EXPLORING AND DESIGNING
PRACTICAL TECHNIQUES FOR THE
ANALYSIS AND DESIGN OF COMPLEX
WORK SYSTEMS:
A JOURNEYMAN’S STORY

by

David A. Bruce-Smith

Master of Science (Honours)
2005
University of Western Sydney

© David Bruce-Smith, 2005.
Abstract

Formal systems thinking methods are not readily understandable, applicable nor necessarily useful in the dealing with complex problem domains facing managers in the public sector workplace. This thesis explores the design of other practical techniques that managers, designers, business systems analysts and project staff can use in the workplace to enhance their individual and collective analytical, systemic and critical thinking skills and capabilities.

The interpretative framework used in this social ecology research comprised a constructivist paradigm, a relativist ontology, a subjectivist epistemology, and a critical learning heuristic method. The research technique has been a purposeful and practical combination of critical learning heuristics, action research, project management and creative design conversations. Through the adoption of a first person narrative form and the literary motif of a journeyman's story I relate aspects of my cumulative learning and research. The four major action research cycles are presented in a chronological sequence spanning the seven year period from late 1997 to end 2004.

Key findings include a range of practical techniques, informed by systems and complexity theories, that managers and staff can readily understand and apply in approaching complex issues and dynamic problem domains in a large public sector organisation.
DEDICATION

I would like to thank the following people for their deep friendship, support, encouragement and assistance over the last seven years as I struggled to complete the research and this thesis:

Sally Gallimore,  
Rhonda Matthews,  
Sue Manley Wallace,  
Stephen Jovanovich,  
John van Blommestein,  
Deborah Biggins.

Each one of whom has accompanied me on a major part of my journey and made a significant personal contribution to the successful completion of my journey.

I especially want to thank Deb for her unflagging enthusiasm, encouragement, friendship, understanding and work over the last twelve months of this research journey.

I also want to thank and acknowledge the extraordinary encouragement, faith, and cheering from the sideline of my parents and siblings and their respective families. My many thanks and acknowledgements also to my parents-in-law, and my many brothers-in law and sister-in-law and their respective families. While I am sure that there have been occasional bets on whether I would ever finish or not, the cheering has been unwavering!

And finally I want to thank my ever-patient and long-suffering wife, Sally, my daughter Georgie, and my son Sam, for their love, encouragement, patience and understanding over the last seven years, to whom I have taken a solemn promise not to embark upon another thesis!

It is to Sally, Georgie and Sam that I dedicate this thesis.
ACKNOWLEDGEMENTS

Acknowledgements and Disclaimer

I want to acknowledge the encouragement, support and assistance I have received from the many people in my extended learning community over the last seven years. Firstly I want to acknowledge and thank the many men and women from the Australian Taxation Office who have accompanied me on various parts of this research journey and who have always been willing to both participate and to provide feedback on aspects of my research.

Equally, I would like to thank and acknowledge all the men and women from the University of Western Sydney, School of Social Ecology and Life Long Learning for their many diverse and individual contributions, their friendship and the camaraderie of the post-graduate research community.

Secondly, I would like to specifically acknowledge and thank the following people for their professional support, insight, friendship, and their individual willingness to engage in long ongoing design conversations:

Mike Bolan, Dr. Richard Hames, Jim Killaly, Dr. Virginia Kaufman Hall, Dr. Richard Bawden, Dr. Roger Packham, Dr. David Russell and Dr. John Cameron.

And finally, I wish to acknowledge the professional contribution, erudition, wisdom, friendship and encouragement of my thesis supervisor, Dr. Robert Woog.

My many thanks to all.
ACKNOWLEDGEMENTS

Disclaimer

The Words and Ideas

This thesis addresses a number of action research initiatives I have conducted in a large public sector organisation over a period of seven years and I wish to acknowledge and thank all those who participated and contributed to the research experience, the findings and the outcomes. Where appropriate I have acknowledged the ideas and contributions of individuals within the narrative, just as I have appropriately acknowledged references, authors, key influences and sources of specific information and ideas. However, this narrative reflects my own experience and the personal creative design approach I have taken to this research.

Where I may have inadvertently used an idea or expression attributed to another without appropriate acknowledgement, I plead one of two reasons. The first is that over the period of seven years that I have been conducting this research, I have read extensively and been engaged in many, many informed conversations in diverse fields of interest, to the extent that, while I believe I have acknowledged all key authors and influences, I cannot now necessarily remember where every small idea or nuance or expression may have initially come from. The second reason is a general expression that “there is rarely anything new under the sun” and that where some of my reasoning or findings seem similar to another’s it does not necessarily mean that I am familiar with the other person’s work. The act of engaging in action research over a long period of time, in a knowledge-rich organisation and across different Australian states, cities and local workplaces means that I and my colleagues are open to the infinite influences and information flows present in our many cultures and ways of life in Australia at the turn of the 21st century. In a knowledge economy where ideas and documents are electronically transferred around the world in less than a second and this type of electronic transfer of knowledge has become a part of the background noise of a modern office environment it is going to becoming increasingly complex and difficult to attribute
initial ideas to any one individual or source. That said, I have written of my own experiences in this narrative using a 1st person reflective writing approach and, as such, I will simply say that the contextual use of ideas and application of my thinking to the complex and dynamic problem domain in which I have been conducting action research is entirely my own.

The views expressed in this thesis, therefore, are my own and are not necessarily the views of other individuals, the University of Western Sydney, the School of Social Ecology and Lifelong Learning, the Centre for Systemic Development (which has long since faded into academic oblivion), or the Commonwealth of Australia public sector organisation in which I work.

I also need to acknowledge how aspects of my employment have shaped aspects of the narrative and the need for discretion about disclosure of certain information and levels of detail. I work in a complex, dynamic and at times, politically sensitive environment and have by necessity written areas of this thesis at different levels of abstraction to observe issues of secrecy, privacy, confidentiality and security associated with maintaining the integrity of the Australian Taxation Office and the conditions of my employment.

One final note, the use of certain fictional characters, freehand sketches and diagrams, photographs, and poor attempts at poetry scattered throughout the narrative are also entirely my own.
STATEMENT OF AUTHENTICATION

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in full or in part, for a degree at this or any other institution.

..............................................................

David A. Bruce-Smith
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dedication</td>
<td>i</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>ii</td>
</tr>
<tr>
<td>Statement of Authentication</td>
<td>vi</td>
</tr>
<tr>
<td>List of Tables</td>
<td>viii</td>
</tr>
<tr>
<td>List of Diagrams</td>
<td>ix</td>
</tr>
<tr>
<td>Foreword: A Journeyman’s Story</td>
<td>xi</td>
</tr>
<tr>
<td>A Reflective Moment: Summer</td>
<td>xv</td>
</tr>
<tr>
<td>Chapter 1: Introduction</td>
<td>1</td>
</tr>
<tr>
<td>A Reflective Moment: Visual Haiku</td>
<td>57</td>
</tr>
<tr>
<td>Chapter 2: Systems Thinking and Mapping Techniques</td>
<td>59</td>
</tr>
<tr>
<td>Chapter 3: Practical Techniques</td>
<td>97</td>
</tr>
<tr>
<td>A Reflective Moment: Winter Doubts</td>
<td>170</td>
</tr>
<tr>
<td>Chapter 4: Workplace Applications</td>
<td>175</td>
</tr>
<tr>
<td>A Reflective Moment: A Difficult Muse</td>
<td>213</td>
</tr>
<tr>
<td>Chapter 5: Aspects of Organisations as Complex Adaptive Systems</td>
<td>216</td>
</tr>
<tr>
<td>Chapter 6: The Namadgi Technique</td>
<td>243</td>
</tr>
<tr>
<td>Chapter 7: Key Research Findings and Outcomes</td>
<td>254</td>
</tr>
<tr>
<td>Chapter 8: Conclusion</td>
<td>265</td>
</tr>
<tr>
<td>Bibliography</td>
<td>286</td>
</tr>
<tr>
<td>Appendix A: Extract from “David’s Book of Living and Being”</td>
<td>A-1</td>
</tr>
<tr>
<td>Appendix B: Systems Mapping</td>
<td>B-1</td>
</tr>
<tr>
<td>Appendix C: Extract from “A Journeyman’s Toolkit”</td>
<td>C-1</td>
</tr>
<tr>
<td>Appendix D: Some Useful Notes and Quotes about Systems Thinking</td>
<td>D-1</td>
</tr>
<tr>
<td>Appendix E: Interview Questions, November 1999.</td>
<td>E-1</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1.1:</td>
<td>Research Techniques</td>
<td>30</td>
</tr>
<tr>
<td>Table 1.2:</td>
<td>A Brief Summary of my Research Phases</td>
<td>47</td>
</tr>
<tr>
<td>Table 3.1:</td>
<td>Cumulative Research Development and Learning Throughout 2000</td>
<td>119</td>
</tr>
<tr>
<td>Table 3.2:</td>
<td>Features of my Social Ecology</td>
<td>124</td>
</tr>
<tr>
<td>Table 3.3:</td>
<td>Relationship between Training Course Modules and the Content and/or Technique</td>
<td>159</td>
</tr>
<tr>
<td>Table 5.1:</td>
<td>Diagrams in Chapter 5</td>
<td>242</td>
</tr>
<tr>
<td>Table 6.1:</td>
<td>Techniques included in Appendix C</td>
<td>249</td>
</tr>
</tbody>
</table>
# LIST OF DIAGRAMS

<table>
<thead>
<tr>
<th>Diagram 1.1:</th>
<th>Diagram of a system</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagram 1.2</td>
<td>The Research Timeline</td>
<td>49</td>
</tr>
<tr>
<td>Diagram 2.1</td>
<td>Systems mapping (An A3 mind map)</td>
<td>83</td>
</tr>
<tr>
<td>Diagram 3.1:</td>
<td>Aspects of Integrated Design for ATO Business Intelligence Capability</td>
<td>126</td>
</tr>
<tr>
<td>Diagram 3.2:</td>
<td>Systemic and Holistic Work Design</td>
<td>130</td>
</tr>
<tr>
<td>Diagram 3.3:</td>
<td>How Do You Conduct a Coherent Conversation?</td>
<td>138</td>
</tr>
<tr>
<td>Diagram 3.4:</td>
<td>Analysis and Design of Intelligence Environments</td>
<td>146</td>
</tr>
<tr>
<td>Diagram 3.5:</td>
<td>A Work System</td>
<td>149</td>
</tr>
<tr>
<td>Diagram 3.6:</td>
<td>A Work System in Dynamic Relationship with its Environment</td>
<td>150</td>
</tr>
<tr>
<td>Diagram 3.7:</td>
<td>A Business Process, a Work System and a Complex Adaptive System Modelled Across the Organisational/Community Interface</td>
<td>156</td>
</tr>
<tr>
<td>Diagram 3.8:</td>
<td>A System of Social Ecology Enquiry</td>
<td>161</td>
</tr>
<tr>
<td>Diagram 4.1:</td>
<td>Work Systems Desk Guide</td>
<td>182</td>
</tr>
<tr>
<td>Diagram 4.2:</td>
<td>The ‘Five-Step, Many Step, Design as Dance’ Approach to Design</td>
<td>187</td>
</tr>
<tr>
<td>Diagram 4.3:</td>
<td>The ‘Six-Step, Many Step’ Approach to Analysis</td>
<td>190</td>
</tr>
<tr>
<td>Diagram 4.4:</td>
<td>Analysis Process and Deliverables Expressed as a Work System</td>
<td>192</td>
</tr>
<tr>
<td>Diagram 4.5:</td>
<td>Design of an Effective Work System in a Complex Environment</td>
<td>193</td>
</tr>
<tr>
<td>Diagram 5.1:</td>
<td>LB&amp;I Strategic and Business Intelligence</td>
<td>220</td>
</tr>
<tr>
<td>Diagram 5.2:</td>
<td>Applying DCASAL as a Work System</td>
<td>221</td>
</tr>
<tr>
<td>Diagram 5.3:</td>
<td>A Model of an Organisation as a Complex Adaptive System</td>
<td>230</td>
</tr>
<tr>
<td>Diagram 5.4:</td>
<td>An Illustration of an Organisation in Dynamic Relationship with the Broader Community</td>
<td>232</td>
</tr>
</tbody>
</table>
Diagram 5.5: A Model of a Complex Adaptive System 237
Diagram 5.6: A Problem Domain Viewed as a Complex Adaptive System 238
Diagram 5.7: The Thinking Rainbow 239
Diagram 6.1: The Namadgi Technique – The Four Major Components 246

Photographs in Narrative

Photographs 1 to 5 showing detail of Wall Map “Exploration of an Organisation as a Complex Adaptive System” 223-225
This is my story, a journeyman’s story, a gentle story of action research, creative design, social ecology and applied thinking and learning in the workplace. It is my story about aspects of my personal research that I have conducted the last seven years between 1998 and the time of writing, 2003, 2004 and 2005. The action research has taken place in four reasonably distinct phases, beginning with the first phase in 1998 and part of 1999, the second in late 1999 and 2000, the third in 2001 and the fourth in 2001 and 2002.

Having said that though, it could also be argued that the supposedly distinct phases tend to have fuzzy boundaries with fuzzy beginnings and fuzzy endings, each one tumbling inextricably into the other as if they were all interweaving threads and patterns of the one long design conversation and social ecology enquiry in which I have been engaged for the last seven years. This is certainly the case of the fifth phase, my current phase, that of the writing of this research thesis and my efforts to capture the essence and the outcomes of my seven year conversation and enquiry into practical ways for people in the workplace to analyse and design complex work systems.

There will of course be yet another phase.

This will be the ongoing reflection about my research and the making and re-making of meaning that will be part of my life, long after my studies with UWS Hawkesbury have finished.
Fuzzy boundaries, fuzzy beginnings and fuzzy endings, yet discernable phases of action research nonetheless.

While I am using my extensive research notes, taken at the time when particular aspects of the research and conversation occurred, to help inform my current writing, the bulk of this narrative is being written now with the benefit of hindsight and reflection. My filters are those of knowing what I know now and of being who I am now and of my current state of mind and personal and contextual circumstances. It is also reasonable to say that in the last seven years I have gained an extensive body of personal knowledge and experience. I am a different person from the one who set out eagerly and enthusiastically on this research journey in 1998. I have been shaped and influenced by experiences and conversations and learning along the way. I have changed, just as I have influenced changes in others, which in turn has added to the richness and complexity and wonder of the long design conversation and social ecology enquiry.

There is a tangled yet elegant reciprocity here. As I grow, I learn; as I learn, I grow. A journey through life expressed as a dynamic and complex adaptive system.

Over the last seven years and as a direct consequence of my research, aspects of my world views have changed; aspects of my relationships with both the work community and the social ecology research community have changed, as too have my relationships with the workplace and the broader environment. So it is important to acknowledge that while my current filters have been clearly influenced by the last seven years and that in this fifth phase, that of writing up the research, I am also trying to demonstrate a reasonable representation of my research from my perspective that I held when a particular phase or event occurred.
This narrative then is also a series of reflections on aspects of my research journey and my learning over the last seven years. It is as complete and as incomplete as any person's story can be expected to be, given both the current filters with which I write and the practical need to write a coherent and relevant work to qualify for a Master of Science (Hons) in Social Ecology. I can only hope that what I write is sufficient for the reader to see some of the story through my eyes and contextual concerns and through the many known and unknown filters of my clearly flawed character.

As a social ecologist working in a large public sector environment I sometimes sense that I am perceived by my peers and colleagues who have followed more traditional paths of accounting, commerce, law, management etc as the odd one out, someone who is similar yet different in some indefinable way. An example of the organisational paradox of being even slightly different: “he is one of us, and yet, at the same time, he isn’t”.

“Same, same, different”, as one of my colleagues in defence intelligence is fond of telling me.

Sometimes this issue of where I fit in bothers me, most of the time it doesn’t. In the last ten years as I have practised and honed my professional skills as a social ecologist I have come to realise that being different goes with the territory.

And so, I have worked as a journeyman applying my skills and capabilities and expertise to a wide range of complex organisational issues and problem domains, working with others in the workplace to design innovative and effective approaches for moving forward as a robust and sustainable learning community. As a journeyman I help others to learn, and to learn to learn, and then I move on.
This narrative is about my learning and my journeys over a seven year period as I worked with other men and women in learning to learn. I offer this story to you as from one journeyman to another.
A Reflective Moment

Summer; Early Tuesday morning.

Summer.
Early Tuesday morning.

Outside the study window the dawn breaks grey and warm.

18 degrees at 5 am. Relatively warm for a Canberra night in late December, 2002.

My study window faces south, looking into the carport and north-facing brick wall of the house next door. Between the carport and the window is the weathered and dilapidated paling fence that Jamie the dog, our four year old border collie, constantly threatens to knock down with his sheer weight and exuberance.

On my side of the fence partially obscuring the walls and other man-made structures is a three metre high lemon tree full of fruit, rounded oblong yellow shapes against a background of deep green leaves and grey-green branches. To the right of the lemon tree (viewed from where I sit) rises a majestic brittle gum, Eucalyptus mannifera, a beautiful white trunk that stretches twelve metres into the grey morning sky and carries with it wonderfully shaped branches that twist and turn in a design of constant surprises and which in turn support dulled dark red twigs with ends covered in an abundance of thin green leaves.

A slight breeze causes the leaves to ripple and the tops of the gum to sway in greeting to the dawn. A pair of eastern rosellas are sitting quietly in the lower branches while above a lone magpie begins an enchanting and melodic dawn chorus.
Misty the cat pads silently into the study and surprises me by jumping up onto the desk top and lying down across my writing papers. He wants his stomach tickled. I scratch him absent mindedly as I stare out the window through the gum to the sky and listen to the magpie calling out in full throat. A magpie mate answers from another tree in my garden, though both tree and bird are out of sight.

I love this time of day, the early morning in the house when the others are still asleep and the world outside is quiet and relatively cool and the native birds are gently creating songs of magic and wonder.

I came in here to write some of my thesis before Georgie and Sam wake to create mayhem with competing CDs and FM stations and outraged cries that they each have to use the computer immediately and as matter of extreme priority for a myriad of inexplicable, unknown and mostly unspecified teenage purposes. Secret and unintelligible teenage business. It is the school holidays and I have a few hours yet before I have to worry about either of them stirring. The hot summer nights and the late night TV have taken their toll, and Georgie and Sam have quickly developed a routine where they sleep in till noon and I don't see them until after I return from the office sometime towards six thirty in the evening.

Misty purrs and rolls over for attention to his other side.

I am thinking about what to say, how to start this critical chapter on paradigms and epistemologies and theoretical frameworks, how to sort out the relevant from the irrelevant and to present a wonderfully academic, erudite, coherent, compelling, concise and succinct argument. I sigh and think that this is not the way things ever are for me. The articulation of theoretical frameworks and
rationale behind the choices that I make and have made are always slightly more complex and convoluted and interrelated than I can easily write at first sitting. Choices have histories and fuzzy boundaries and have a tendency in the telling to blend into one another and lose their shape and slightly change their original meaning. New meanings emerge and sometimes the arguments and choices sound crisp and noble and marvellously informed and wise; sometimes the original reason is totally obfuscated, but still there, hidden behind a new facade; sometimes the original reason and meaning remain intact and stay whole in the telling and in the writing and so pass into history as they are.

