (with Richard Neville). In 2007 he completed a two-year project with Teaching Australia on the future of teaching and since 2003 he has directed projects on the future of electricity (for Aurora Energy in Tasmania); the futures of government & primary industries (for the Victorian Government); the future of urban water management (for Ku-Ring-Gai Council); the future of financial services (for St George Bank) and the future of printing (for RMIT). He was a director of the Australian Business Foundation from 2001 to 2007.

People, Scenarios and Innovation

Oliver Freeman

Oliver Freeman is a director of The Neville Freeman Agency, and an adjunct professor in the Faculty of Business at University of Technology Sydney.

When it comes to innovation, people are the *only* asset a business enterprise has. The concept of the learning organisation has turned out to be inadequate: organisations don't learn, people do. Another inadequate concept has been the idea of continuous business development. True innovation requires scenario planning that can take into account the full spectrum of possibilities the future holds and, if necessary lead to radical innovation. Such innovation does not simply respond to the existing environment in which the business operates, but transforms that environment.

INTRODUCTION

> *"Learning and innovation go hand in hand. The arrogance of success is to think that what you did yesterday will be sufficient for tomorrow."*
>
> – William Pollard, CEO, The Service Master Company.
> Author of *The Soul of the Firm*

This paper looks at the interrelationships between people; the business and organisations (systems) they inhabit and indeed constitute; the alternative future worlds or environments (scenarios) that they may have to encounter; and how learning from the future can influence the strategic innovation they create for their businesses and organisations today.

PEOPLE

It is more than a cliché that people are the most valuable assets of any enterprise, particularly in a business environment where successful firms compete through knowledge and innovation. When it comes to innovation, they are the *only* asset.

POINTERS FROM EXPERIENCE

As a preliminary step in a leadership workshop, we asked participants to define what they meant by leadership. They then had to pin these attributes on a huge sketch we had made of the human body as to the source of each.

The locus of this predominantly male group's attributes was the head and the arms. Brain power and physical strength. Masculine, stereotyped and abstract.

We then spent three hours in conversation about what they needed from leadership in the future to deal with the exigencies of business today.

The new set of attributes were pinned on the body. Lo and behold, they now covered the whole body – head, body, arms and legs, hands and feet, and the heart. Masculine and feminine values. Human and real.

Think for a moment about one-design yacht racing. A fleet of boats built to a common design race against each other under the same conditions. Same water, same winds, same tides. The only differentiators between them (ignoring the possible intervention of illicit drugs and illegal differences in the actual physical specification of the boats)

are the qualities – mind, body and spirit – of the crew members. It is these aspects that separate the winners from the rest of the fleet, and their confluence that creates innovation in strategy, tactics and process.

When the race is won, victory isn't delivered by the boat that has won or by the group from which the crew members are drawn – nor even the sponsors who are funding the crew and its equipment. It is delivered by the people on board combining together and innovating to navigate successfully the challenges presented by the water, the wind and the tides – and by the other competitors.

POINTERS FROM EXPERIENCE

Sailing at Cowes Week in the United Kingdom some years ago, we were matched with a fleet of one-design yachts on a day when light winds fluked about and the tides were muddled and hard to read.

Our skipper took us from the start on the opposite tack to the other boats, and as we hugged the shore while the fleet sailed a mile out to sea, we appeared to be last by a considerable distance. But near the end of the race we made a long starboard tack that took us around the last buoy 200 m ahead of the competition.

Over the last 20 years, two major themes in business have turned out to be inadequate as frameworks for understanding how business crews might improve the way they engage with the tidal uncertainties of the external environments in which they operate.

The first is the concept of the learning organisation and the learning company developed notably by Chris Argyris, Peter Senge, Arie de Geus and others. If organisations cannot learn, they cannot win. But learning and winning are done by people, not by 'organisations'. The learning company and the learning organisation are abstractions, however personalised they may be, by an anthropomorphising culture.

> *"Everything that can be invented has been invented."*
>
> – Charles H Duell, Commissioner, US Office of Patents, 1899

The second is the idea of continuous business improvement, which has turned out to be at best an incomplete response to a changing world and at worst a lesson in blindsiding.

Every day we hear of businesses being encouraged to do things better and to be nimble and adaptive in the world they inhabit, without any attempt to consider they might

do better things and change the world in which they live. As Toyota's president Katsuaki Watanabe is reported as saying in *AFR BOSS* in September 2007, the economic success spawned by the long boom (1992 – 2007) nurtured the concept of continuous improvement while blinding people to the deep changes which are fermenting.