Sometimes, as the teller, I just muddle the whole story and everything sounds thin and daft and suspect. Sometimes I forget facts and create new ones, sometimes accidentally, sometimes intentionally. Mostly though it is because the stories have already changed in my mind and become blurred with other events and narratives and meanings and interpretations from earlier tellings to other people in other contexts. This is where in conversation and verbal presentations I used slightly different words that had other nuances and shades of meaning and that gave rise to the emergence of totally unexpected political or social or cultural values and interpretations. From such conversations come new interpretations and new meanings. And these new interpretations and meanings may replace or build upon my early understanding and lead to whole new paths of thought and knowledge about the world.

Sometimes the meaning only really becomes clear to me long after the original events and conversations and meetings have faded from corporate memory. Sometimes it is only through the distance of time and assimilation with other knowledge and subsequent events and thoughts that I really start to realise the significance and deeper or meta-meaning of the events and conversations and design activities in which I have been involved. Often too it is only
through the discipline of writing, the discipline of purposefully shaping the events and thoughts and recollections with sentences and phrases and particular words and punctuation that the real meaning emerges for me. Well, at least one version of the contextual "real" meaning, one meaning and interpretation that others can access and read and interpret in their own contexts and ways.

Then there is also the issue of persona.

The different personas I adopt at the time of writing also influences the shaping of the meaning that I attribute to certain events and activities and outcomes. If I am writing letters to friends or short stories then I can be highly creative and allow my vivid imagination to run free and to follow paths and ideas that emerge through the writing and the act of writing. I can present many different shades and perspectives of being me. As the author I can introduce both a factual and a fictional "me" and I can then have both characters talk to one another. I can combine fact and fiction and news and ideas and humour and flights of fancy and genuine emotion and feelings to entertain and communicate very specific images and meanings to both myself as the writer and, hopefully, to the intended reader. I can change form from one paragraph to another, I can transgress the immutable flow of time and write in a creative mix of past, present, future, I can experiment and explore and write with great passion and belief. I can be the creative writer "me", a persona that brings me great joy and satisfaction.

Similarly, when writing for social ecology, I can write creatively and systemically and holistically, exploring the transdisciplinary nature of social ecology and expressing my "ecological voice" and consciousness. My appreciation of the world is operating in a constructivist paradigm with a relativist ontology and subjectivist epistemology and I can write from this perspective to others who
appreciate the world and life and human affairs being viewed and interpreted in this way. I can write of matters of the heart and of the spirit, as well as of matters of the intellect and the physical world and the infinite social issues and stories and concerns that arise from people living in the world. I can use myth and metaphor and stories and argument and formal structured logic. Not to mention fuzzy logic and sometimes even abductive logic. There is an heuristic element that I can bring to my writing, a notion of writing as an exploration of ideas and situations, a form of ongoing inquiry and a search through learning and research for meaning. Rather than writing with the voice of subject or situational authority, I write with the voice of a colleague hoping to engage others in collaborative approaches and coherent conversations. I can write with imagination of ideas and offer my interpretations and invite others to join in an ongoing conversation about the nature of things and to contribute their own ideas and interpretations so that together we can move towards a shared meaning and understanding.

A social ecology research persona.

When I am at work in the public sector however, I am the Director of the Work Systems Design and Research Unit in Strategic and Business Intelligence, Large Business and International Division, in the Australian Taxation Office. I work in the national headquarters, my persona is one of organisational and work systems design consultant, and I work with senior and middle management in a conservative and risk averse organisation to address problem situations associated with management practices, productivity and compliance. I also conduct social research and cultural analysis and I work with others to design and implement programs of effective and sustainable change. I am still a social ecologist and a systemic thinker however I write analysis and design reports for an audience of senior and middle management that is predominantly operating in a positivist paradigm, with an
realist ontology, objectivist epistemology and a reductionist quantitative approach to understanding both the present and the future.

In such an environment my professional competency and performance is constantly judged by my ability to take holistic, systemic and creative approaches, yet to communicate with senior and middle management in a positivist-informed corporate language, to frame my work plans in manageable short-term deadline-driven activities, to conduct "systems" and comprehensive analysis using reductionist methods, and to present findings and recommendations in quantifiable measures and "realistic" outcomes. The over-riding concern of costs and bottom-line and "more with less" and demonstrable guaranteed concrete results is expected to feature heavily in such reports and conversations and findings.

To add another level of complexity to this work persona, I also have different versions of the persona depending upon the contextual situation and audience. I give many presentations and facilitate a wide range of analysis and design activities and workshops. Depending on whether it is to senior or middle management or line managers and team leaders and staff, I may vary my use of corporate language, the style and tone of presentation, use different body language and gestures, and use different symbols and metaphors so that I am using symbols and metaphors and images that are relevant and known and the language-in-use of the particular audience. Different audiences in different contexts see different aspects of my self and the personas that I adopt. Similarly, depending on the language and vocabulary and tone that I choose for my written communication with them, I can, and do, present different groups of people within the organisation with different "realities" or at least different perspectives and levels of resolution about the same broad area of concern.
The eastern rosellas have long since left the brittle gum. A wattle bird is now hopping through the lower branches and commenting on the day with his harsh raucous call. A week ago there was a choir of cicadas in the gum tree, the first in a number of years, and it was a great pleasure to hear this quintessential sound of summer again. Georgie expressed some ambivalence about the sound, not sure if she liked it or not, while Sam, frustrated at having to momentarily turn up the volume on the TV, was loudly in favour of ridding the earth of all cicadas.

Sigh.

I am beginning to suspect that my social ecology genes and my love of nature have not been inherited by my son!

Different realities.

Different perspectives and values and interpretations of being and existence.

The notion of multiple realities is an extremely hard concept for many in the organisation in which I work. Mention concurrent multiple realities and people have been known to clutch their heads and groan in abject despair. It was on one such occasion when, to introduce an element of frivolity and levity into an otherwise dreary and uninspired meeting, I spoke in mock seriousness to some dedicated tax accountants about "that shadow side to postmodernism, multiple unrealities"! After a colleague and I had picked the two accountants who fainted off the floor and managed to calm the others down by administering coffee and reading a chapter from the Income Tax Assessment Act (1936) accompanied by an extraordinarily dull overhead showing debt collection results 1998-99 to 2001-02, I reflected quietly on this issue of
communicating across the paradigms. Why, I thought, is the concept of two different sets of account books instantly acceptable to some people, but not the thought that the books may both be valid reflections of two different realities existing in a company at any one time?

The idea was not worth pursuing. Situational leadership and knowing when to keep quiet are some of the basic tool kit and competencies for social ecology in practice.

Hmm!!

Now that I think about it, being a social ecologist and systems practitioner in a large hierarchical public sector organisation is not a career path I would recommend for anybody! It is no wonder that my research path has been such a danger to health and sanity and well-being! Nor is it any wonder that I keep being told by well-meaning colleagues that pluralistic approaches and emancipatory techniques and systemic appreciations are definitely career limiting attributes and behaviours!

A gentle tap on my arm from a white-tipped tabby paw reminds me that I have momentarily stopped adding value to this cat-human interaction. "Yes, but in whose eyes?" I ask Misty. He looks up at me with a benign expression as if to say "you worry too much, interpret it any way you will - just keep rubbing my soft furry tum."

Conversing with cats in early morns on matters of great post-graduate research import has never been highly successful or meaningful in my experience, at least in terms of research outcomes. It does, however, do wonders for the soul. I sigh again and wonder what it would feel like to climb a tree again. The great loquat tree in the backyard of my childhood, or the camphor laurels that ringed the Mosman Library in the 50's and 60's and that we
mucked about in while Mum and Dad selected their weekly novels and armchair travel books. Even if I could still manage to, where would I climb a tree these days? Perhaps a new tree, as yet undiscovered, somewhere in the Namadgi National Park just forty minutes drive from here, or perhaps I could just wander through the forests of mountain ash on the slopes of Mt. Aggie in the Brindabellas and find a spot to sit and watch the day go by…

A small flock of six or seven sulphur crested cockatoos wheels in a noisy formation across the sky calling me back to my original intention with their loud screeching cries. The morning is filling with light and I can hear the sounds of the suburb awakening. I put aside my daydreams and look down at the cat and decide on action. "Time for you to go outside, Pusscat Pusscat Pretty Lazy", I say to him as I gently lift him off the desk and place him on the floor, "I have work to do".

Misty responds to many names with equal good grace and favour. I have many variations of name for him depending on the context and circumstance, and I often call him a different name depending upon my mood and the moment. Misty, Misters, Mister Bisters, Uss, Usscat, Meow, Meowski Dowski, bloody cat! kitten, Pusscat, Purrcat, and my favourite, Pusscat Pusscat Pretty Lazy.

The last name came about from the ABC radio news broadcasts of about six or seven years ago, when seemingly for months I continually heard two names involved in various stories. One was the then Secretary-General of the United Nations, Butross Butross Ghali, the other was Chief Butalaze in Zimbabwe. I loved the repetition and the internal rhyme and I played in my mind with the names and juxtapositions of sounds:

Butross Butross Ghali, Chief Butalaze,
Butross Butross Ghali Butalaze,
Segue into
Pusscat Pusscat Pretty Lazy.

I love the way it rolls off the tongue and I often greet my cat by saying "hello my pusscat pusscat pretty lazy…" to which he always smiles in recognition and comes up to me for an affectionate rub and a purr.

The rest of the family on the other hand just call him Misty.

We are good friends, Misty and I, and we’re both comfortable with the myriad names. I also have other non-verbal names for him, just as he probably has for me. I watch him as he departs with a good natured "meow" and heads out towards the kitchen to check the food bowl and have a quick pre-breakfast dry food snack. I often wonder what he calls me in his mind or how he mentally conceives me and distinguishes me from other humans in his life.

Multiple identities and personas.

Multiple realities.

Multiple choices of author's voice.

Multiple theories.

Multiple theories on theories.

Multiple ways of knowing.
In the end, just one complex me to write the story, present the findings, and to see what emerges.

I turn back to the desk and focus on the task at hand. I pick up the pen and poise to write on the clean white page as I think "Where to begin to make sense of all this?"…
Chapter 1. Introduction

“I write because I want to find something out. I write in order to learn something that I didn’t know before I wrote it”.

Laurel Richardson
(Richardson 1994, p.516)

The purpose of this Introductory chapter to my thesis is to introduce the reader to the research topic, the context in which the research took place and the research design and method of enquiry. It is organised in the following manner (suggested by Anderson and Poole 1998):

1. A lucid, complete and concise statement of the problem being investigated.
2. A justification for the study.
3. An overview of the history and present status of the problem.
4. A preview of the organisation of the thesis.
5. Positioning the work in related theories.
6. A brief statement of the sources of the data.
7. A final reflection.
1. A lucid, complete and concise statement of the problem being investigated.

Introduction

I began my research in late 1997 & early 1998 with the intention of exploring and trying to address aspects of the following problem domain that I had frequently observed in the workplace:

Systems theories and methods, when introduced into large organisations often do not appear to be readily accessible, easily understandable nor immediately relevant to many operational managers and staff. The pressures of time, need for quick results, limited resources and office politic often mean people negate a systemic approach to design and problem solving in favour of the short-term “quick fix”. How, I asked myself, could the application of systems thinking methods and techniques be better introduced into the workplace and managers and staff encouraged to use such techniques?

The purpose of this narrative is to discuss critical aspects of my research over the last seven years, between 1998 and 2004, exploring a range of potential contextual answers and solutions to this focussing question.
Major outcomes from my research are:

- **Work Systems Mapping Technique**: A new practical technique for visualising and mapping work systems.

- **The Iceberg Analysis Technique**: An enhancement and adaptation of an existing technique for encouraging people to undertake a systemic and holistic exploration of a complex problem.

- **The six-step, many step analysis approach**: A new practical approach for the systemic analysis of complex work systems.

- **The five-step, many step design approach**: A new practical approach for the systemic design of work systems that need to function effectively in complex work environments.

- Accessible and understandable diagrams and documentation for use by managers and staff in applying these techniques in the workplace.

I have called this collective set of practical techniques and approaches the **Namadgi Technique**.

I believe that the practical techniques and approaches I have researched and developed during the last seven years in addressing the research question can provide managers and staff with effective ways to learn about, access and readily apply systems thinking to some of the complex problem domains that confront them in the modern public sector work environment.
2. A justification for the study

Working as a social ecologist and a business systems analyst within a large public
sector organisation over the last ten years I have been researching and developing
practical techniques for the application of systems thinking theoretical frameworks
and methods in the workplace. In particular, since 1998, as a University of Western
Sydney, Hawkesbury, School of Social Ecology post-graduate research student,
using critical learning heuristic and action research methods I have designed,
prototyped, trialled and implemented a range of practical techniques for use in the
analysis and design of complex work systems. (I am defining a work system here as
the purposeful and intentional combination of people, processes, technologies,
resources, intellectual capital and place to achieve a planned business outcome
(Bruce-Smith 2002)). These techniques are now being used by operational managers
and staff in the design of a range of work systems in my employer organisation, the
Australian Taxation Office.

A Meta-Hypothesis for an Heuristic Enquiry

In addition to the focussing question framing the direction and substance of my
thesis, I also began with a meta-level hypothesis (i.e. heuristic approach) that I could
bring aspects of social ecology and systems thinking together in the workplace in
practical ways for the benefit of other people engaged in the analysis and design of
complex work systems to enhance and improve organisational productivity and the
successful achievement of planned business outcomes.

In adopting a social ecology framework (University of Western Sydney, Hawkesbury
1996) for my enquiry I wanted to pursue two ideals. The first was that by
consciously adopting multi-disciplined approaches to social enquiry I could learn to
be more pluralistic, holistic, inclusive and creative in my analysis of complex work
problems, as well in my approaches to the design of systemic interventions to
address the complex work problems. The second ideal was that in striving to achieve
the first I could also find gentle ways to encourage my work colleagues to also
become more pluralistic, holistic and creative in their approaches to understanding and resolving complex problems. I wanted to learn new ways of thinking and understanding, and I was hoping that in leading by example I would also find ways to provide others with similar opportunities to learn.

This meta-level hypothesis has significantly influenced both the broad design of my research and my choice of the various paths I have followed during the last six years of my research and social ecology enquiry.

**My Professional Background and Practice**

I have been employed by the Australian Taxation Office (ATO) in Canberra for the last twelve years as an internal management consultant in organisational design, project management, business systems analysis, management practices, and in working collaboratively with others to explore and make meaning from complex problem domains. In the last six to seven years, I have been specialising in areas of strategic intelligence and knowledge management, with a particular emphasis on the design of effective strategic and business intelligence capabilities. This research thesis has been directly related to my work in the ATO.

I have over twenty years experience in both the public and private sector in the field of socio-technical systems design. I am a graduate of School of Social Ecology at the University of Western Sydney, Hawkesbury, where I gained a Graduate Diploma in Social Ecology in 1994 and a Master of Applied Science in Social Ecology in 1996. Since graduating with a Masters Degree I have described my professional practice as being that of a social ecologist.
3. An overview of the history and present status of the problem.

The narrative addresses the critical learning heuristic research as social ecology enquiry, my findings and my reflections during a seven year period from the beginning of 1998 until the end of 2004. During this period I initiated and conducted five major critical learning heuristic and action research cycles/phases in my pursuit of practical techniques for the analysis and design of complex work systems.

The Context in Which My Research Has Been Conducted

Let me briefly turn to the history of the problem domain and the context in which my research has been conducted.

I enrolled in a Master of Science (Honours) research degree at the beginning of 1998, because I wanted to do several things that I believed could be done concurrently and to the mutual benefit of each activity.

The first was to continue my ongoing research that I had commenced five years earlier when I enrolled in a two year part-time Graduate Diploma of Social Ecology at University of Western Sydney (UWS) Hawkesbury in 1993. This was followed by two years further part-time study in 1995 and 1996 for a Master of Applied Science (Social Ecology), also at UWS. A major focus for both these qualifications had been conducting action research in the organisation for which I worked, the ATO. The combination of action research, experiential learning, being part of a broader Social Ecology learning community and the encouragement to explore and conduct social research and enquiry in the public sector in my professional capacity as a project manager and business systems analyst, awakened gifts and abilities in my character that I had not previously understood or appreciated.
An opportunity began to form at work in mid-1997, where I believed I would be able to undertake some longer term action research over the next eighteen to twenty four months, and that such a research opportunity could be combined with further study for the Master of Science (Honours) degree. This became the second activity that could be done concurrently. Part of my even longer term plan and my motivation for doing this at the time was to use the honours degree to gain entry to the PhD candidature.

All this aside, however, the intriguing issue that I wanted to tackle was to explore the possibility of developing practical techniques that could help in the facilitation of ATO managers and staff using more systemic approaches in the analysis and design of work systems, business processes, Information Technology applications, client relationship management, compliance strategies, risk management and generally in the way they thought about and approached complex problem domains. This wasn’t all altruism; I also wanted to find such techniques for myself. This desire sprang from a number of factors and behaviours in the public sector during the late 1990’s that contributed to what I observed as the widespread use of clearly inadequate and inappropriate reductionist techniques and approaches when trying to address complex issues and problems.

**Many Projects, Yet Few Skilled Analysts**

In a large public sector organisation, like the ATO, there are often anywhere between an estimated one hundred to one hundred and fifty or more change projects being undertaken at any one time. Some of these may be major administrative projects involving many people, multi-million dollar budgets, fundamental legislative change, and possibly impact on the collection of billions of dollars in revenue. Such projects may take twelve to twenty four months to complete, sometimes longer. On the other hand there are also many much smaller projects that involve only one or two people, have a duration of one or two months, and address a very specific compliance risk and/or the design of an improvement to an existing business process, computer
application, form design, policy statement, organisational arrangement etc. Then there are also the many mid-sized mid-range projects in between.

To my mind, this implied that a huge amount of analysis and design activities were, and are, being undertaken by various people and projects throughout the organisation at any one time. I would reasonably expect that, with these analysis and design activities, I would also see the production of written reports, auditable and transparent decision-making and definitional work that ensures clarity of meaning, clarity of intent and shared organisational understanding. This, however, is not always the case, and I have observed over the years that many projects not only fail to deliver on their initial enthusiasm and optimism through subsequent inadequate analysis and impoverished design, they also fail to add to the corporate intellectual capital through poor information management and knowledge management techniques and practices. Many projects seem to put more effort into a “we are making a better world” hype and type of marketing at the beginning of large projects than they put into the application of professional analytical approaches and techniques. Some of the more clearly observable reasons for project failure are the lack of systemic analysis, the application of limited linear approaches to design rather than holistic approaches to design, and the inability of individuals and groups to challenge assumptions or to undertake critical questioning and reflective reviews as a fundamental component of their repertoire of project activities and behaviours. These are not the only reasons, nor are they necessarily evident in every case of a project not delivering on expected outcomes or failing to survive through to completion. The heady mix of a dynamic organisational environment and the interplay of the many individual personalities and wide variability of the capabilities of people involved in the projects presents a far more complex landscape than that. Beyond the internal organisational factors and forces, it is also necessary to consider the often rapidly changing political and economic environment that influences and shapes public policy and public sector activity.
Wanting Project Staff with Professional Capabilities

I was not intending in this thesis to tackle the enormity and endless fractality and spiralling, swirling, fuzzy nature of this dynamic and ever evolving problem domain. However, I am an experienced and professional project manager who employs project staff and business systems analysts, and both I and those senior managers for whom I work depend on these people to work with me in delivering high-quality project outcomes. From this perspective I have a major interest in the very real issues of having project staff with professional capabilities in the areas of analysis, design, and critical thinking, and who can apply these skills effectively and creatively in dynamic, ambiguous and complex environments.

Contributing Factors and Academic Texts

In late 1997, when I began to explore this situation in some detail, I realised that one of the contributing factors was that people were not introduced through any formal skilling program to using systems thinking in the workplace. At best some people may have been fortunate to attend a one or two-day problem-solving workshop with a management consultant, but for whatever reasons, the transfer of skills and knowledge from “expert” consultant to participant was very poor. Those people with whom I spoke and who had been involved in this type of “semi-training” workshop often expressed their confusion about the systems techniques they were shown or that the consultant had used, e.g. viable systems method or causal loop analysis, and they rarely had the confidence to try the technique for themselves. I also found that the reference books and textbooks by which people might individually learn about system thinking methods and techniques were:

- rarely to be found in the workplace,
- not actively encouraged in the workplace as part of the creation and maintenance of a robust learning environment,
- written in an academic and relatively dense language,
- far too theoretical for the average public sector office environment,
illustrated in such a way that they rarely contained readily understandable diagrams or clear processes to inform the reader how the various systems thinking techniques may be applied in practice.

I include in my scope here influential and often cited authors and texts such as:


A Difficulty for Managers and Staff

This is not meant to be a criticism of the above authors or their respective works. I have great deal of admiration for the scholarship, thinking and skill with which each author has approached their respective work, and I find each of the books insightful and of use to me in my professional work. I am using the list here to illustrate the point that if a manager or staff member in a large public sector environment wanted to gain some first hand knowledge and understanding about systems thinking or the implications and application of complexity thinking, he or she would probably try to read one of the world leading authorities included above. That is if he or she knew that such books existed, or if he or she could find a copy of one in the workplace or possibly the department library. Then, on trying to read any particular author, he or she may find the work too dense, too conceptual, and full of a vocabulary that is both academic and very different from the workaday language of the office. Such books take time to read and to think about and to absorb. If you are like most people trying to understand new ideas and concepts you may feel the need to be able to discuss
your reading and the new ideas with someone else who also knows about the work. This is easier said than done in the public sector workplace. You may be looking for a reasonably straightforward process or approach that you can take from the book and try in the workplace. Instead you may find that, even if you could recognise the process or technique among the densely written pages, it is difficult to extract concise information or practical process from the endless qualifications and notes that seem to accompany every diagram and recommended concept.

One of the issues is, of course, that these books are written often for use in an academic context, and there is often an assumption that the reader (for example, an undergraduate or postgraduate student) will have a certain level of critical ability and background knowledge of the subject matter, as well as time to absorb the new ideas and learn. This is very far from being the case in the context of an individual public sector manager trying to catch up on what may, more often than not, turn out to be the latest management fad, or simply trying to undertake some self-directed learning to improve his or her knowledge of different ways of thinking about the world. Many people in the workplace who would like to know more about ideas and concepts informing the current discourse about organisational design and strategic planning in a knowledge economy simply do not have a language-in-use that enables them to easily read and understand many of the primary source texts that they may find on management bookshop shelves. This is not to suggest that people are not capable over time of learning and understanding, it is simply the observation that many of my colleagues and peers find it a very difficult undertaking in the short-term.

There are two further aspects to this issue that I want briefly highlight.

Many traditional managers perceive that the act of learning about new ideas and areas of knowledge that are not immediately relevant to the “bottom line” or operational task at hand is clearly outside the boundaries of organisational concern, and therefore is perceived to be outside the scope of normal acceptable management practices. In other words, reading and discussing theoretical ideas at work about potentially more effective ways of making meaning from complexity are actively discouraged. In the language of the Australian public sector at the beginning of the 21st century, this potential for self-directed learning behaviour is considered to be
neither “core business” nor relevant to achieving productivity targets established between a public sector agency and the Department of Finance in an Output Pricing Agreement (ATO Annual Report 2001-2002).

The second associated aspect is that the act of thinking more widely, beyond the current organisational boundaries, by initially referring to expertise and knowledge in written texts is rarely encouraged by middle or senior management. This is particularly observable in the large administrative organisations such as the ATO, as opposed to the more policy oriented government departments, where a literature search as part of a more robust research method is more likely to be an expected and accepted management practice.

**Patterns of Poor Thinking and Research Behaviour**

Over the last fifteen years I have been asked to facilitate many, many analysis, design and problem-solving group activities and workshops in ATO National Office and Branch Offices throughout Australia. And, year after year, I keep seeing the same problematic research behaviour repeated by novice and experienced managers and researchers in project teams alike. This behaviour has a number of key characteristics:

- A poor individual and collective understanding of the differing dynamics of research, analysis and design activities and approaches.

- The problem solving group/ project team tends to be internally referenced for ideas and direction, that is, they look for solutions within what they know and have previously experienced of the ATO patterns of thinking and behaviour.

- Similarly, problem domains are described in terms of a proposed design solution and the subsequent analysis by a project team/ research group is conducted to justify the initial design solution and/ or to support the “answer”
proposed initially by someone in the hierarchy with a higher authority and power to influence careers and promotion.

➢ There is a very strong parent-child relationship exhibited where the project team believe that the “answer” will be provided by the senior managers who commissioned the work. A sub-set of this characteristic is the belief by middle managers and staff that the senior management know the complete answers but “just have not got sufficient time in their busy schedules to fully articulate it to middle management yet”. I have also observed on occasion where this corporate myth of senior management “wisdom and knowing” is quite deliberately perpetuated by individual managers and/or networks of managers. It is my belief that this dependency on the senior management parent for the “answer”, at once limits initiative, creativity and an individual’s growth and development as a mature adult. It also leads to clearly observable extensive project delays, poor design solutions and often convoluted rationalisations to justify relatively mediocre design and project outcomes. From my observations and close involvement in a number of high-profile examples of this type of behaviour, I would also suggest that as neither project evaluation nor senior management accountability for specific poor results is a common feature of the wider ATO and public sector management practice, it is not surprising that such behaviour is one of the many aspects of corporate behaviour that Argyris (1993, p.98) refers to as ‘organisational defensive patterns’, and that Egan (1994, p.4) so readily and aptly refers to as the shadow side of management that ‘deals with the covert, the undiscussed, the undiscussable, and the unmentionable’.

An Epic Epistemic Struggle

One perspective of this is to imagine the organisation in a constant state of unrest and churn where many people are caught up almost unconsciously in an epic epistemic struggle between those who seek to learn and to evolve and to embrace the endless wonder of life, and those who see the world as a dangerous ill-disciplined place that
needs to be endlessly regulated and controlled and to have a blanket of sameness and uniformity cast over the landscape. A great difficulty here is, of course, that we often have both aspects of this struggle in our own individual complex characters and natures. At different times and in different contexts I may clearly identify with one over the other. Other times I may be neither, and yet even other times I may be both. We are curious, changing, complex multi-dimensional beings each with unique personalities, identities, inner thoughts and sense of self. Yet between 8 am Monday and 5 pm Friday in the Australian public sector I may see many people walk freely into their office work environment where they cloak themselves in the mantle of sameness and adopt a positivist reductionist language of control and predictability. At the same time I may see others who bring to the workplace demonstrably buoyant and jubilant levels of enthusiasm for learning and sense of curiosity and wonder about the world. Each influences the other, the epic epistemic struggle first favouring one view then the other, an endless ebb and flow of organisational rhythm that is part of the unseen fabric of people’s daily working lives.

Book Sought, Yet Left Unread

On a more prosaic note, I have observed over the last ten years that, despite all the active and passive discouragement, many people throughout the organisation, including senior managers, middle managers, team leaders, and staff at all levels, do borrow a library copy or buy their own copy of management books that they believe will give them insight into different ways of thinking and new areas of knowledge. Such areas might include the key ideas that are influencing and shaping organisational directions, knowledge management, client service management, public policy, community relations, information technology, the future of work and the workplace, and any of the many areas of subject speciality in which they may be involved. However, from the innumerable conversations I have had with colleagues over the years in the fields of systems thinking, complexity theory, strategic management, intelligence and knowledge management I know that many books are bought or borrowed with enthusiasm and great interest, but after just a few pages are
left for a whole range of reasons by the reader among a pile of other books and papers that “I must find time to read one day”.

Two Texts that are Easy to Access and Read

I should add here that one of the few books that is easy to read and understand and in which can be found ideas and techniques that can be applied in the workplace is Peter Senge’s et al (1994) *The Fifth Discipline Fieldbook: Strategies and Tools for Building a Learning Organisation*. Nicholas Brealey Publishing, London.

Similarly useful is O’Connor & McDermott (1997). *The Art of Systems Thinking*. Thorsons, Great Britain, which provides a straightforward introduction to systems thinking concepts and causal loop analysis.

The drawback with both texts are that they have a North American view of systems thinking, they both are heavily influenced by Jay Forrester’s work on system dynamics and do not include nor acknowledge the contributions and works of other authors and soft systems or critical systems advocates such as Vickers, Churchman, Checkland, Scholes, Reason, or Flood & Jackson. Nonetheless both books are readable, accessible and contain a range of practical techniques and approaches. Unfortunately, I rarely see a copy of either of these books in my travels through the office, though I do occasionally come across a project manager or business systems analyst who may refer to aspects of Senge (1994) every now and then.

My Early Work in this Field

As part of my combined earlier work for the ATO and my previous studies in Social Ecology, I had designed and implemented a number of practical analytical techniques that drew on systems theory as well as adult learning and experiential learning and that were presented in a relatively straight-forward language-in-use that most people I worked with could and did readily understand. The action research to
design, prototype, develop, implement and evaluate these practical techniques formed a major part of my work for the GDSE and the MAppSc (Soc.Ec) qualifications. I also presented papers on the work mapping technique (Bruce-Smith 1995) at the 1995 British Academy of Management Conference in Sheffield, U.K., and at the 1995 1st Australian and New Zealand Systems Thinking Conference in Perth, W.A. The second major technique I developed was for conducting a visual representation of systemic analysis across the organisational/ community interface (Bruce-Smith 1996). This became the subject of my conference paper and presentation at the 2nd Australian and New Zealand Systems Thinking Conference held at Monash University, Melbourne in October 1996. Both the work mapping technique and the interface analysis technique are still used extensively as practical tools for the analysis of work in the ATO.

**Fifteen Years Experience in Socio-Technical Systems Design**

While I was by no means completely familiar with the wide range of systems thinking approaches and techniques, I was a business systems analyst with (then) fifteen years experience in the application of socio-technical systems design principles and techniques in the Department of Defence, the Defence Housing Authority, the Australian Taxation Office and the Capita Financial Group. My professional quest for practical techniques came directly from my experience in each of these organisations in trying to find more meaningful ways in which people could participate in the analysis and design of work systems. Most systems analysis techniques had been designed for use by a skilled management consultant (eg Viable Systems Methodology, Soft Systems Methodology) or by people working in the field of applied information technology (eg Entity attribute data modelling, data flow diagrams, ATO Information Systems Development Methodology). I was interested in how people could participate meaningfully in the analysis and design of work systems, particularly those work systems that would directly impact and influence the type of future work that those people may be expected to do and/ or influence the design and shaping of the physical working environments in which the work may
take place. I believed that there was a need for practical techniques that helped to give people a voice in the design of work and the design of organisational change.

**Integrated Design Manager in ATO Project Bijou**

In terms of ATO organisational context, in January 1998, I was the Integrated Design Manager for a newly initiated ATO large business system development project called Project Bijou. Part of the challenge for this project was to use a range of traditional analytical techniques, as well as more systemic approaches, to design a suite of integrated work systems and Information Technology applications that would support management and staff in achieving a range of ambitious and sophisticated business outcomes. Part of my role was to make this happen. To do this I believed at the time that I needed project staff who understood systems thinking and who could use systems thinking techniques in the conceptual design as well as in the detailed design of the new integrated work systems. How I went about this is the subject of the initial action research narrative about Action Research Cycle 1 that I describe in Chapter 2.

**The Emergence of the Namadgi Technique**

Mostly though, I want to tell the story of how a relatively small personal inquiry evolved through a number of iterations and over a period of seven years to emerge as a set of approaches and practical techniques that I am collectively calling the Namadgi technique. This Namadgi technique is now being used by managers and staff in the ATO.

The emergence of the Namadgi technique is a result of my heuristic enquiry and cumulative learning, and is progressively documented in the unfolding narrative of Chapters 2, 3, 4, 5, and 6.
4. A preview of the organisation of the thesis.

A Journeyman’s Story

As the thesis title suggests, this narrative forms in part a journeyman’s story, the story of my research journey of exploration and discovery, and of my cumulative reflections and learning over the seven year period between 1998 and 2004. I have therefore designed my thesis to follow a pattern of unfolding research activity and the articulation of cumulative reflection and learning. I have done so within a traditional thesis structure (Anderson & Poole 1998, p.95) where Chapter 1 represents an introduction to the research questions and focus, an interpretative framework and an outline of the research activity, as well as an initial discussion of the contextual problem domain, and the research design methods and techniques.

Chapters 2, 3, 4, 5, and 6 form the main body of the text and represent the narrative of the research activity, expressed as five key stories of my journeyman’s experience and follows the major critical learning heuristic and action research phases that constitute my research enquiry.

Chapter 2 is an initial exploration of systems thinking and systems mapping techniques within the context of the ATO Project Bijou. My initial research question in early 1998 was: “Would an educational approach to learning about systems thinking be an effective way of introducing people to systems thinking techniques and to skilling people in the practical application of those techniques?”

In addressing this question, part of the initial exploration involved a collaborative learning and research partnership formed in 1998 between the ATO Project Bijou and Professor Richard Bawden at the Centre for Systemic Development, University of Western Sydney, Hawkesbury to introduce project managers and staff to systems thinking. Key to this initial exploration was the direct engagement with systems theory and systems thinking techniques, particularly Soft Systems Methodology (Checkland and Scholes 1991), Critical Systems Thinking (Midgley 1996), Viable
Systems Method (Beer 1985), and Richard Bawden’s notions of systemic learning and being systemic (Bawden, McKenzie and Packham 1998). The insights and understanding of systemic approaches and the implications for adult learning approaches became a foundation body of knowledge that I was to draw on many, many times over the next five years. Chapter 2 also briefly explores aspects of the application of the initial learning and the systems thinking techniques to ATO project work associated with Australian Government’s Tax Reform in 1999.

Informed by the learning and findings of the initial research, and by my growing understanding of the contextual shortcomings of available systems thinking techniques described in Chapter 2, I set myself a new major research question: “Given that the techniques we explored in 1998 only went so far, could I develop a set of practical techniques specifically for use by business systems analysts and project officers involved in the analysis and design of business and work systems in complex environments, particularly in an intelligence and knowledge management environment?” There was also a second question here: “Assuming that I could design a set of practical techniques, how could I most effectively introduce techniques and train people in the use of the techniques?”

Chapter 3 explores my research and development of an initial set of practical techniques for the analysis and design of complex work systems within the context of the ATO Jacaranda Project during 2000. This research included a greater exploration of complexity and chaos theory as well as the engagement of aspects of social ecology theory and the use of adult learning and experiential learning in the design of the visual techniques and an associated training program. The Jacaranda Project involved the analysis and design of an ATO strategic and business intelligence capability, and through my work in this project the application of the new techniques such as the “five-step, many step” design model and the “iceberg” technique were to become, over the next few years, fundamental tools for people working in ATO areas of intelligence, risk analysis and compliance management.

Chapter 4 continues within the context of the Jacaranda Project with the brief story of the second iteration of the design of the practical techniques during the first six months of 2001. My research questions here at the beginning of 2001 were: “What
had we learnt so far?”; “Could I improve on the initial set of practical techniques and the introductory training workshop?”; “How might I encourage managers, business systems analysts and other staff to use these approaches and techniques in the workplace?” Chapter 4 also addresses the design of new techniques, particularly the three approaches to systemic analysis and the “six-step, many step” analysis model, in response to an emerging understanding from the earlier research activity and experience described in Chapter 3.

Moving on from practical techniques for the analysis and design of complex work systems, Chapter 5 explores research I conducted in late 2001 and early 2002, to develop from complexity theory, systems theory, social ecology theory and first principles, a practical model of a complex adaptive system, so that this model could inform and provide insight to managers and staff engaged in analysis and design activities. This continuing research was based on my observations and feedback from people that, while they understood the systems thinking techniques, they were struggling to understand the implications and significance of complexity theory in relation to the analysis and design work that they were being asked to undertake. In response to this feedback I asked myself: “Could I develop models of organisations as complex adaptive systems that would help others to visualise and understand these concepts more easily?” In Chapter 5, several different models are explored and there is a brief discussion about the different ways in which I have introduced these models, and how I now use these models in the workplace.

Chapter 6 is a brief story of both synthesis and ongoing exploration and discovery. By the end of 2002, I had a comprehensive set of documentation for introducing and training managers and staff in the use of these techniques, however, I now wanted to address the design of a booklet specifically for use by myself, one that I could use in my professional practice and that was not contextually linked to the language and management culture of the ATO. My research questions became: “What is useful to me in my practice as a social ecologist, a facilitator and a management consultant? What may be useful to me in other organisations and work contexts? What would I want in booklet specifically for use by me? How would I want to arrange the information and which specific techniques, information sets and diagrams would I include in my booklet? What did I want to capture from my learning over the last
five years?” In exploring these questions, Chapter 6 briefly addresses the bringing together of the cumulative learning and the emergence and development of the Namadgi Technique. The Namadgi Technique is the name I have given to the suite of systemic approaches and practical techniques that I now use in the analysis and design of complex work systems, and that I have introduced during 2003 and 2004 to many ATO managers and staff through a comprehensive training program and specifically designed visual and written documentation.

Chapter 7 details a summary of my research findings, and Chapter 8 my brief Conclusion.

There are also five Appendices: the first, Appendix A, is a brief extract from a personal book I wrote and compiled in 1999 entitled “David’s Book of Living and Being”. This book was an important development in my being able to conduct this ambitious post-graduate research project at the same time as leading and managing organisational project activities and outcomes in a complex adaptive organisation.

The second, Appendix B, is an occasional paper I wrote in February & March 2004 and that presents a visual and part-diagrammatic narrative of the logic I have used in the development of the work mapping technique.