We have been enjoying continuous improvement and its governance has worked well in Australia for key indicators like economic growth, levels of employment, shareholder value and personal wealth. But what is needed now – based on the evidence of such things as the Wall Street meltdown, climate change, peak oil, obesity, feelings of insecurity as well as the uncertainties linked to things like the Internet, biotechnology and generational change – is radical renewal. Disruptive, generative change.

> *"With over 50 foreign cars already on sale here, the Japanese auto industry isn't likely to carve out a big slice of the US market."*
>
> – *Business Week*, 2 August 1968

If innovation and change are properly in the hands of the people rather than the inanimate organisations in which they work, it is contestable as to who from the organisation is involved, how and when. Leaders of organisations often believe that the top executives are likely to be more innovative than people down the hierarchy. But innovation is not like that. It is an emergent property which thrives on flat management structures, open space collaborations and an environment which challenges hierarchical thinking.

POINTERS FROM EXPERIENCE

A power tools manufacturer in the United States is family-owned and the major shareholders come to work every day. They have a traditional hierarchical structure and place a great deal of emphasis on governance so as to protect their interests. They recognise, however, that innovation is at the heart of their success and the hierarchy is made of triangles from which one side has been removed. Everyone in the company has the right to engage with everyone else through these open sides on matters relating to innovation and R&D. When it comes to innovation they have a flat management structure.

The lesson from Jim Suriowecki's *Wisdom of Crowds* (2005) helps answer these questions. The headline idea is that nobody is smarter than all of us. Suriowecki is not suggesting that 'group-think' is better than 'I-think'; Pauline Hanson appealed to a type of group-think which would advocate the return of capital punishment and the closing of our borders to Asian immigrants, examples of Alexis de Tocqueville's complaint almost 150 years ago about 'the tyranny of the majority' in US-style democracy. Suriowecki wisdom of crowds is a wisdom made up of the aggregation of individual

decisions from diverse group of participants, compared with the views of a small number of experts contemplating the same issues.

> *"Very interesting, Whittle, my boy, but it will never work."*
>
> – Professor of Aeronautical Engineering at Cambridge, shown Frank Whittle's plan for the jet engine

Let's dub this wisdom 'I-intelligence', 'I' standing for 'me', 'the eye', 'my world view', and so on. Its significance arises when the individual views of all participants are taken together and create a completely new context within which businesses and organisations review their strategic future.

This is the process that drives, for example, the acceptance of new technology or its push back, the adoption of new ideas or their rejection and the framing of how the world is seen by its participants. Innovation in regard to climate change, for example, needs more than an understanding of science. What we do about it, how we respond to it (which is driven by I-intelligence) is the key.

POINTERS FROM EXPERIENCE

A scenario planning client, introducing our futures methodology to the scenario building team, prefaced his few words with the observation that he had been in the public service for over 25 years, during which time nothing had changed, and that he did not expect anything to change in the next 25 years. This was his I-intelligence at work. The way he sees the world and what he sees are powerful filters. It is no surprise that this piece of work failed to deliver innovative outcomes as the managers involved were not given permission to be transformed and did not have the courage to stand up for themselves.

So I-intelligence is critical. Many innovation initiatives have failed to deliver because they ignore the importance of the human context within which innovation takes place.

Innovation is not just about R&D, where men and women dressed in white coats come up with new ideas. Nor is it just about levels of investment from the financial markets or the focus of government on promoting such things as the clustering of new enterprises and smart thinking.

> *"There will never be a bigger plane built."*
>
> – A Boeing engineer, after the first flight of the 247, a twin-engine plane that carried 10 people

Innovation is the outcome of an interaction between 'mechanistic' components like these with the contextual human dimensions of I-intelligence. Understanding I-intelligence and recognising its formative power in making or breaking the desire for innovation thus becomes a pre-requisite. Innovation is emergent. And at the heart of I-intelligence are people. The I's have it!

SCENARIOS

If I-intelligence is a critical component of the environment in which businesses operate, it is not the only one. There are many other independent influences that need attention. These can be clustered using the INSPECT environmental scanning tool that the Neville Freeman Agency has developed as part of its Scenario Planning Learning Quest™.