The third, Appendix C, is an extract of key components from the Namadgi Technique that are included in a much larger work that forms the third prototype of my journeyman’s toolkit.

Appendix D, is a brief example of some of the range of ideas and applied knowledge about systems, systems thinking and systems mapping. It contains quotes from various influential authors and thinkers, and goes beyond the fields of management problem solving and organisational design to include definitions of systems from ecology, landscape design, systems engineering and ecopsychology.

And finally, Appendix E, is a list of interview questions used during November 1999 in evaluating the ‘Leadership in the Design of Complex Systems’ training program (see pp. 90-91).
For a number of reasons I have not written of the many details about the specific broader ATO projects in which I conducted the action research between 1998 and 2002. Instead I have focussed the narrative on my personal experience in leading, designing, conducting and evaluating the heuristic research and on the emergent learning and understanding generated by the research that I conducted within the broader project. The exception to this is where a contextual understanding of aspects of the broader ATO project in which I was involved and the prevailing organisational politic are necessary for understanding the choices I may have made or for appreciating the organisational factors limiting my course of action. The reasons for this approach are:

- Writing about the broader host ATO project and complex organisation will result in far too much needless detail and laborious exploration that does not alter or effect the research outcomes,
- Issues of maintaining particular individuals’ privacy,
- Issues of maintaining aspects of ATO security, secrecy and confidentiality,
- By confining the scope of my narrative to my experience of the action research I am better able to avoid the complicated descriptions and extensive explanations that would be necessary to fully understand the complex nature of the internal ATO politic and heterogenous environment.
5. Positioning the work in related theories.

Three Key Clusters of Theory

There are three key clusters of theory informing my thesis and qualitative social research approach.

While these three clusters overlap to some extent, for the purposes of this narrative they can be broadly regarded as;

- An interpretative framework based on a constructivist paradigm, a relativist ontology and a subjectivist epistemology;
- Social ecology as a method of enquiry and as a praxis of principles in action;
- Principal theories-in-use:
  - Systems theory and systems thinking,
  - Complexity and chaos theories and exploring organisations as complex adaptive systems.

Let me briefly address each of these.

1. An Interpretative Framework

The meta-theory level that informs my research and my narrative is a framework suggested by Guba and Lincoln (1994, pp.108-117) in an effort to state simply what is actually a complex set of ideas and perspectives: my interpretative framework comprises a constructivist paradigm, relativist ontology, subjectivist epistemology, and heuristic and hermeneutical methodology.

The Centre for Systemic Development shares Guba and Lincoln’s interpretative framework (www.uws.edu.au.csd/paradigm.shtml 14/04/02) and encourages the adoption of a “constructivist paradigm as a useful tool to generate dialogue and
While I work in a corporate world of other more predominant paradigms and epistemologies, such as positivism, reductionism and objectivism, I find the constructivist paradigm to be both intellectually and spiritually liberating and a very powerful framework with which to engage others in the search for meaning and in making sense in complex human, social, and organisational problem domains. This understanding has developed over time as a direct outcome from my research, and for me it is probably one of the most important outcomes of my studies and research.

Social ecology as a multi-disciplinary and trans-disciplinary field of inquiry (www.uws.edu.au/serg/researchdomian.htm 29/01/02), is clearly positioned within a growing tradition of qualitative social research, and as social ecologist and a post-graduate MSc (Hons) research student with the University of Western Sydney School of Social Ecology and with the associated Centre for Systemic Development, I felt simultaneously greatly challenged, intellectually stimulated and liberated, and enormously privileged in being able to take a multi-disciplined approach to my research and being included in a social ecology learning network as one who “shares a passion and energy for working in complex social systems with critical awareness” (www.uws.edu.au/csd/credo.shtml 15/04/02).

### 2. Research Method and Approach: Social ecology as a method of enquiry and as a praxis of principles in action

Crotty (1998, p.216) concludes in the *Foundations of Social Research* that “as researchers, we have to devise for ourselves a research process that serves our purposes best, one that helps us more than any other to answer our research questions”.

I designed my research as a social ecology enquiry in which I combined a critical learning approach with an action research that I modified and adapted to my
contextual environment with the inclusion of project management techniques, critical systems thinking, fuzzy logic, creative design, and the personal awareness of trusting my intuition and exploring opportunities as they emerged during the course of the research. I describe this in more detail below.

My Background in Research Method

My choice of research method was to use an action research approach adapted and modified to the various organisational and management contexts that I was operating in and the Australian Public Service and ATO environments.

I had been successfully using action research in the ATO and as a UWS Social Ecology postgraduate coursework student for a number of years. This experience included the use of action research for both short and long term research and design projects to achieve a range of productivity improvements. Notable successes included the development of work mapping techniques (Bruce-Smith 1995) in 1993 to 1994, analysis techniques in organisational re-design and productivity improvement (Bruce-Smith 1996) during 1994 to 1996, as well as the development of a work force planning framework and in national approaches to work and job design under new industrial relations conditions e.g. ATO Agency Agreements, during 1996 and 1997 (see Bruce-Smith 1997 & 2000).


During the 1990’s, with growing confidence and experience, I had developed, as a personal and locally applied technique, a very effective action research approach comprising the three key phases of:
- Defining the initial hypothesis and/ or proposition for change;
- Taking action to explore and test the hypothesis and/ or proposition; and
- Reflecting, assessing, evaluating.

Leading to the next action research cycle or analysis / design iteration of:

- Re-defining an enhanced hypothesis/ proposition and/ or developing a new hypothesis/ proposition (including the option of no further action or research) based on an evolving understanding and on the changing organisational context.

This meta-model of an action research approach is also very similar to Roger Packham’s presentation of the Action Research Spiral introduced by the University of Western Sydney, Hawkesbury, as a model for Participative Action Research and for systemic action research (Packham 1997, pp.39-41). The Action Research Spiral comprises the three stages of:

- Planning,
- Taking action and observing, and
- Reflecting and evaluating the results and emerging outcomes.

This modified approach to action research worked extremely well because I had adapted it to meet a range of conditions, behaviours and management expectations and practices in relation to organisational research and analysis and design projects in an ATO environment. The most notable adaptation here was the integration of action research and heuristic approaches with project management methods and techniques.

During the period 1996 to 1998, Hames and Oka (1997) had introduced into the ATO the concept of Strategic Navigation for which the application of a personal and organisational level critical learning heuristic was the dynamic driving force that encouraged constantly sensing and making sense of the external and internal environments, assessing priorities and needs, re-aligning organisational resources
and internal capabilities to meet changing niche and business outcomes. Taking action to rapidly change, adapt, evaluate etc.

By the beginning of 1998 I was using a critical learning heuristic approach, with its explicit experiential learning model and process at two levels, one at the personal level as a meta-learning, reflection, design process, and the other at an organisational and management level.

**My Research Design in 1998.**

In designing my research approach in early 1998, I used a critical learning heuristic approach with an action research method that I modified and enhanced to meet the conditions and circumstances of my contextual working environment in the ATO.

The enhancements included the integration of an action research design framework with an ATO project management discipline and practice expected of me in my professional capacity as Integrated Design Manager on Project Bijou.

Other contextual enhancements included the emphasis on emancipation through opportunities to learn and grow through participation in my research, rather than a broader democratic notion of participation where individuals in a whole research group may have equal voice. There was a very practical recognition of the professional responsibilities of myself as a manager and the clear understanding of the ATO organisational management culture and its very low tolerance for broad participative approaches and practices. The emancipatory approaches I adopted included developing opportunities for cooperative research by establishing communities of interest and practice, particularly in relation to strategic intelligence and knowledge management capabilities, as well as encouraging my colleagues and peers to engage in long-term ongoing design conversations about the changing nature of work and systemic approaches to the design of effective work systems in complex environments.
I should also add that even my experience in conducting action research in more tolerant organisational conditions during the early and mid-1990’s had led me to the belief that in a geographical dispersed team working out of different cities and given the hierarchical, conservative and risk-averse nature of the ATO, action research needed clear leadership to motivate others, to shape the research, and to continually create meaning and context in a dynamic changing environment. Without such leadership, participative research approaches, after an initial enthusiastic start, very often simply founded and dissipated. Similarly, leadership was essential to make timely and well-informed decisions to resolve individual and political conflict and boundary disputes and to navigate successfully through complex issues arising from the inevitable tensions between people engaged in innovative, participative, and emancipatory research approaches in a hierarchal, deterministic and conservative organisation. The role of leadership and sound project management techniques became essential to the application of heuristic approaches and to any form of innovative and creative research if the research was to survive and produce outcomes that found credibility and useful application within the organisation.

A second major adaptation was the integration with critical systems thinking, particularly using the notions of Critical Awareness and Methodological Pluralism to rapidly re-assess the changing organisational priorities, moods, and the sometimes vastly different contexts and working environments experienced by managers and staff in National Office to those experienced by managers and staff in various geographic regions and specific Branch Offices (Bruce-Smith 2000).

There were two other key modifications and adaptations to my action research method. The first was the recognition and use of fuzzy logic as a management tool for dealing with ambiguity, paradox and evolving complex problem domains, and as a methodological approach for qualitative social research, an approach suggested by Woog, Dimitrov, and Kuhn-White (1998, pp.105-116).

The second was enabling me to accommodate my personal preferred behaviour and learning style of creative design, day dreaming, reflection and the use of the national forests, flora and fauna reserves and parks as a physical workspace as well as a
source of inspiration and an analysis and design metaphor in the more traditional office environment.

**Research Methods and Techniques.**

“A strategy of inquiry comprises a bundle of skills, assumptions and practices that researchers employ as they move from their paradigm to the empirical world”. (Denzin and Lincoln 1994, p.14).

Within the combined critical learning heuristic and action research framework I have used a wide range of research techniques over the last six years. These techniques are included in Table 1.1.

<table>
<thead>
<tr>
<th>Table 1.1</th>
<th>Research techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitation and participation in many, many workshops</td>
<td>Creating physical design spaces in which to work</td>
</tr>
<tr>
<td>Meetings (formal &amp; informal)</td>
<td>Case studies</td>
</tr>
<tr>
<td>Interviews</td>
<td>Design and evaluation of questionnaires</td>
</tr>
<tr>
<td>Observations</td>
<td>Feedback sessions</td>
</tr>
<tr>
<td>Group discussion</td>
<td>Focus groups</td>
</tr>
<tr>
<td>Scenario planning</td>
<td>Meditation</td>
</tr>
<tr>
<td>Narrative</td>
<td>Reflection</td>
</tr>
<tr>
<td>Conducting and facilitating experiential learning workshops and activities</td>
<td>Interactive diagnostic presentation sessions with senior and middle managers</td>
</tr>
<tr>
<td>Story-telling</td>
<td>Conducting on-the-job training</td>
</tr>
<tr>
<td>Analysis conversations</td>
<td>My own experiential learning</td>
</tr>
<tr>
<td>Design conversations</td>
<td>Use of creativity and imagination</td>
</tr>
<tr>
<td>Coherent conversations (Woog 1999)</td>
<td>Creative writing</td>
</tr>
<tr>
<td>Literature reviews and reading</td>
<td>Play</td>
</tr>
<tr>
<td>Attendance at conferences, presenting refereed and non-refereed papers at conferences</td>
<td>Bushwalking as a an opportunity for thinking, reflection and &quot;replenishing the well&quot;</td>
</tr>
<tr>
<td>Whiteboard sessions to explore ideas and conduct brainstorming etc</td>
<td>Designing techniques and models from first principles</td>
</tr>
<tr>
<td>Creative design</td>
<td>Reflective/ reflexive writing techniques</td>
</tr>
<tr>
<td>Wall mapping and rich pictures as individual exploration activity and research and as participative and interactive group activities</td>
<td>Incessant note taking and the chronological and subject cataloguing of my increasing volume of research notes and observations</td>
</tr>
<tr>
<td>Work systems and workspace analysis and design</td>
<td>Encouraging creativity and imagination in others with whom I work</td>
</tr>
<tr>
<td>Writing organisational papers that document from an ATO perspective my progressive findings and outcomes, and that can be critiqued by my peers</td>
<td>Collating my many analysis, design, project management and facilitation artifacts e.g. models, diagrams, workshop outlines, plans, that I have designed and used as part of this meta social ecology inquiry and thesis research</td>
</tr>
</tbody>
</table>
By taking a qualitative social research approach in the form of a social ecology inquiry and the use of a modified action research technique, I was ready to be informed by all that I read, but at the same time my critical judgement has its foundations in seeing what was actually useful for managers and staff in their workplace contexts. That is to say, I was not making critical judgements purely on the basis of some objective pre-determined organisational or management criteria, rather my approach was also subjective, contemporaneous, and informed by the ideas of methodological pluralism and contextual relativism, qualitative social research and social ecology as a multidisciplinary and transdisciplinary field of inquiry.

3. Principal Theories-In-Use

- Systems theory and systems thinking
- Complexity and chaos theories and exploring organisations as complex adaptive systems

My enquiry has been primarily concerned with systems theory and systems thinking methods, as well as with related theories of chaos and complexity and exploring an understanding of organisations as complex adaptive systems.

Key concepts, authors and ideas include systems theory (Flood and Jackson 1991), critical learning systems (Bawden 1995; Bawden, McKenzie, and Packham 1998), socio-technical systems design (Weisbord 1987; Greenbaum and Kyng 1991), and systems thinking methodologies such as Soft Systems Methodology (Checkland 1981; Checkland and Scholes 1990), Viable Systems Method (Stafford Beer 1985; Flood and Jackson 1991), Critical Systems Thinking (Flood and Jackson 1991; Midgley 1996; Midgley 2000), Scenario Planning (Arie De Geus 1997; Hames and Callanan 1997), Causal Loop Analysis (Senge 1990; Senge et al 1994; O’Connor and McDermott 1997). From the related fields of complexity science and the application of complexity and chaos theory to social science key concepts, authors and ideas include complexity and chaos theory (Waldrop 1992; Gleick 1998); organisations as ecological systems (Hames and Callanan 1997); organisations as learning systems (Sveiby 1997; Senge et al 1994; Senge et al 1999), and organisations as complex adaptive systems (Merry 1995; Stacey 1996; Stacey, Griffin and Shaw 2000).
The significance of all these concepts and ideas was, for me, that they all drew on the notion of open systems as a fundamental principle in how we could interpret and understand the world. From a social ecology perspective I was particularly interested in the direct relationship between a constructivist paradigm and the use of open systems theory as both a literal and a metaphorical technique for exploring and making meaning of the multitude of complex situations in our personal and organisational working lives.

Let me look briefly at a brief selection of the literature and my engagement with various texts and ideas from my contextual perspective as a systems practitioner, action researcher and social ecologist.

Firstly, I need to state that there is a wide and diverse range of literature relating to systems theory and systems thinking. The texts and authors that I refer to in this chapter (i.e. on page 10 and in this section) are only a very small selection of the available literature. However, I believe that within the context of my research these texts represent a considerable coverage of key ideas and issues relating to the application of systems theory in areas of organisational design, productivity and work systems design and management problem solving and decision-making. Throughout this research I have drawn on this work and have constructed a framework of ideas relating to open systems theory, systems thinking and systems mapping methods and approaches that continue to inform and influence my work.

Just as there is a wide body of work relating to systems theory so too are there many definitions of the notions of a system. Checkland and Scholes (1990, p.4) cite an earlier study by Jordan (1965) which identified fifteen definitions of a system, and it is a feature of texts on systems thinking that they all address some slightly different working definitions of a system and/ or systems thinking.

When I began my research I was keenly interested in such definitions to the extent that I began to develop a table of the some of the definitions and thinking presented by various authors. As a means of illustrating some of the range of ideas and applied knowledge about systems, systems thinking and system mapping I have included a
selection of these definitions in Appendix D. It contains quotes from various influential authors and practitioners, and goes beyond the fields of management problem solving and organisational design to include definitions of systems from ecology, landscape design, systems engineering and ecopsychology. I believe that having a range of comparative definitions from different disciplines and fields of enquiry provides a greater depth of understanding about notions of systemicity for both myself and for those whom I introduce to systems thinking.

This issue of a definition of both system and open system became important in the context of conducting action research into practical techniques for the analysis and design of complex work systems. Initially, my work was enhanced considerably by adopting the definition provided by Flood and Jackson (1991) where they approached the concept of system by identifying two key considerations, firstly that the notion of system referred to “a particular way of organising our thoughts about the world” (Flood and Jackson 1991, p.2), and secondly, that the use of systemic metaphors (e.g. machine, organic, neurocybernetic, cultural and political) could form a basis for structured thinking by which they could approach complex problems and issues in organisational design. Aided by an understanding that systems exhibited multiple and dynamic relationships between the elements, Flood and Jackson defined a system as:

In systems thinking, a “system” is a complex and highly interlinked network of parts exhibiting synergistic properties – the whole is greater than the sum of its parts (ibid, p.4).

This definitional work also included the general concept of a system as having specific features and characteristics including elements (i.e. parts), relationships, boundary, inputs and outputs, transformation, sub-systems, environment, feedback, attributes, and purpose. Within a management and organisation context, they further included notions of open system, homeostasis, emergence, communication, control, identity, hierarchy, as well as levels of resolution and the concept of recursion. Equally important was the illustration of a system (Flood & Jackson 1991, p.6, Figure 1.1) which had a profound impact on my thinking, and particularly influenced
my exploration and design of visual techniques for systems thinking and systems mapping.

Diagram 1.1 Diagram of a system.

Flood and Jackson (1991, p.6) Flood and Jackson were primarily interested in the application of systems theory and thinking to management problem solving, and the focus of their work was a comprehensive problem solving approach called Total Systems Intervention or TSI. TSI itself comprised three key phases: creativity, choice, and implementation. (This is very similar to Midgley’s (1996) Critical Systems Thinking model comprising the three phases of critical awareness, methodological pluralism, and implementation).

Within the framework of TSI were located the major systems thinking methods and techniques, each method being described, discussed and critiqued in a uniform way to illustrate the philosophy, ontology, strengths and weaknesses and the potential application of individual methods. Flood and Jackson (1991) proposed the notion of Total Systems Intervention as a system of systems methodologies and included detailed exploration and critical examination of:

- System dynamics, drawn from the work of Jay Forrester,
- Viable systems diagnosis, drawn from the work of Stafford Beer,
- Strategic assumption testing and surfacing, drawn from the work of C.W. Churchman,
- Interactive planning, drawn from the work of Russell Ackoff,
- Soft systems methodology, drawn from the work of Peter Checkland, and
- Critical systems heuristics, drawn from the work of Ulrich.
Of these six, I was particularly interested in exploring the three techniques that I believed offered the most potential in my focus of management practice and organisational design: viable systems method, soft systems methodology and critical systems heuristics.

Stafford Beer’s viable systems method is informed by the field of cybernetics, the study of effective organisations, and brings together notions of living entities i.e. the human body as an wholly integrated and interdependent system with the effective design of information flows and communication networks and practices within an organisation. The viable systems model identifies five key purposeful organisational systems, which are System 5: Identity, System 4: Intelligence, System 3: Management and Control, System 2: Coordination, and System 1: Operations, plus the sixth system of System 3*: Audit. Fundamental to the viable systems model are the features of recursion, dynamic relationships with the external environment, and the application of Ashby’s Law of Requisite Variety, all of which have significantly influenced my design of work systems and my application of open systems across the organisational/community interface (i.e. the boundary between the viable system and its environment).

Similarly, Checkland’s soft systems methodology with its rich pictures of complex problem domains and its exploration of human activity systems, and Ulrich’s critical ethical dilemmas and questions of inclusion and exclusion in community and organisational design have been woven into the design of my work systems mapping and design technique. All three systems thinking approaches and techniques are shaped by a constructivist paradigm and offer insights into ways of addressing tensions between the emancipatory and democratic nature of systems thinking and the actual application of systems thinking in hierarchical and predominantly positivist-oriented and reductionist-thinking organisations.

Flood and Jackson’s (1991) Creative Problem Solving: Total Systems Intervention provides an extraordinarily profound and rich introduction to the potential application of systems thinking in management problem solving, as well as provides clear, succinct and insightful descriptions of the six different systems methods listed
above. In this regard I have long considered *Creative Problem Solving: Total Systems Intervention* to be a seminal work on the application of systems thinking in the related fields of organisation, management and socio-technical systems design. My own well-thumbed and much notated copy attests to the ongoing usefulness of the text and the durability of Flood and Jackson’s (1991) writing and insightful cataloguing of these six key systems thinking techniques.

From my perspective, the main drawback with *Creative Problem Solving: Total Systems Intervention*, however, is twofold:

- An underlying purpose of the authors was I believe a desire to present systems thinking as an objective, rational science that would therefore become eligible to be considered as a management science and field of study in its own right, and
- The associated rule-bound nature of the writing that gives the impression of a formulaic and repeatable scientific method that must be followed if the individual methods are to be used successfully.

This also taps into a broader discourse that informs the rich domain of systems thinking, that of an ongoing tension between the purist position of the academics and theorists on the one hand and the more practically minded systems practitioners on the other who tend to be more eclectic and opportunist in their choice of techniques in the field. Gleick (1998), reflecting on this tension in the field of science, notes:

“Theorists conduct experiments with their brains. Experimenters have to use their hands, too. Theorists are thinkers, experimenters are craftsmen...The theorist operates in a pristine place free of noise, of vibration, of dirt. The experimenter develops an intimacy with matter as a sculptor does with clay, battling it, shaping it, and engaging it.” (Gleick 1998, p.125)

Perhaps associating closer with that of an experimenter, and in contrast to systems thinking as a management science, Bawden (1995) uses systems thinking to move from a positivist and reductionist scientific research approach to an experiential based form of research as social ecology enquiry. Coming from a background of
academia in agricultural science, Bawden (1998) proposed the adaptation of systems thinking to the process of learning, so the experience of learning became an appreciative system of enquiry or critical learning system. Bawden argues that a systemic view of learning would liberate the learner from reductionism and “the prevailing view of instrumental rationality” (Bawden 1998, p.7).

Rather than comprising only logical and rational argument, in Bawden’s view systems thinking could be applied to the creation of a system of enquiry where meaning emerged through the dynamic relationship between two sub-systems: “An experiential sub-system with its source as experience, and an inspirational sub-system, which has innate insight as its source” (ibid, p.7).

Bawden’s argument drew on Checkland’s soft systems methodology, Churchman’s’ critical systems thinking, Churchman’s concerns for ethical defensibility, Kolb’s experiential learning and Salner’s (1986) research on the requisite state of cognitive development for understanding systemic concepts and thinking, a stage of learning Salner referred to as epistemic development and that was informed by an ontological position of contextual relativism. Using the concept of a critical learning system Bawden proposes that a person actually needs to be systemic as a prerequisite to thinking systemically. He uses the image and metaphor of a lemniscate to illustrate a critical learning system. The model comprises a contextual relativist ontology and an epistemology that is constructed around complementary conscious and unconscious component cycles of experiential and inspirational learning.

By consciously acknowledging and understanding the tensions of difference between reductionism and holism, and between objectivism and relativism, the learner or researcher, engaged in social ecology and systemic enquiry, would be constantly learning and able to make more holistic, better informed, ethically defensible decisions.

The third broad strand of open systems and systems thinking was that of socio-technical systems design, which in addition to being concerned with the holistic design of work, comprising both the human (that is, meaningful and fulfilling work) and the technical (that is, process, technology, and so on), was equally concerned
with participative and collaborative approaches to the design of work systems. Central to these two equal concerns was the notion that people who would be doing the work should be engaged in the initial design and the ongoing improvement of the work. In this regard, socio-technical systems design was fundamentally different to the more traditional Taylorist perspective of work design being handled by engineers and specialist management consultants. Socio-technical systems design was considered to be both participative and emancipatory in that it encouraged workers to be involved in both the design and the ongoing decision-making processes about new designs and the improvement to existing designs of work systems. Weisbord (1987) reminds us of the important developments in the philosophy and practice of socio-technical systems design during the twentieth century, and describes the work and contribution of leaders in this field including Lewin’s action research and organisational learning, McGregor’s Theory X and Theory Y of management approach and employee motivation, Emery’s and Trist’s work with the Tavistock Institute of Human Relations in the United Kingdom and with the notion of whole systems improvement and open search conferences where they encouraged wide employee participation in organisational planning and the generation of new ideas for product, market, decision-making and productivity. During the late 1950’s and early 1960’s, Emery (Weisbord 1987, pp.167-168) proposed six intrinsic factors for designing satisfying jobs:

1. Variety and challenge
2. Elbow room for decision making
3. Feedback and learning
4. Mutual support and respect
5. Wholeness and meaning
6. Room to grow – a bright future.

Of significance and relevance here to my research was that these factors were to become essential components of the Australian Labour Governments’ Industrial Democracy legislation in the 1980’s and that they remain as key concepts of work design in the Australian public sector today. (Australian Public Service Act 1999; Australian Taxation Office Agency Agreement 2004 to 2006).
Greenbaum and Kyng (1991) also come from a socio-technical systems design background, however, they were particularly interested in collaborative and participative approaches to the design of user-based computer systems, as well as holistic work system design. The rise of information technology during the 1990’s as a dominant management and corporate board-level consideration in productivity improvement also mirrored the experience in the public sector where the application of information technology often became the primary focus and leverage for organisational change and productivity improvement. To mitigate this monopoly of technological design Greenbaum and Kyng (1991) encouraged a notion of situated design, a user based design focus that integrated applied information technology within the context of the work and the user experience, and drew on documented experiences in Scandinavian countries during the late 1980s and early 1990 to illustrate the benefits of such an approach.

The fourth key theme was that of the application of complexity and chaos theory in organisational and work design, and the notion of organisations as complex adaptive systems.

While Waldrop (1992) and Gleick (1998) introduce us to the key concepts of complexity and chaos (e.g. self-organisation, sensitivity to initial conditions, non-linearity, non-reducibility, emergence, attractors, the interplay between predictability and non-predictability, dynamic co-adaptation and co-evolution, systems at the edge of chaos, novelty and creativity, autopoiesis, etc) and initial notions of complex adaptive systems, it is for the application of these theories to management and organisational design that we can look to the work of authors such as Hames, Merry and Stacey among others.

Drawing on both ecology and complexity, Hames (1994) introduces the nuance of purpose, consciousness and living into his definition of system: “a system is a coherent set of processes that work together to achieve the purpose required in order for the system to survive” (Hames 1994, p.286) and goes on to describe systems thinking as “the ability to appreciate the interrelated complexity of whole systems, especially as this concerns processes, feedback loops and relationships”. In a later work, Hames and Callanan (1997, p.257) offer a far more expansive definition of a
system and also discuss the notions of an appreciative system, which is a “self-organising system that sustains a social ecology able to learn its way into preferred futures”. Within this framework of evolving sophistication Hames and Callahan (1997) propose that systems mapping is a method for making non-linear patterns and relationships visible in order to perceive the essence of complex issues. This systems mapping of non-linear patterns and relationships also became a fundamental feature of the Hames and Oka (1997) concept of Strategic Navigation as an essential leadership practice for strategic planning and organisational design.

On a more universal level, Merry (1995) was concerned with the application of insights from complexity and chaos to understanding human and social systems as complex adaptive systems. This he believed would, in turn, lead to greater insight into understanding and coping with complexity in our personal lives and in organisations and communities. Merry used the features of complex and chaotic systems to critique aspects of current human society and to offer ideas for new approaches to transforming society and human consciousness so we might design and create a better world. (Merry 1995, p.199).

Concurrent with this exploration of organisations as complex adaptive systems was a second interrelated stream of literature applying systems thinking to the field of management and organisational design. This stream is about viewing organisations as learning systems, commonly called the learning organisation. Probably the most influential author in this field was Peter Senge (1990), who argued that successful leadership and management reflected the exercising of five competencies: personal mastery, mental models, building shared visions, team learning, and systems thinking. In Senge’s approach, drawing on Forrester’s work in system dynamics that bridged aspects of engineering with management (Flood 1999, p.28), this fifth competency, systems thinking, became the fundamental leverage for integrating the other four competencies and for transforming traditional organisational command and control structures into his vision of a learning organisation. Three key components of Senge’s notion of systems thinking were an understanding of the dynamic relationships between elements, the ability to discern patterns of behaviour exhibited by systems over time, and an understanding of cause and effect, not as a
linear process, but as dynamic feedback relationships that could be modeled using causal loop diagrams.

The causal loop analysis diagramming technique enabled sophisticated models of systems-in-focus to be constructed where understanding of complex problems could be aided by the identification of lag in the system and by recognition of meta-patterns of systems behaviours in terms of balancing loops and feedback loops. The purpose and usefulness of this technique was that firstly, it enabled a greater understanding of the complex behaviours in a system, and secondly, the identification of points of systemic intervention to improve the situation.

Senge’s notions of the learning organisation, his views on the application of causal loop analysis and of an individual’s ability to discern patterns of behaviour, were substantially enhanced in 1994 with the publication of *The Fifth Discipline Fieldbook* (Senge et al. 1994), which proposed and outlined a number of practical approaches, techniques and processes for applying aspects of systems thinking to management problem solving activities and in the creation, shaping and nurturing of a learning organisation.

However, while Senge’s view of systems thinking could be considered as reasonably accessible to potential practitioners, its major drawback is that it taps into only one aspect of the broader thinking and discourse in this field of enquiry. In his *Rethinking the Fifth Discipline: Learning within the unknowable* Flood (1999), while acknowledging the benefits and usefulness of some of Senge’s work, also offers the criticism that in relying so heavily of Forrester’s systems dynamics, Senge ignores the wider and richer complementary body of work that comprises the field of systems thinking and systemic approaches. Flood also offers the observation that Senge’s limited view of what comprises systems thinking is in itself reductionist and therefore not systemic (Flood 1999, p.28).

To conclude this section on principal theories-in-use, let me re-iterate that within the broad discourse and field of systems thinking there is no universally agreed definition of a system, nor is there any one predominant view of systems thinking. In designing my research I have drawn from a number of sources, ideas, methods and
authors. What has been useful to me in accommodating the many different perspectives of systems thinking and the different contexts and backgrounds of the various authors has been to use the following three broad categories:

1. Systems thinking as a method or technique for management problem solving;
2. Systems thinking as a behaviour and approach for learning and being systemic; and

By applying these three categories, together with the application of fuzzy logic and fuzzy boundaries, I have been able to bring together ideas of Bertalanffy’s open systems theory, soft systems methodology, viable systems method, critical systems thinking, and organisations as complex adaptive systems. I have done this within the dual contexts of my professional work in management practice and organisational design, and my post-graduate research in social ecology.

The significance of all these concepts and ideas was, for me, that they all drew on the notion of open systems as a fundamental principle in how we could interpret and understand the world. From a social ecology perspective I was particularly interested in the direct relationship between a constructivist paradigm and the use of open systems theory as both a literal and a metaphorical technique for exploring and making meaning of the multitude of complex situations in our personal and organisational working lives.

**Secondary Theories**

There are many secondary theories that I could have equally addressed. These include organisation and management theory, particularly in relation to the changing nature of work in the public sector, information technology, intelligence and knowledge management, adult learning and experiential learning, and the socio-political economic environment in which I work. For the purposes of this enquiry
and maintaining a focus I have drawn a boundary around systems and complexity theories and intentionally excluded the other equally interesting areas of enquiry. Many of the secondary theories, however, are considered thematically if only implicitly throughout this narrative.

Themes Woven into My Narrative

There are a number of themes I have consciously woven into this narrative and that I discuss to differing degrees where appropriate. These themes are:

- The need for accessible, readily useable, and practical tools and techniques for use in the public sector office workplace by managers and staff to make meaning from complexity,
- Adult learning in the public sector office workplace,
- Systems theory and the application of systems thinking methods and techniques in management practice and the workplace,
- The specific application of systemic thinking in the analysis and design of complex work systems,
- The use of experiential learning in introducing people to new ideas, concepts and techniques,
- Social ecology, as a method of learning and enquiry, and as a framework for my own professional practice in collaborative design and organisational change,
- Ecopsychology, as one of my personal contextual frameworks that also informs and influences my professional practice and my whole person learning,
- Applied aspects of complexity and chaos theories, particularly in viewing large organisations as complex adaptive systems,
- The tension between the emancipatory nature of systemic approaches and the traditional exercise of power and decision making in hierarchical organisations,
The need for analytical, critical, systemic and creative thinking by individuals in the workplace,

Inclusive approaches to research and design, including critical learning heuristic approaches to organisational research, action research, participative action research, collaborative design conversations, and engaging people in ongoing, long-term intermittent design and learning conversations and activities,

The long-term development of knowledge management and strategic and business intelligence capabilities as the background organisational context in which my research is located.

Theoretical Frameworks - Conclusion

‘A primary purpose of action research is to produce practical knowledge that is useful to people in the everyday conduct of their lives’. (Reason and Bradbury 2003, p.2).

At the beginning of 1998, as the Design Manager for the ATO (Large Business & International) Project Bijou, I had the opportunity to apply systems thinking methodologies and to encourage others to also learn about and use these methodologies. I also had the opportunity to explore my own ideas about more practical approaches and techniques in the analysis and design of whole work systems in dynamic and complex organisational environments.

When I began my research in 1998, I wasn’t naïve enough to think that I could shift the enormous prominence and influence of positivist, objectivist, and reductionist world views that permeated the Information Technology, Accounting, Legal and Tax...
administration professions, educational frameworks or industries throughout the world. Nor could I universally change these predominant ways of thinking and approaching complex issues as they were practiced in the ATO. Rather I was intending to work locally within my own small working community to see if I and hopefully others who may wish to join me in my enquiry could find other more holistic and systemic practical approaches and techniques that could complement the more traditional ways of thinking about the design of work in a public sector environment. I was adopting a “think global, act local” approach.
6. A brief statement of the sources of the data, the procedure or methods of analysis in the proposed treatment of the findings.

I draw my cumulative understanding, learning and interpretation from my experience of conducting six key research phases between late 1997 and late 2004.

The first phase represents the pre-research student period of late 1997, when, as a project manager and design manager in the ATO, I began to explore the problem domain and to frame my research questions. The second, third, fourth and fifth phases represent the four heuristic research cycles that I conducted over a five year period between January 1998 and end 2002. The sixth phase began in about October 2002, and extended to December 2004, during which time I used a critical reflexive writing approach to shape my thoughts, conclusions and to write this thesis narrative.

I am therefore presenting this narrative as a 1st-person reflection on key aspects of my progressive, iterative, heuristic research experience as well as my contemporaneous, subjective and contextual observations, learning, findings and the unfolding nature of my research, where each phase shaped further research questions and avenues of enquiry.

The Critical Learning Heuristic/ Action Research Cycles

In the cumulative nature of my social ecology inquiry the outcomes and findings from my 1st action research cycle in 1998 and early 1999, directly informed the design of my 2nd action research cycle in 2000. Similarly the findings and outcomes from 2000 directly informed the 3rd action research cycle in 2001, which in turn informed the 4th action research cycle in late 2001 and 2002. Each of these action research cycles and activities were situated within a number of different broader...
ATO projects in which I was working at the time. An outline of each of these cycles is included in Table 1.2.

**Summary of Research Phases**

The following table (Table 1.2) outlines a brief summary of my six research phases.

**Table 1.2**  
A Brief Summary of My Research Phases

<table>
<thead>
<tr>
<th>Research Phase / Timeframe</th>
<th>Description</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phase 1</strong></td>
<td>Pre-research: Apply for enrolment in Master of Science (Honours) in Social Ecology</td>
<td>Outlining an area for a social ecology research topic and proposed research methods. Interested in exploring and developing a set of practical techniques for use by managers and staff in the analysis and design of complex work areas.</td>
</tr>
<tr>
<td>Phase 1 (cont)</td>
<td>Pre-research: An initial 2-day action research workshop to explore some ideas about systems thinking techniques.</td>
<td>With eleven other ATO colleagues who were similarly interested in systems thinking, I explored how people might access books and texts on systems thinking techniques, as we applied different systems thinking techniques to a workplace problem domain.</td>
</tr>
<tr>
<td><strong>Phase 2</strong></td>
<td>Action Research Cycle 1 (Critical Learning Heuristic Phase 1)</td>
<td>Exploring a range of systems thinking approaches and systems mapping techniques in ATO Project Bijou, 1998 - 1999.</td>
</tr>
<tr>
<td><strong>Phase 4</strong></td>
<td>Action Research Cycle 3 (Critical Learning Heuristic Phase 3)</td>
<td>2nd iteration of the design of practical techniques in ATO Jacaranda Project, 2001.</td>
</tr>
<tr>
<td><strong>Phase 5</strong></td>
<td>Action Research Cycle 4 (Critical Learning Heuristic Phase 4)</td>
<td>Exploring practical techniques for modelling aspects of organisations as complex adaptive systems, and the emergence of the Namadgi Technique while working in ATO Strategic &amp; Business Intelligence during late 2001 and 2002.</td>
</tr>
<tr>
<td><strong>Phase 6</strong></td>
<td>Research Writing, Phase 5 (Critical Learning Heuristic Phase 5)</td>
<td>Writing as inquiry. Writing, developing and shaping the narrative. Further development in ATO strategic and Business Intelligence of the Namadgi Technique as a synthesis of practical techniques for use by managers and staff in the systemic analysis of complex problem domains.</td>
</tr>
</tbody>
</table>
Diagram Illustrating My Research Timelines

The diagram (Diagram 1.2) on the next page shows a research timeline indicating the duration of the 6 phases of my research, the first five of which were major iterative and sequential action research projects, with each action research project building on the findings and outcomes of the preceding one. The sixth phase is the current one, that of writing up the thesis narrative as a record of my research and findings, as well as an act of inquiry in itself (Richardson 1994, p.516).
Diagram 1.2  The Research Timeline
Writing the Narrative

The experience of writing this narrative has been as important for me as conducting the actual practical research. In using a critical reflexive writing technique I came to understand that many of my findings were subjected to two phases of interpretation, the first associated with the contemporary research activity and the second associated with my experience of writing the narrative and the emerging reflective re-interpretation of the research activity as well as the new understanding and shaping of meaning as I reflected upon the research from my current, more informed and knowledgeable position of having completed the research activity. It is because of this complex unfolding of my learning and understanding over various cycles of time and research activity that I intend to write briefly here about my experience and states of mind during the writing of this narrative over the two years.