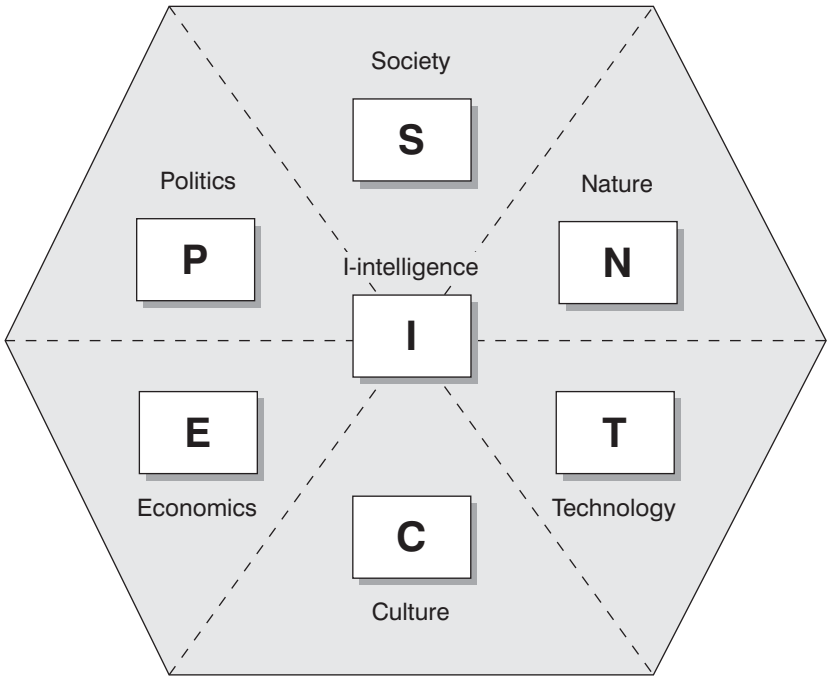


FIGURE 1: The INSPECT environmental scanning tool

Scenario planning scans the future environment and identifies the influences that are likely to be most important and most relevant as the context for innovative change and thus to the research agenda (the 'framing' question or questions).

> *"I think there's a world market for about five computers."*
>
> – Thomas J Watson, chairman of the board of IBM

The environment, which lies outside the organisation as the world in which it must operate, can be viewed at many levels. It might be local (micro) for a business serving an immediate community, for example with hospitality, home services, health or education. The environment could be regional (meso) for a business with some outreach, as in financial services, insurance, manufacturing or transport. Or it might be global (macro) as in travel, outsourced services, fashion and the Internet.

These layers are not exclusive; a business might be influenced by what is happening at all three levels. A provider of educational digital media would be an example.

What is significant about these contextual frames in the process of learning about the environment is how resolutely uncertain they are – not only in their component parts but also in the way they might come together. Alternative scenarios for the future are, thus, powerful tools for helping people to be innovative because they provide a more rounded vision of what the future might be.

POINTERS FROM EXPERIENCE

In a recent project on the future of teaching and the teaching profession, one of the participants wrote: "For me, the richness of the … experience was more to do with robust exchange of differing world views and the shaping of personal viewpoints than it was to do with building the scenarios themselves. From a more pragmatic perspective, I will, in the future, engage more diverse viewpoints in planning activities in my school. Enriching the world views of participants seems to be of more value and importance than any plan itself."

Before embarking on strategic innovation, businesses and organisations create these alternative futures as a way of promoting new thinking about the future and reducing the risk of being unprepared for what might in reality be coming at us at a million miles an hour.

Futures linked to climate change, for example, vary significantly on the impact of global warming. The 'big melt' of the ice at the poles might hit the world in as little as 10 years or could it be that we have 50 years of grace before our coastal towns are flooded. Innovators working on urban water management would like to know the answers!

These uncertainties which make the future such a slippery devil are not suggesting we live in an either/or world. For every future we are interested in, there is a cluster of influences whose confluence has the power to generate very different worlds. For example:

Future of …	Critical influences …
Hospitality	Leisure time, personal wealth, work ethics, licensing laws, geopolitics, carbon emissions
Education	Job design, educational technology, social stratification, globalisation; multiculturalism
Financial services	Technology, globalisation, Internet, mobile technology, economic wealth, branding
Fashion	Disposable income, generational change, cult of celebrity, brands, sustainability

Scenarios are pictures of the alternative futures created from the critical influences. The crucial skill is not to attempt to pick which scenario will actually happen – to guess the 'right future', as it were. Rather, the aim should be to 'imagine into being' and then explore a sufficiently comprehensive range of futures to avoid getting the future wrong. This idea was first voiced in the mid 90s by Peter Schwartz, co-founder of GBN.

Scenarios, thus, work as a set of futures, none of which is likely to emerge as framed but all of which, taken together, seem to comprehensively embrace the known 'critical uncertainties' that unfolding futures unveil.