October 2002 to December 2004
Research Phase 6: Writing, Reflections, Narrative, and Healing.

The sixth research phase has been writing the narrative and findings of my action research using a reflective writing method and social ecology inquiry approach. The writing of this version of my thesis narrative has occupied my thinking, efforts and all my spare time for the two years or so between October 2002 and December 2004. The experience of writing the narrative has been at varying times challenging, confronting, satisfying, insightful, problematic, and a personal horror of unparalleled proportions!

I wrote early outlines and some drafts of most chapters in October, November and early December 2002. However, I was far from happy with my early results and felt that I was not able to find the right focus, voice, mood, tone or representation of my own or others involvement in the activities, events, and thinking that had unfolded over the five years. Dispirited and tired, I stopped writing during mid-December and purposefully put it out of my mind until after Christmas. In the first week of January 2003, I set myself a deadline of end April 2003 to complete the draft narrative and
began to write again. I didn’t get far. All the struggles and problems with the writing that I had been having late last year came flooding back. I began to taste defeat and wondered how I would ever face my family and friends if, after all this time and all their support, I had to withdraw from the research thesis program. This deep crisis rapidly deteriorated into another major bout of clinical depression accompanied by all the horrors and confrontation of self-doubt and a collapsing self-esteem. “How did I ever get into this mess?” I wondered.

Early January 2003 was hot and dry. There was no break in the year long drought. It was too hot for bushwalking. The bushfire threat was growing with each day of total fire ban and hot dry weather that passed. Water restrictions were declared by the ACT Government. People looked to the skies and asked each other “when will it rain again?” Canberra gardens turned yellow as the grasses dried out, suburban gumtrees began to shed leaves and the hard clay soils baked and cracked in the intense January summer sun. Normally a source of inspiration and sense of well-being, there was no solace for me in the landscape.

Each morning saw new kangaroo carcasses by the roadsides, victims of the juxtaposition between modern automotive technology and Australian marsupials driven by drought to seeking food and water among the grasses and moisture by the roadside. The dead mangled bodies of the kangaroos and wombats and possums and even foxes bloated rapidly in the summer heat. Crows brazenly pierced and tore at the carcasses, while the sweet sickly smell of death and decay became a common sensory experience on my way to work each day.

One Sunday in early January 2003, I decided to leave my thesis doubts and torments behind and go for a long drive. I left Canberra and drove out along the Barton Highway to Yass, then south on the Hume Highway to Gundagai, east up into the mountains through Tumut on the Snowy Mountains Highway, up over the Great Dividing Range to Yarangobilly, on over the Snowy Mountains through the old mining ghost town of Kiandra, then down the eastern escarpment of the mountain range onto the wide grazing plains of Adaminaby through to Cooma where I turned north onto the Monaro Highway and drove back to Canberra across the Monaro Plains. A trip of 6 hours and 460 kilometres through some extraordinarily beautiful
Australian landscapes of grassy plains, small country towns, eucalypt forests, mountains, streams, creeks, rivers, sheep, cattle, golden fields of canola, farm houses, dilapidated rural buildings, roads and highways that snaked across the plains and up into the mountains and forests. And, as always, mysterious and inviting unsealed country tracks that ran off into the bush and the landscape and that always beckoned with a sense of adventure and the promise of new places as yet unseen.

Despite all the beauty and the sheer exhilarating joy of driving through the country though, there was also the constant reminder of the long drought; parched earth, thick dust on the bushes and trees that grew by the roadsides, dry fields, low creeks with little water flow, trucks carting water to rural homes and properties, empty dams, and for mile after mile the roadsides strewn with dead and rotting kangaroos and wombats. I had the windows open and the smell of death and decay mixed regularly with the dry hot clean country and mountain air. It was a very real reminder of the harshness of nature and the Australian landscape. This sensory diversity and richness and exhilarating visual wonder was tempered with the reality of the struggle between life and death, and provided me with the sort of mental jolt that I needed to get myself thinking outside of the claustrophobic enclosed world of thesis writing.

Such was my experience of the first two weeks of January 2003. It was a period of intense internal struggle, of the time-consuming physical muddle of notes and papers, and of intellectual confusion for me as I searched for an effective way to write the narrative and say what I needed to say. As with any design process it was messy and confused and full of repetition and revisited ideas. At the same time it also had moments of great insight and inspiration. Out of this confusion three ideas emerged from the whirlwind of reading, writing, reflecting, thinking and restless searching for a way ahead in writing my thesis. I cannot say with any certainty which idea came first as all three are interrelated and, in a way, each contributed to the generation of the other.

These three ideas were:

1. The development of the timeline diagram (see Diagram 1.2) showing my four action research cycles and other research related information between 1997
and 2003. The power of the diagram for me was that it enabled me to visually display the action research cycles in the context of the key organisational activities and projects in which I was working at the time. It also enabled me to succinctly show the sequential relationship between the end of one action research cycle and the beginning of another, as well as some of the key outcomes and findings from each phase. This is of course a standard project planning technique, and as such I used it to remind myself of the research cycles and outcomes. But I was also able to now use it as a writer and researcher to highlight the paths I had taken in my journey and that needed to be included in the unfolding narrative.

2. The notion of writing as an act of inquiry and research in its own right. This was very clearly influenced by Laurel Richardson’s proposal of “writing as inquiry” in her chapter in Denzin and Lincoln’s 1994 *Handbook of Qualitative Research*. I had read the article some years earlier and again in 2002, but until the first two weeks in January 2004, I didn’t fully appreciate how I might be able to adapt and apply this technique to my research narrative. Richardson proposes a reflexive writing approach with the researcher engaged in writing about past events in the research process while at the same time gaining new insight, learning and understanding by using the opportunity of writing as a method of inquiry, as a way of knowing and a method of discovery and analysis (Richardson 1994, p.516). This idea of writing both reflexively and as an act of inquiry and of personal self-discovery greatly appealed to my sense of being a journeyman and to the overall critical learning heuristic approach with which I had approached all of my research and work over the last five years.

3. The renaming of the ATO organisational projects into names of my choice. In this way, the ATO LB&I Business Systems Development Project became Project Bijou, while the Jacaranda Project replaced the ATO Business Intelligence Capability Project. And perhaps most importantly of all was that the collective technique that I had been half-heartedly calling Systemic Analysis, Holistic Design for the last twelve months finally emerged in my thinking as the Namadgi Technique.
Why did I call it the Namadgi Technique?

Because I often go bushwalking in the Namadgi National Park and the adjoining Tidbinbilla Nature Reserve. For the last ten years Namadgi has been a source of considerable pleasure and joy for me. It has also been a source of great learning and inspiration, and I have often gone on long walks in and around the Orroral Valley or up in the Brindabella’s specifically to think through many work and management issues related to the complexity of conducting long-term action research at the same time as managing research staff in three different cities, and trying to design practical techniques and ways in which to effectively introduce and skill adults in analytical, critical and systemic thinking. Many ideas that had their origin in my thinking and in conversations with a friend on Sunday bushwalks in the Namadgi National Park have been woven into practical techniques and approaches that are now in use in ATO offices across Australia. Over the years I have developed a deep love of place and a spiritual bond with Namadgi and Tidbinbilla, and I draw an enormous sense of well-being and nourishment from these magical places and landscapes. The eucalypt forests, steep gullies and ridges, enormous granite boulders, mountain creeks, grassy plains, cockatoos, wallabies, currawongs, and the mysterious and joyful calls of the lyrebirds in the cold, winter afternoons are all features of the Namadgi landscape with which I feel my life has become inextricably linked. As the idea slowly formed and took shape in my thinking it seemed to be only natural to honour the source of much of my inspiration by naming the suite of techniques after that source, Namadgi.

This sense of naming, or at least re-naming and reframing, was an extremely liberating act that enabled me to do two key things. The first was that I was able to place fuzzy boundaries around much of the ATO contextual “noise” and to effectively exclude the detail and complexity within the boundaries that were not relevant to my narrative or to the findings and outcomes of the action research. The second was that this enabled me to reframe how I thought about certain events and behaviours and to leave behind a lot of the emotional
baggage, the ghosts and other shadows from the organisational environment in which I had worked over the last four or five years. While I haven’t excluded all the rich ATO broader context and detail entirely I have been able to better focus on the intent and purpose of my narrative, as well as to finally find a research voice I am comfortable with. I also believe that in naming the suite of techniques and approaches the Namadgi Technique, it has taken on, in my mind at least, a greater sense of cohesion and coherence. Here is a wonderful sense of co-evolution and synergy. The emergence of a research voice has brought a greater sense of cohesion and coherence to my narrative, while my growing confidence and the emergence of the Namadgi name has brought a greater sense of cohesion and coherence to the technique. Both grow and inform and nourish one another.

In combination, these three ideas of writing as inquiry, timeline diagram analysis and the renaming and reframing of aspects of experience and contextual background, have evolved into a very practical approach and writing technique that I have been using since January 2003 to write and manage my thesis narrative. This in itself has been a major finding and personal learning from my research.
7. A Final Reflection to Conclude this Introduction.

In conducting this critical learning heuristic and action research approach I have been able to combine a process of subjective and qualitative action research with the more expected ATO management practice of objective and quantitative project management. At the meta-level, I have purposefully and consciously taken a critical learning heuristic approach and have been able to weave into this combination of heuristic and action research and project management a personal component of creative design that gave my long-term research a cohesion and demonstrable purpose and kept me intrigued and motivated for so long. The heuristic and creative design has continued in this 6th phase, and I believe that adoption and adaptation of Laurel Richardson’s approach has proved, for me, to be a very good technique for writing up 5 years worth of intense social ecology thinking, practice and research.

A more complete story of the exploration, design and emergence of the Namadgi Technique is addressed in the rest of this narrative.
A gust of wind stirs the eucalypts in the hot summer afternoon. In the distance a kookaburra begins a half-hearted, though melodic, negotiation over some suburban territorial dispute.

It is eight days since Canberra was hit by the fire storm, the land and the Canberra psyche are scarred and traumatised. People are afraid there may be more fires to come.

I look up through the open window into a cloudless yet hazy sky and wonder about rain. The air smells of smoke and burning gum leaves and bushfire. It is a hot dry summer and the occasional gusty breezes are equally full of promise and menace.

“What to say?” I think.

“What to say? What to think? What to write? What to do?”

I rub my eyes and get up from my desk in the study to wander into the kitchen to make tea, padding softly on bare feet across the hot wooden floorboards. The house is very quiet and still. Sal is reading, my children, Georgie and Sam, have both gone out in pursuit of separate weekend adventures with friends.

Teenagers always seem able to leave behind a noisy mess and a silence.

I fill the kettle, switch it on, lean back against the kitchen bench to stare vacantly out to the courtyard and the fishpond, so still in the
sunlight and the 38 degree C heat. I see an occasional flash of bright gold and deep orange among the cool green of the water lilies. Gold fish performing visual haiku in the hot summer afternoon.

“Maybe I’ve just run out of words”, I think. “Maybe a cup of tea will bring the sentence I’m looking for”.

Back in the study, with a cup of sweet black English Breakfast tea resting on a “Hawks in ’98” coaster, I glance distractedly at titles on shelves, thinking of other places I could be. I rummage through discarded thoughts, looking for an image, a hook, a link between the hot still afternoon and an opening sentence on epistemologies….

Moments slip by; the tea cools and I decide to think of something else for a while. Perhaps an afternoon of languid daydreams, I think lazily; though nothing happens. It’s too hot to even daydream.

Staring out the window, I once again smell bushfire in the hot afternoon breeze; this time it’s menace. “Where there’s smoke”, I think to myself, “there’s always somebody else’s paradigm”.

I get up slowly, take my tea and go outside to the front veranda to sit quietly and watch in the shaded afternoon heat and to talk gently to the Misty the cat.
Chapter 2. Systems thinking and mapping techniques.

Purpose

To tell the story of my initial action research and evolving understanding of practical techniques for mapping complex work systems.

Research Methods

A critical learning heuristic approach that combines:

- Various forms of action research;
- Creative thinking and design;
- Personal musing and reflection;
- Active use of systems literature & key texts;
- Collaborative and strategic design conversations;
- Consultation with subject experts.

And takes advantage of emergent thinking and ideas and serendipitous conversations and events along the research journey.

Chapter Outline

In this chapter I relate aspects of my action research conducted principally between November 1997 and March 1999, to explore practical techniques for the visual mapping
of complex work systems in the public sector environment. For the purposes of this narrative, I present the action research in four parts, representing three key iterations of the action research spiral and an evaluation and reflection component. These are:

1st action research iteration: Exploring systems thinking and analysis techniques in late 1997;

2nd action research iteration: Exploring an educational approach to systems mapping techniques (for analysis and design) during 1998 to 1999;

3rd action research iteration: Developing my own skills and sets of techniques for mapping complex work systems during late 1998 and 1999.

Evaluation and reflection Reflecting on my learning and research outcomes of this first critical learning heuristic phase of my research.

In the final section of the chapter “Evaluation and reflection” I present my reflections and key learning in respect of systems mapping techniques emerging from the three iterations of the action research process.

**Background**

I begin this part of the narrative in 1997 after I had applied to do the UWS Master of Science (Honours) research degree, but slightly before the academic year started in early 1998. At that time I was working as the Director, Work Design in a large Commonwealth public sector organisation (i.e. Australian Taxation Office) in Canberra. Part of my role was to analyse existing management and work practices, to identify areas for productivity improvement and to design, implement and evaluate any such improvements. Much of my work involved the facilitation of collaborative and participative approaches to the analysis and design of effective management and work practices. In addition I was also tasked with researching, exploring and developing effective productivity improvement techniques that could be used by managers and staff.
as part of their normal duties and integrated into their everyday work practices, i.e. without the need for large projects that took people off-line for weeks or even months at a time.

In the preceding five years, between 1993 and 1997, I had developed a range of practical techniques that were already in use in the organisation. As this research formed part of my work prior to undertaking the Master of Science (Honours) research I do not intend to include it here. However, as it is also important to understanding my background experience and expertise in this area I have cited the following three conference papers that document summaries of this early work and thinking and that I presented to external conferences in 1995, 1996, and 2000. These papers are:

1. Participative approaches to the analysis and design of work: the use of work mapping and simulation techniques in the Australian Taxation Office. (Unrefereed paper presented to the British Academy of Management Annual Conference in Sheffield, United Kingdom, 11 September 1995).


3. Methodological pluralism in practice: the practical application of various systems methods and techniques in the analysis and design of complex work systems. (Refereed paper presented to the 1st International Conference on Systems Thinking in Management, Deakin University, Geelong, Victoria, November 2000).

Contextual Background

Between November 1997 and March 1999, I was engaged as Design Manager in the Business Systems Segment of the Large Business and International division of the Australian Taxation Office (ATO). The purpose of the Business Systems Segment was to identify and design appropriate business and work systems to support the achievement of planned business outcomes. In this context the terms “business system” and “work system” were used to describe a broad holistic notion of purposeful work systems incorporating business processes, legislation and policy frameworks, client interfaces and requirements, information technology applications, management practices, work practices, etc.

In December 1997, my colleague, Sally Pegler, as Project Manager, and I as Design Manager, were tasked by the Deputy Commissioner of Large Business and International with delivering on a major design project, named Project Bijou, which was to occupy much of our thinking and efforts over the next twelve months. We used this project to focus the people and the work of the Business Systems Segment and as the “burning platform” for change and raison d’être for transformation.

This notion of “business system” represented in the ATO a significant departure from more traditional approaches to computer systems application projects. As such, we needed to find and apply a range of analytical and design techniques that we could use to address the systemic nature of the outcomes we sought. Our work required exploratory approaches, and from the beginning, in December 1997, I used a critical learning heuristic framework and a collaborative action research/ action learning process with which to focus the work of our project team.
When I enrolled in the Master of Science (Honours) research program at the beginning of 1998 I was able to combine my professional responsibilities with my personal passion and my academic research interests, and to begin the journey that would lead me over the next five years to the development of a range of practical techniques for the analysis and design of complex work systems.

**My Research Issues and Questions**

To explain my approach and the development of my initial hypothesis, i.e. that aspects of social ecology and systems thinking could be effectively applied to the analysis and design of business systems and that we should skill our business systems analysts in formal systems thinking methods and techniques, I need to briefly address some of my earlier research that I had conducted in 1997 and that had been the motivation behind my applying to do this research degree.

As a social ecologist and as the Design Manager for Project Bijou, I was interested in how people in the workplace could:

- Firstly, access and learn about the intellectual and theoretical aspects of systems thinking;
- Secondly, could gain some experience in exploring and applying the various methods and techniques;
- Thirdly, could choose the most appropriate technique and/or techniques for their specific problem domain; and
- Fourthly, apply the technique with both rigour and methodological integrity.
In November 1997, I proposed and conducted a small action research project to pursue some of these interests.

**Action Research/ Experiential Learning Workshop**

Within the ATO I was part of a small informal network of ATO middle managers who were interested, and in some cases actively exploring, the application of systems thinking in range of work situations. Tapping into this network I invited eleven people to join me in a two-day workshop in Moonee Ponds Branch Office in November 1997, in which we would explore aspects of systems methods and techniques. The context for the workshop was the design of a workforce planning framework, however the purpose was twofold. The first part of the purpose was to explore issues associated with accessibility of systems thinking techniques, from both an intellectual perspective and a comprehension of texts perspective. The second part of the purpose was to also explore the practicality and usefulness of applying these techniques in an experiential learning environment.

**Workshop Outcomes**

The outcomes of the workshop were both encouraging and thought provoking. Encouraging because people genuinely tried to address their specific problem domains with the assigned methods/ techniques and, in doing so, while struggling with the new concepts and nuances of language, they quickly became familiar with basic concepts and with the practicalities of applying the techniques. Encouraging also, because, as a group, we quickly demonstrated the enormous insight that methodological pluralism gave us in examining different perspectives around the domain of the subject matter i.e. a workforce planning framework.
Over the course of the two days, the use of Soft Systems Methodology provided the first draft of detailed work processes and decision-making criteria as well as the management and work practices required to support sustainable workforce planning framework. With Viable Systems Diagnostics we explored the organisational communication and information flows at various levels of recursion, including ATO, LB&I and the individual Segments within LB&I. The Viable Systems Diagnostic also provided great insight into the requirements of leadership in being clear about organisational purpose and identity as well the policies and management discipline required to make workforce planning actually work. System Dynamics was used to explore and develop a model to simulate flows and relationships between variables including recruitment, aging workforce demographics, rates of retirement and resignations, lead-times to develop people with appropriate skills, knowledge and breadth of experience. Causal loop analysis was used to explore a range of dilemmas and relationships, and demonstrated the validity and/ or fallacy of aspects of various assumptions and relationships associated with historical and current approaches to workforce planning in the ATO. Our social ecology inquiry provided insight into the cultural aspects of diverse work communities within the ATO and identified the nature of the change program required to support the introduction of a workforce planning framework. Collectively, the five techniques provided an extraordinarily rich understanding and multi-perspective appreciation of a workforce planning framework for ATO LB&I.

On the other hand, I personally found aspects of the workshop thought provoking because it became apparent to me by mid-morning of the second day that a few participants had trouble applying the theoretical frameworks and were simply drawing “bubbles and arrows” and linear processes on a whiteboard, all the while convinced in their own minds that what they had produced represented a systemic analysis. This was particularly the case with those who had explored the use of causal loop analysis, and similarly, though to a lesser extent, with those who had pursued a social ecology systemic appreciation.
I should add that this workshop was conducted in a spirit of collaboration, action research and shared learning, and that everybody’s observations and reflections on all results and findings were encouraged and acknowledged. We did not criticise nor praise one another on the basis of the degree of our individual command of the assigned method or technique; rather as a group we explored what we could do to make the technique more accessible and/ or understandable.

Key Issues and Insights

Key issues and insights arising from this workshop included:

- While the various methods and techniques were (and still are) all referred to loosely in the ATO as “systems thinking”, they are actually fundamentally different, with different purposes, languages and nuances, and need to be specifically selected and applied to appropriate contexts, types of enquiries and problem domains;

- Without some practical experience and possibly expert guidance, the group considered that SSM, VSD and causal loop analysis were all difficult to understand and apply from simply reading a relevant text;

- From the group’s brief exposure to the “hard systems” approach, that of System Dynamics, and from our observations of the two skilled participants using the technique we considered that System Dynamics required a prolonged time to learn and a great deal of expertise and competence to use;

- Adopting a worldview that incorporated methodological pluralism into our approach provided us with extraordinary insights and different perspectives of a subject area-in-focus. Through our discussion about the range of insights and outcomes from each technique we gained an even greater emergent
understanding and deeper appreciation of the systemic nature of workforce planning and its relationships and links into many other aspects of strategic management, work systems and organisational design;

Discussions about degrees of difficulty and questions of rigour led me to pose the questions:

1. Could everybody learn to be a “systems thinker” and to successfully and competently use a range of methods and techniques?

2. Did everybody need to be systems thinker?

3. What sort of organisational commitment and investment were we as an organisation going to need if we truly wanted people in the ATO to develop expertise in systems thinking?

These questions generated a wide ranging and ongoing conversation among our broader informal “systems thinking” network over the coming months. Perhaps more importantly from my perspective, these three questions became the key drivers of my research and my work over the next 6 years as I sought practical ways for introducing systems thinking into the workplace and the public sector environment.

While no means conclusive, the general feeling of the group was that we did not believe that everybody could be an effective systems thinker, but more importantly that everybody in the organisation did not need to be a systems thinker. This initial conclusion immediately raised doubts and concerns about the current organisational rhetoric exhorting people, especially middle and senior managers, to become systems thinkers if they were to demonstrate that they were worth their “organisational salt” (or indeed, their performance pay)!. On the third issue, that of organisational investment, we began to discuss some of the practical changes to organisational structure and behaviours, management practices, and human resource management strategies that
would be required to develop the sort of expertise in systems thinking and practices we believed the ATO may need. Our two day workshop had managed to raise our awareness of systems thinking methods and to generate our initial strategic thinking about the development and practice of systems thinking in the ATO.

**Reflection**

This relatively quick action research project had given me much food for thought and a great deal of insight into some of the difficulties and issues that people might face in accessing, understanding and applying systems thinking methods and techniques in the workplace. In particular I began to understand that without some form of dedicated education and skilling program that gave people the opportunity, the means and the time to learn, it was unlikely that the organisation would see any real understanding or effective application of systems thinking.
2nd Iteration: Exploring an educational approach to systems mapping techniques (for analysis and design) during 1998 to 1999.

Forming a Research Hypothesis for my Thesis

The workshop and research was still very fresh in my mind in early 1998 when I began the research degree, which by good fortune rather any planning on my part, coincided with my new role as Design Manager in the Project Bijou. While my broad thesis research topic was about exploring the development of practical techniques for the analysis and design of complex work systems, I began the first part of my research in 1998 on a slightly simpler basis. I began with the hypothesis that a sound understanding and working knowledge of systems thinking methods and techniques would be of significant benefit to the managers and staff of the Business Systems Segment. Thus my initial research hypothesis brought together my thesis research requirements and my professional workplace requirements in a very practical way.

From my perspective the question became one of how were we going to successfully, and in a relatively short time frame (say three to six months), introduce and skill business systems analysts to undertake the work required for the newly commissioned LB&I Project Bijou. In addressing this question, the Project Manager, Sally Pegler, and I spent considerable time researching and thinking about this issue. As we formed and shaped the project team, we also commissioned a formal training audit, including a training needs analysis, and established that we had a team with a wide range of expertise, experience and qualifications particularly in the domain of management, computer systems development and computer support to ATO business activities.

What we needed, in addition to this already impressive array of skills and abilities, were business systems analysts who could use a range of systems thinking methods and
techniques, and who could form a community of practice in which they could converse in the language of systems thinking about issues relating to the analysis and design of business and work systems. My initial research in 1997 had clearly indicated to me that we were going to need professional expertise in systems thinking and in adult education if we were to successfully meet this need. But I also had another more personal research agenda, that I could bring together aspects of social ecology and systems thinking to inform the development of practical approaches and techniques for the analysis and design of complex work systems.

**Education & Training Program in Systems Thinking**

In April 1998 (while attending my first postgraduate research residential), I approached Professor Richard Bawden at the Centre for Systemic Development, University of Western Sydney, Hawkesbury. Richard Bawden had recently developed a leadership program based on a systems thinking approach and was offering this program on a commercial basis to business and other organisations. In a response to a public tender process the ATO had, in December 1997, included Richard Bawden and the Centre for Systemic Development in a panel period contract for the provision of systems thinking services and consultancy to the ATO. Richard had also been one of my supervisors for my Master of Applied Science (Social Ecology) some years earlier, so I already knew something of Richard and his work.

I explained my need to skill business systems analysts and outlined some of my recent experience in this area. Richard listened politely, smiled, and said, “Of course, I could have told you that people cannot learn systems thinking in non-systemic ways! You need to read Marcia Salner’s article (1986) on epistemological development and contextual relativism!” (or words to that effect). That said, we sat down together and began to develop what became, after appropriate negotiations in the following weeks, a duly contracted learning partnership between the ATO and the Centre for Systemic Development.
Over the next 6 weeks, Sally Pegler and I from the ATO, and Richard Bawden and Bruce McKenzie from UWS, designed a new program specifically to support our people working on the LB&I Project Bijou. This program was based partially on Richard’s leadership program but also on Project Bijou needs and designed with the specific purpose of introducing ATO business systems analysts and other project staff to the notions of personal learning systems, general systems thinking, soft systems methodology, critical systems thinking, and viable systems methodology. The program also included a thematic exploration of various intellectual, behavioural, personal and ethical aspects required for leadership in the design of complex work systems. And for good measure, we also included introductory sessions on chaos and complexity theories.

The program was conducted over six months between June and November 1998, for twenty seven ATO staff and was facilitated principally by Professor Richard Bawden, Bruce McKenzie and Dr. Roger Packham from UWS, Hawkesbury. (Four of the ATO staff, including Sally Pegler and myself, had been involved in the earlier action research workshop that I had conducted in November 1997). The “Leadership in the Design of Complex Work Systems” program comprised:

- an initial three-day workshop in Sydney in June 1998,
- an initial work-based learning project,
- a five-day residential workshop at UWS, Hawkesbury, in September 1998,
- a second work-based learning project, and
- a final five-day workshop in Canberra in November 1998.
Key Outcomes from Learning Program

The key outcomes from the ‘Leadership in the Design of Complex Work Systems’ training program were:

1. The business systems analysts now demonstrated a very good understanding of systems thinking concepts and the primary systems thinking techniques of:

   - Soft systems methodology;
   - Viable systems method;
   - Critical systems thinking;
   - Learning systems;
   - General systems theory.

2. Business systems analysts began using the language of the techniques and applying the techniques in the workplace as part of their normal analysis and design activities.

3. I had established a community of practice for the application and evaluation of systems thinking techniques in the ATO, particularly LB&I.

4. I had whetted the appetites of many people for learning and for finding out a great deal more about systems and complexity and chaos. Like many other adults introduced to formal learning and study after years in the workplace, people had become intrigued and now had been given both the tools and the "organisational permission" to go on learning and to applying that learning in the workplace and their everyday lives.

5. As a result of my initiative in trialling this educational approach in 1998, the work of Richard Bawden came to the attention of Jim Killaly, ATO Deputy Commissioner LB&I. Following discussion and contract negotiations, the
Systemic Leadership program conducted by Professor Richard Bawden and the UWS Centre for Systemic Development became the model for leadership development for middle managers in the ATO Large Business & International division, a program that has been successfully conducted each year from 1999 to 2004.

6. I personally gained a far greater understanding of the range of systems thinking theories and techniques, and I gained enormous confidence, insight and knowledge about the underlying design and implementation of this type of learning program. It was a body of knowledge and understanding that I could, and would, apply in my professional practice in the ATO in the years ahead.

7. Perhaps most importantly, I realised that the “formal” systems thinking techniques of soft systems methodology, viable systems method, causal loop analysis, and strategic assumption surfacing and testing, were only useful in limited circumstances and that, for the many dynamic and emerging complex problem domains that faced senior and middle management in a large public sector regulatory authority, we were also going to need other practical techniques for systems appreciation, organisational analysis and design, and management problem solving.

The practical benefits from this program to our project were demonstrated, to both ourselves and senior ATO management, in the internal ATO project design report of October 1998. The report included:

- an exploration of the broader tax system and of (then) current ATO LB&I business systems capabilities using soft systems methodology;
- hard and soft systems maps;
- the identification of systemic interventions using soft systems methodology, viable systems methodology, and critical systems thinking;
the design of work systems, sub-systems and sub-sub-systems required to achieve LB&I Business outcomes;

the identification of key stakeholders, systemic relationships, boundary issues and proposed collaborative approaches and partnerships;

the design of hard and soft systems sub-projects to develop the appropriate work systems, business processes, technology applications, business intelligence and knowledge management and communication systems, client focus, management practices, work practices, performance management, leadership and the behaviours required to support and sustain an evolving and dynamic learning environment.

Emergent Learning and Issues

This approach to design using a methodological pluralism of systems techniques and other techniques, also quickly highlighted a number of organisational tensions, issues and design paradoxes. These issues included:

1. Using systems thinking techniques in an organisational environment populated predominantly by linear and process-oriented thinkers (i.e. positivist and reductionist) proved to be a two-edged sword where we began to observe serious tensions between those using systems thinking techniques and those using more traditional techniques.

2. Similarly, while the ATO had been encouraging managers and staff to “look outside the box” and to take far more systemic views of situations and problem solving, I observed that many senior managers were totally unprepared to deal with issues arising from the underlying emancipatory worldview inherent in soft systems methodology, viable systems methodology and critical systems thinking.
3. Further tensions arose where, in using these techniques, we quickly began to surface a range of strategic paradoxes and critical assumptions about the purpose, intent and strategic decision-making processes of the organisation. These were debates that the organisation was not necessarily willing to entertain.

4. Perhaps the most critical emergent issue from all this was that the very business systems analysts that we had endeavoured to skill in systems thinking became, to varying degrees, frustrated and disillusioned by the organisational response to the project design proposals, and to the difficulty of discussing systemic and emancipatory approaches with colleagues and managers who had not had the same learning opportunities. This was not a good aspect of the current organisational environment if the long-term aim was to reinforce the initial learning from the training program and to encourage the ongoing use of systems thinking practices. The challenge for the business systems analysts in using these techniques was to also understand the nature of leadership and personal judgement that needs to accompany the application of systems thinking. Unfortunately, for many different reasons this type of critical insight may take many years to develop in some individuals and in some cases may never occur to specific people during their working lives.

**Reflection**

Between late 1997 and 1999, adopting an action-research approach coupled with sound project management techniques, I and other members of the project team applied a range of systems theoretical frameworks and techniques in a number of collaborative workshops and other analysis and design activities. These techniques included soft systems methodology, viable systems diagnostics, causal loop analysis, critical systems heuristics, and general systems theory, the use of which represented a radical departure from more traditional organisational approaches to the design of business processes and information technology applications.
At the beginning of 1998, I had proposed the research hypothesis that a sound understanding and working knowledge of systems thinking methods and techniques would be of significant benefit to the managers and staff working on Project Bijou. By engaging the professional education services of Professor Richard Bawden and the UWS Centre for Systemic Development and by taking an heuristic approach to the exploration of this research hypothesis I believe that we did collectively achieve significant benefit for the ATO and for many of the managers and staff working on Project Bijou.

**What did I personally learn?**

I personally finished the "Leadership in the Design of Complex Work Systems" course in November 1998, with a far greater appreciation of Learning Systems, Soft Systems Methodology, Viable Systems Methodology and a strong understanding of Richard Bawden's notion of "being systemic". The great breakthrough for me, however, was being introduced to Critical Systems Thinking, with its three components of Critical Awareness, Methodological Pluralism and Implementation, and which provided a cohesion and framework in my mind for considering the whole field of systems thinking. In 2000 & 2001, I would later use this understanding of Critical Systems Thinking to underpin my systemic representation of social ecology enquiry as one of the four major components of the Namadgi Technique (See Chapter 3 and 6).

**Revisiting an Earlier, Yet Recurring, Question: Could everybody learn to be a systems thinker?**

Based on my experience with this course and from my perspective and observations, I do not believe that everybody can learn to be a systems thinker. Of the twenty seven people I introduced to the "Leadership in the Design of Complex Work Systems" during 1998, it quickly became apparent that some people thrived in this learning environment
and in thinking systemically while others struggled with some of even the basic notions of systemicity. Of this latter group, comprising about five people, all of them could use the language of the systems thinking course, but they could not immediately (i.e. in 1998) apply any of the knowledge or thinking in either changing some of their individual patterns of behaviour in the workplace, nor could they apply the knowledge to their work as middle managers or business systems analysts.

There are possibly two issues here:

- The nature of systems theory & the various systems thinking methods and techniques; and
- The effectiveness of the education program conducted over six months by UWS Centre for Systemic Development.

In the evaluation of the program that I conducted in December 1998 and again, another twelve months later, at the end of 1999, it was clear that all but two of the twenty seven participants found the course thought-provoking, intellectually challenging and stimulating and on reflection believed that the blend of experiential, propositional and practical learning had been a very effective way of gaining individual and shared knowledge and understanding. The two exceptions to this both said that they felt out of their depths and could not understand either the systems thinking content nor the learning processes in which they were involved. This seemed to apply particularly to the experiential approach to much of the program. We had recognised this situation with these two individuals early in the program so it did not come as a surprise. As to whether it was the quality and effectiveness of the training program or the nature of the individuals themselves that contributed to their learning difficulties, I can only say from my perspective that both people involved were not as intellectually capable as the others, though nor were they expected to be. The public sector employs a wide range of people from different cultural and educational backgrounds, and it is clearly acknowledged that some people are more capable than others. I say this simply to emphasise my sense that the training program itself was an appropriate and effective learning and education
process for most of the participants given the context and circumstances in which we were involved in 1998.

So while some people thrived and some clearly didn't, most participants found the program a stimulating, challenging and rewarding learning experience. A basic premise in adult education and social ecology is that people think and learn differently, and this program had been designed to take different learning and thinking preferences and styles into account. My belief is simply that for many reasons not everybody is a clear thinker, let alone a systems thinker, no matter what the situation or context may be.

Nonetheless, the key impact of the program was that it greatly improved the general thinking capability and level of debate in our Project Bijou team. Key learning from this program included:

- If not everybody could think systemically, particularly about business, organisational and work related issues, the education experience alone was worth while as every participant acknowledged their own personal growth and development, as well as observing in themselves and in each other an improved critical thinking capability;

- Some systems thinking techniques were far more intellectually and practically accessible than others. Critical Systems Thinking and Soft Systems Methodology were more readily understood and participants expressed the view that they could see a clear link between the theory and being able to apply the methods and techniques in the workplace.

- The Viable System Method however was difficult for many to grasp, and on reflection, we could have spent more time and hands-on support and guidance when introducing participants to this concept and technique.
➢ We saw a significant improvement in the individual and collective professionalism of our team

➢ Many people commented on the deep personal insights and learning experiences as a result of doing the program.

So could everybody learn to be a systems thinker? Based on this experience and approach, probably not.

Did everybody need to be a systems thinker? Quite simply, no.

I believe that there is immense value in having a team that comprises a diversity of experiences, learning and thinking styles. What we needed were good thinkers, no matter whether they were systemic, critical, linear or creative thinkers.
3rd Iteration: Developing my own skills and sets of techniques for mapping complex work systems.

Exploring Practical Techniques for Systems Mapping in the Workplace

In November 1998, I began to think about practical techniques for systems mapping in the workplace. From my earlier research I already understood a range of formal systems techniques, however, my experience and associated cumulative learning had also led to my understanding that something more practical and accessible needed to be identified and made available for use in the workplace.

Background

One Saturday morning in November 1998, I was bushwalking by myself in Tidbinbilla Nature Reserve. As I walked among the granite boulders and dry eucalypt forests I found myself having the following conversation with myself that went something like this:

The expressions "systems mapping" and "mapping the system" can often be heard in management meetings and corridor conversations of large public sector organisations. "We need to do some systems mapping!" a manager will declare incisively to his or her gathered colleagues, to which the gathered colleagues will all nod their respective heads in wise agreement. Talk to most middle and senior managers and you get impression that the idea of systems mapping is a commonly understood and widely used technique. But if that is the case then the office walls should be covered in such "maps", enabling people in the workplace to quickly access intelligible and readily communicable information about the broader work, social and organisational systems in which they work. Managers and staff would readily use such techniques in a wide range of strategic and operational activities from strategic planning to risk
management to client service, resource allocation, performance management and improving processes for team communication.

I often look around the walls and across the desktops of my work colleagues and yet, I see no such diagrams or maps. I attend management meetings and problem-solving workshops and I see no evidence of systemic appreciation or of shared understanding. Instead, I hear the language of linear thinking and hierarchical control and see the application of inadequate techniques that simply serve to limit thinking and debate. I am not saying this to criticise my colleagues or peers in the workplace. Over the years I have heard many systems thinking practitioners and management consultants nod wisely about "systems mapping" and yet have seen very few systems maps and models forthcoming. So what is this ‘systems mapping’ that everybody seems to know about but few have seen?

What are they all talking about?