> *"There is no reason anyone would want a computer in their home."*
>
> – Ken Olson, president of Digital Equipment Corp., 1977

The influences are made up of a broad mix of elements: events, characteristics, propensities and useful abstractions. Some of them are wild cards: things that happen that are totally unexpected, whatever hindsight might say. Some are seen as possibilities but are critical uncertainties – important events that are foreseeable but whose outcome cannot be predicted. Others seem bound to happen – pre-determined elements - however nervous observers might be about sharing that view with others. Still others are the result of confluences of different influences interacting in ways that are so complex that the emergent outcomes are impossible to know with any confidence until they actually emerge.

Wild cards, critical uncertainties and pre-determined elements are all part of the strategic innovators' armoury, and by engaging with them they are engaging with the dynamic elements that enable innovative engagement with the future.

POINTERS FROM EXPERIENCE

The way we see the world is very personal and, despite 'group think', we are always struck by the diversity that lurks in every group we facilitate. The challenge is eliciting this diversity and it is only by focusing on the human dimension in organisations that we find it. A 12-year-old student in a scenario focus group responded to the question 'What do you learn from your parents?', not with the stereotypical 'social values and how to behave', but with the mind-blowing 'I learn how to love'. Just imagine what innovation could be built on that 'world view'!

What are the strategic implications of scenarios? Are these implications universal or specific to one future environment rather than another?

> *"This 'telephone' has too many shortcomings to be seriously considered as a means of communication."*
>
> – Western Union memo, 1876

These are the critical questions that need to be answered before innovation can be set in motion. Learning from the future in this way is exciting and challenging because it changes, forever, the way innovation is undertaken in the present.

Once the implications are identified and prioritised in terms of the universality of their application, the innovators are ready to do their thing: to intervene and change the products or services to be offered.

Before leaving the subject of scenarios: scenario thinking can usefully be applied to the internal issues (such as vision, mission and the reason for being) faced by the subject organisation. The framing questions are not always externally focused.

> *"The concept is interesting and well formed, but in order to earn better than a 'C', the idea must be feasible."*
>
> – A Yale University management professor in response to Fred Smith's paper proposing reliable overnight delivery service. (Smith went on to found Federal Express Corp.)

A company may have significant issues surrounding its vision, mission, values, culture and behaviours. When seeking to be more innovative, the organisation will often bump into messy human issues inherent in these topics. And scenario approaches can help get people 'unstuck' about them by unlocking value that is ever-present and not always east to access.

These problems become marked when there are dilemmas about purpose. Companies in Australia have a governance responsibility to look after the interests of their shareholders. But they also have responsibilities to the community at large, their customers and their customers' customers.

POINTERS FROM EXPERIENCE

The asbestosis crisis that hit James Hardie Industries was an example of the dilemmas companies can face with 'conflicting' responsibilities. We can expect that managing the conflict between shareholder value and the liability for compensation to victims will change in the future as aspects of corporate social responsibility become enshrined in the statute book.

Scenario techniques can help mediate these potential conflicts by creating a 'place' in which the divergent stakeholder interests that need to be embraced are identified and measured so as to drive explicit outcomes for the creation of the soft (human) building blocks on which organisations are built.

Compelling reasons for being (like the wish to 'make a difference') are mapped as to 'who for?' and 'by doing what?' and then contrasted with enabling 'metrics' around uncertainties such as 'our resources', 'competitors' and 'distinctive competencies'.

These then generate scenario frameworks that create unique alternative future pictures of the organisation's success formula – and the pathways to bringing into being the desired characteristics become clear.

INNOVATION

In the scenario planner's world, innovation undertaken within any organisational system is a strategic response to the possible future behaviour of the environments (micro, meso and macro) in which it is embedded.

The pathway to innovation has been made by assessing these future behaviours and identifying opportunities to adapt and intervene in ways that lead to transformative change. Rigorous, experiential, collective and critical learning processes are used to classify and better understand their emergent properties as clusters of systemically linked influences.

Scenarios are developed to give these clusters life and meaning and to reflect their complexity. Strategic innovation comes to the fore when ideas for desirable and feasible change are identified, reflected upon and debated within the context of the complexity, contingency and uncertainty that scenarios reveal.

"Drill for oil? You mean drill into the ground to try and find oil? You're crazy."

– Drillers who Edwin L Drake tried to enlist to his project to drill for oil in 1859

Innovation is transformative. It is built on the I-intelligence of the way people see the world. Through the lens of the 'I', it can either be an evolutionary or adaptive response to the external environment on the one hand or, on the other, a proactive, creative strategy that changes the environment itself.

Adaptive responses are about continuous business improvement (doing things better) while generative radical responses are about changing the business idea (doing better things).

Adaptive innovation, thus, occurs when the innovators are concerned with responses to a given set of conditions in the external environment. The power of the process is revealed when these conditions have been seen as prospective (in the future) and contextualised (not one scenario but many).

"640KB [kilobytes] ought to be enough for anybody."

– Bill Gates, 1981

A typical framing question that drives innovation will assume that the social need being met by the innovators' products and services is a given ('people will always need to eat') and that the innovation will be in identifying how the business meets this need given uncertainty about conditions affecting the size and nature of demand.

Australian business is very good at evolutionary innovation. It assumes that the broad brush that paints the operational canvas is a given because Australia, being two per cent of everything global (except land mass, natural resources and sports talent!), has no power to change the world. The 'sunburnt country, a land of sweeping plains' is a fast follower, responding with agility and adeptness to the changing world of business.

POINTERS FROM EXPERIENCE

When we built scenarios for the future of urban water management with a multi-stakeholder group in New South Wales, the initial sense of strategy was based on a convergent 'official' future that that we needn't worry because technology would save us. By the end of the process, this confidence had evaporated (along with most of the state's water!) and the group was engaging positively on how to make a radical difference to the prognostications of the scientists.

Radical innovation occurs when the innovators are responding to a fast-changing world in which there is little convergent thinking about the nature of reality and what is given.

The results generate qualitative changes in the products and services offered and may introduce completely new ones that influence such matters as demand in the external environment itself.

Australian business is less successful in radical innovation because its business culture is strongly derivative. However, the writing is on the wall if Australia is to develop a sustainable business sector which is not dependent on mining and primary industries.

The innovative challenge is to identify the future environments that Australian business might well have to engage with and to think about the added-value, non-mining goods and services that might be developed.

Conclusions

Innovation researchers and management consultancies spend much time on reifying the unreifyable. Whether it is the 'learning organisation', 'research and development' or 'business re-engineering', these are all abstractions with limited value.

Innovation is about transformative change and change is about people. And people are about world views. Their 'I-intelligence' is the most dominant influence in the mix from which innovation flows.

> *"Radio has no future."*
> *"X-rays are clearly a hoax."*
> *"The aeroplane is scientifically impossible."*
>
> – Royal Society president William Thomson, Lord Kelvin, 1897–9

Leaders seeking to promote innovation are well served if they focus on their people, on understanding how they see the world, and on the way the organisation, as a system, engages with the world through its people.

The writer once argued with a director of human resources of a major bank that any company that had a customer service department was in trouble.

By reifying customer service in this way, the organisation institutionalises the activity and suggests that other staff members are *not* involved with customer service. Richard Branson's success is based on his understanding that everyone employed by Virgin has a customer service role.

The human dimension is everything in business. Without it, success through innovation is unachievable.

References

Argyris, C (1982), *Reasoning, Learning, and Action: Individual and Organizational*, Jossey-Bass, San Francisco.

Chakravorti, B (2003), *The Slow Pace of Fast Change*, Harvard Business School Press, Cambridge, Mass.

Geus de, A (1997), *The Living Company*, Nicholas Brealey, London.

Friedman, T (2000), *The World is Flat*, Farrar, Strauss & Giroux, New York.

GBN Australia (2000), *Alternative Futures: Scenarios for Business to the Year 2015*, Australian Business Foundation, Sydney.

Neville Freeman Agency (2005), 'The Ancient Mariner Scenarios for the Future of Urban Water Management', unpublished paper prepared for Ku-ring-gai Council, Sydney.

Neville Freeman Agency (2006), 'Scenarios for the Future of Primary Industries', unpublished paper prepared for Department of Primary Industries, Victoria.

Neville Freeman Agency (2008),'Teaching for Uncertain Futures', Teaching Australia, Canberra.

Pollard, CW (1996), *The Soul of the Firm*, Zondervan, Grand Rapids.

Surowiecki, J (2004), *The Wisdom of Crowds*, Doubleday, New York.

Tocqueville de, A (2000), *Democracy in America* (originally two vols, 1835 and1840), trans. and ed. H Mansfield and D Winthrop, University of Chicago Press, Chicago, 2000.

Twiname, E, *Sail Race and Win*, London, Macmillan, 1982.

NOTES

NOTES

NOTES

NOTES

NOTES

NOTES

NOTES