Well, in a way it is an urban or, at least, corporate myth, an Eldorado of corporate problem solving.

Systems mapping is similar to the mythical unicorn, nobody is quite sure if it exists or not. Everybody seems to want it to exist, but try and track down somebody in the corporate world who has seen or heard or even used it, and you get told stories about “a friend of a friend who said…” and “no, not here, but I know they definitely used it in the other place I used to work.”

I began to wonder whether systems mapping was simply a trick of the light, a form of chiaroscuro in organisation folk lore, a vague shimmering light viewed fleetingly and indistinctively in the distance down the corridors of power, perhaps a strange twenty-first century form of corporate mirage and hive hysteria.

In the end I came to the conclusion that there may be no such technique as "systems mapping" or at least no one definitive technique that you can put your hands on with certainty and use in the workplace to produce a formulaic and clear-cut systems map.
Instead there are a number of theoretical and practical ideas, modelling techniques, approaches, language and thinking frameworks that you can use in combination during informed conversations to give you a range of systemic perspectives, insights and diagrammatic representations about dynamic relationships and emergent properties that relate to your system-in-focus or area of inquiry.

The next day, Sunday morning, I took a number of systems thinking related books from my study bookshelves, grabbed a handful of A3 paper and some blue and red pens and I sat down at the dining room table to focus on these questions:

- What did "systems mapping" actually mean?
- What was currently being used by myself and others in the workplace to map systems and systemic problem domains?
- What other techniques could I use?

I started browsing through the books, marking key pages with post-it stickers, looking for anything that vaguely hinted at a systems mapping technique. Some techniques were easily identified: causal loop analysis, soft systems methodology, viable systems, critical systems thinking, and learning systems. But with the exception of causal loop analysis, these techniques were all approaches and processes rather than a mapping technique in itself. So much for a quick literature search, I thought, let me start with what I know.

I began to develop a mind map on an A3 sheet (see Diagram 2.1 Systems Mapping on next page). In the centre I wrote:

**SYSTEMS MAPPING**

*(Practical ways to map relationships in complex systems)*.

On the left hand side of the paper I wrote "Systems Thinking", under which I began to list some key information: eg

- A system…

- System features…
Soon I was reaching for various research papers, articles and books and filling my mind map with relevant information and detail about various concepts, ideas, methods, techniques.

Then I started going further a-field into other areas of concern. During 1998, I had done some research articulating key principles of social ecology from my perspective, and I now listed these principles on the top right hand side of the page.

I included a quote from Kipling’s "If" and related it to Situational Leadership and also to "personal ways of making meaning, coping, healing, living, being...".

Above "Systems Mapping" in the middle of the page I wrote:

“The making of meaning and the making of meaning for others ” which I then also connected to the "Leadership" and "Complexity" and "Social Ecology" areas and to “Systems Mapping”.

Also in 1998, I had been working on a general approach to systems analysis and design, which I now wrote on the page under a heading of "Practical Techniques for:"

I also thought that what might be needed were some Principles for Designing Complex Works Systems, though I didn't have any clearly articulated yet. Then, almost as an afterthought I listed seven techniques that might be useful in systems mapping:

- Scenario planning
- Stories & narratives
- The five why’s
- Brainstorming
- Mind mapping
- Relationship diagrams
Causal loop diagrams

On the bottom right hand corner of the page I listed 3 quotes from C. West Churchman (two of which came from Flood & Jackson (1991), and the last of which was attributed to Churchman by Richard Bawden (1998).

I then briefly mentioned Marcia Salner's work on Perry's 3 thinking states and epistemological relativism (Salner 1986), and finally I included some other ideas of my own that I thought might be helpful:

Interface analysis
Focussing questions...

I sat back and looked at my mind map and thought about it for a while.

With everything I knew about these techniques and degree of difficulty and learning about them, and with everything I knew about adult learning and the ATO "let's just do it" culture and the type of tax legislation oriented people who comprised the Business Tax Reform team (with whom I was then currently working as a systems mapping consultant), I asked myself: "What would be useful, helpful and readily understandable in the work place?".

I took a new sheet of paper and created the following list:

- Interface analysis and design (Bruce-Smith 1996);
- Mind mapping;
- Relationship diagrams (ATO Continuous Improvement techniques)
- Rich pictures (Checkland & Scholes 1990)
- Work systems mapping (Bruce-Smith 1998)
- Causal loop analysis diagrams (and stock/ rate of flow diagrams) (Senge 1994)
- Emergence diagrams (Hitchins 1992)
- Applied strategic navigation systems model (Hames & Oka 1997)
This became my hypothesis: that these eight techniques comprised a range of practical and understandable approaches to mapping aspects of the new business tax system.

Over the next eight months I conducted a series of design workshops for Business Tax Reform where I was asked to facilitate the application of these various techniques to a range of Business Tax Reform design options and considerations. I quickly found that the interface analysis and design technique was the most readily understood and useable technique for people, and was particularly useful for introducing people to concepts of systems thinking in a work context.

Mind mapping and relationship diagrams were also readily used, while the rich picture technique was used less frequently and then mainly in the form of high-level interface diagrams.

The work systems design concept and technique that I had developed and found intriguing and useful proved to be unfathomable to most people and was not used. This seemed to be partly because I hadn't thought it through properly, nor had I considered how to introduce people to the idea or value of such a technique. This was to give me considerable insight and food for thought so that, 18 months later, I redesigned the technique and found a totally different and more successful way of introducing the idea and the practical technique to people.

Hitchins’ (1992:83) notion of emergence diagrams proved to be both difficult to understand and impractical to apply. This was disappointing from my perspective because it had been enthusiastically recommended to me by a management consultant colleague and I had hoped that the use of emergence diagrams would have clear benefits in designing complex work systems to achieve specific desired outcomes. A number of people who comprised our systems thinking community of practice and who also tried to apply some of Hitchin's ideas all reported difficulty in reading the text and actually following the logic by which he applied his techniques. Their experiences mirrored my own. I believe that some of the difficulty with Hitchin's book was the page layout and typeset in that the book simply did not present ideas well. Similarly the diagrams became busy and confusing.
Causal loop analysis was used to some extent though at a fairly unsophisticated level; it was more bubbles and arrows on a whiteboard rather than an exploration of causality and causal relationships. Similarly, there was a very poor understanding of the Strategic Navigation technique, despite the organisational decree that senior and middle managers were expected to be familiar with and to use the techniques. The almost total lack of educational effort by the ATO to actually help managers learn about Strategic Navigation revealed this sort of ATO executive decree to be yet another example of empty organisational rhetoric. (This ironically had the undesired effect of creating a negative reinforcing loop around entrenched cynicism and a general dismissal of any strategic management techniques among senior and middle managers!) As a result Strategic Navigation with its rich potential for sophisticated and critical thinking was largely ignored.

The simple fact was that the people working in Business Tax Reform did not generally see the world in systemic terms, nor had they been trained to do so. They were tax lawyers, auditors, and chartered accountants. They did not have a working vision or understanding of a business tax system and were not interested in systems mapping activities.

**Findings and Outcomes from this 3rd Action Research Iteration**

Over this time, the interface analysis and design techniques, relationship diagrams, mind mapping (applied to the exploration of business problem domains) and to some extent rich pictures, all became synonymous in Business Tax Reform with idea of systems mapping.

Of the eight techniques in my original November 1998 systems mapping hypothesis these four techniques (interface analysis, relationship diagrams, mind maps, rich pictures) proved to be readily accessible, understandable and useful to managers and business systems analysts, while the Strategic Navigation techniques, work systems and causal loop analysis techniques were simply not used by other ATO officers for
the simple reason that people in the workplace believed that the techniques took too long to learn. I also suspect, from my experience in working with many of these people over time, that the techniques required a reasonable level of critical and analytical thinking and personal judgement to use as well as a prolonged period of time to learn and to gain confidence in using. As seems to so often be the pattern, there is rarely an intentional or conscious organisational environment that encourages individuals to learn and to take time to play and practice applying these new techniques.

The final technique, that of Hitchin's emergence diagram, proved to be unclear in its purpose and description and impractical to apply in the type of business systems problem domains we were dealing with.

Over the last five years since 1999, I have had considerable experience using seven out of the eight of these techniques. (I have not revisited Hitchins’ emergence diagram, nor indeed any of his work). I have however, spent considerable time, effort and research in fully developing the work systems mapping technique, and it now forms an important part of my journeyman’s toolkit.

**Building on Research Findings and Cumulative Learning**

There are several other techniques that I developed as a result of my ongoing research and my cumulative learning. Whereas the seven techniques discussed above came from desire to develop ideas and techniques that could be readily used by others in the workplace, there have also been a number of techniques that I have developed principally for myself as a means to improve my capability as an analyst and designer of work systems and as a facilitator of design conversations.

These techniques are:

- Using work systems maps and modelling as an initial framework for systemic diagnostic activities and productivity improvement,
- Knowledge maps,
The use of wall maps,
Coherent conversations and moment of truth diagrams,
Systemic appreciations, formed by bringing together different diagrams
together to weave a tapestry/collage, and to use this collage to reflect, think,
make connections and to discuss different perspectives and interpretations.

I developed these techniques over time, as my understanding of complex problem
domains grew and as I began to gain insight and confidence into how these problem
domains could be addressed.

Over the last 6 years I have used this organisation/community interface technique
extensively in a wide range of design conversations and analytical and design
situations. I have also developed a great degree of sophistication in analysing and
mapping complex situations using this technique, as well as high-degree of skill in
engaging others in explorations of systemic analysis.

I now find that with a whiteboard and/or a large blank sheet of paper and a few
coloured pens I can quickly develop a systemic analysis of a complex problem
domain and facilitate a coherent conversation that can move groups of people closer
to an shared and agreed understanding as well as an appreciation of design options for
improvement and sustainable change.

How did I develop such a skill? By taking a long-term heuristic approach, and using
each new potential application as an opportunity for trial and error and for exploring
both my limits of systemic analysis skill and the limits of the technique in exploring
and communicating ideas. I also use the whiteboard or large sheet of paper as a
canvas for my creative imagination, and as a way of capturing and describing the
essence of the stories others tell about the problems and challenges facing them in the
organisation and workplace. I listen and observe and gain feedback from others. I also
watch how others respond and engage with this technique, which gives me further
insight into how different people think about real-world issues and approach the
exploration of complex problem domains. This insight in turn feeds my imagination
and thinking as I seek new ways to express ideas and to help others articulate their
explicit concerns and understanding of a situation.
The relevance of my ongoing learning and the development and use of these techniques is that I realised in 1999 that there is a limit to what and how I can show and teach others to use particular techniques. In various training courses that I conduct for managers and staff I introduce people to the basics of interface analysis and design, and I train them in how to use and apply the basics of systems mapping and work systems analysis. Any further sophisticated use of the techniques I leave to each individual to develop and grow and learn as they wander on their own respective learning journeys through life and the myriad work landscapes that present themselves to each of us. Each person will make his or her own meaning of his or her unique experiences and opportunities.

Part of the limit between what I know and what I can teach simply represents the fuzzy boundaries between the component of the technique that many people can readily use and the component of the potentially more sophisticated way in how I may personally use the technique. My personal use of the technique is intrinsically linked to who I am and my own unique blend of creativity, knowledge, thinking patterns, experience, personality, intellect and visual design opportunities.

**Formative Evaluation**

Twelve months after the completion of the 1998 ‘Leadership in the Design of Complex Systems’ training program, I conducted a follow-up evaluation of the outcomes of the program because I wanted to know how useful people had found the program on reflection and which techniques and ideas they were still using.

In November 1999, I formally interviewed ten people who had been on the course. Five of the ten people interviewed were either working for me or with me in the Jacaranda Project, while organisationally, most were still associated with the same LB&I Business Systems Segment they had been in 1998 when they worked on Project Bijou.
The formal interviews comprised participants being invited to a one-on-one interview with me at a pre-arranged time. (The interview questions are included in Appendix E). Participants were fully aware of the purpose of my interview and willingly agreed to be interviewed. I asked each of them the same series of questions and recorded aspects of their respective answers in handwritten notes, a copy of which they were given at the end of the interview. The interview lasted approximately forty five minutes.

I also informally interviewed a number of other managers and staff who had also been on the course but who came from other organisational areas and were not business systems analysts directly associated with Project Bijou. The reason for conducting these interviews informally was a combination of people’s availability, geography, the time available, and that our conversations relating to the 1998 training program opportunistically occurred as part of a broader analysis activity and discussion which I was conducting during October and November 1999. The informal interviews comprised my engaging two small groups of managers and business systems analysts in design conversations focussed around a large wall diagram on which I had been collaboratively developing a visual representation of a systemic appreciation over a period of two months. This activity involving the large wall diagram was relevant to my and their work at the time. For ATO and individual confidentiality reasons I will not write of any of the contextual details of the problem domain nor of the circumstances in which I was conducting the systemic analysis.

Here are some of my key findings from late 1999.

**November 1999**

Much had happened organisationally between our finishing the ‘Leadership in the design of Complex Work Systems’ program in November 1998 and my evaluation interviews and conversations in November 1999. Many of the ten people I formally interviewed to had been involved in working for the Business Tax Reform project where, for whatever reasons and to the constant frustration of the ex-Project Bijou
business systems analysts, systems thinking was actively discouraged. Nonetheless, these were the general findings:

- Most people thought that the 1998 course had been worthwhile, but that:
  - By November 1999, they had forgotten a lot of it;
  - they did not have an opportunity to use the techniques in their work in the Business Tax Reform project;
  - they thought the whole course was possibly too rushed, and that
  - they would like the opportunity to do the course (or some variant of it) again with more time for thinking, practice, reflection, discussion, guidance and feedback.
  - In regard to this last point, many said they would like opportunity to formally study systems thinking methods and techniques, rather than just having an introduction to this knowledge. They also wanted to include a much deeper exploration of complexity, chaos and complex adaptive systems. A significant number of business systems analysts and managers also said that they would ideally like this to be combined with a course on the latest information technology advances in relation to intelligence capabilities.

- A number of people said that they would like to do similar systems thinking courses again, but that they wouldn’t use the University of Western Sydney, preferring to approach other institutions such Monash University or Royal Melbourne Institute of Technology to see what these institutions had to offer in terms of learning programs and the possibility of ongoing contact and support. In this context there were a significant number of concerns raised about the level of professionalism and depth of experience that the UWS facilitators actually had in systems thinking and in the practical application of systems thinking in complex business situations.

- Some people were still reflecting on the experience (these twelve months later) and what it had all meant to them personally. They were still uncertain what to make of the whole program as well as systems thinking, particularly the learning systems approach.
Some managers said they were still actively using aspects of the Viable Systems Diagnostic to gain insights into issues of communication, information flows and intelligence capabilities, although none had actually used the technique except at a very high (i.e. abstract) level and during general discussions in meetings.

Most people still used, in their current language-in-use, notions of soft systems, rich pictures, recursion, systems 1, 2, 3, 4, 5 and 3*, external environment, boundaries, relationships, sub-systems, systems, supra-systems. Also from Critical Systems Thinking, most people could readily discuss Ulrich’s 12 Questions, and, in fact, had been actively using aspects of the technique in their various project work, particularly in regard to ownership of work systems and issues of the potential inclusion and exclusion of stakeholders.

Many expressed the frustration of talking a language of systemicity in a broader organisation that continued to talk a language of reductionism and linear process. This was also in the context of general dissatisfaction between much of the (then) corporate rhetoric around tax reform when compared with the actual management practices.

One influential manager said that he never believed systems thinking was anything more than an interesting theory and that, like many things in the real world, his experience of the last twelve months had convinced him that that systems thinking and techniques didn’t work.

A number of managers and business systems analysts said that they actively used soft systems methodology. On gently probing I found that in each case they only thought they had been using soft systems methodology; each person was quite genuinely surprised when he or she couldn’t give me an example of actually using the technique. Some people confused fairly basic mind maps with Checkland’s notion of rich pictures. Another person who said that his team had used soft systems in a whole of team analysis activity admitted that,
after the rich picture development, they had partially used the CATWOE/TWO ACES mnemonic but that they did not define the define the “T” (transformation) nor the “W” (Worldview) and had not continued to do a Root Definition, or to follow through with the next stages of the soft systems methodology.

- Four people said that they remembered the notion of learning systems very well, but admitted, when asked, that it had not occurred to them to use this concept to introduce new staff who now worked in their areas to aspects of systems thinking. Further probing revealed that while these four were now all managers and regularly used a “systemic language” to converse with one another, there had been no effort made to introduce this language to subordinates or to include them in the discussions. Apparently if others were present at planning meetings when, say, the viable systems model was being used as a diagnostic tool, then these new staff who had not had the benefit of formal training sat there in silence and were unable to effectively participate in the discussion. A language of inclusion had become a language of exclusion. This appeared not to have been the result of any deliberate intention, just the outcome of thoughtlessness on behalf of the managers.

- Two people independently expressed the idea that perhaps 1998 was the right organisational time for systems thinking, but that now time had moved on and these techniques were no longer appropriate. A significant number of people expressed the similar view that in the current political and organisational climate of late 1999 any clever idea or holistic technique was unlikely to be well-received within the ATO senior management hierarchy.

- One person who was keenly interested in participative and collaborative analysis techniques, discussed the idea that soft systems methodology in its “Checkland” form was too intrusive and demanding on people in the workplace, particularly in terms of the enormous difficult in getting consensus around problem definition, the development of an agreed rich picture, and the
high degree of difficulty in both using the TWOACES mnemonic and the formation of a root definition. Instead, she had been researching and exploring similar yet more inclusive and engaging techniques associated with user and client focussed information technology applications design. (In 2003, by now a team leader, she enrolled in Masters Degree at RMIT to further her understanding in areas of participative approaches and knowledge management. We regularly exchange information and discuss effective techniques).

- Despite various shortcomings of the program, all of those interviewed during the formal and informal discussions, had particular enjoyable experiences and memories of aspects of the course that still caused them to laugh and that they each happily shared with me during our conversations.

Based on these interviews and my observations throughout 1999 when I had a lot of ongoing contact with all ten people as well as with many others of the original twenty seven participants, there were three broad conclusions that I drew from these formal interviews and ongoing evaluation conversations:

1. That without an encouraging and supportive post-training work environment, people were going to have a very difficult time retaining and practicing their new knowledge and skill sets. In fact, it was my belief that the unsupportive environment in which these people worked during 1999 caused them to experience unnecessary personal stress and organisational friction.

2. That the formal systems thinking methods and techniques were not enough. As they were currently packaged and presented from an academic perspective, the formal techniques such as soft systems methodology, viable systems method, learning systems and critical systems thinking were not readily applicable nor fully useful in approaching the complex organisational and situational problem domains that the business systems analysts were expected to tackle. People were still going to need more readily accessible and very practical techniques
that could be applied in the workplace to encourage systemic analysis and design.

3. Overall, we did not have the community of practice or critical mass of skilled systems thinkers and business systems analyst that we were hoping to draw on as the Jacaranda Project progressed over the next 6 to 12 months during late 1999 and throughout 2000.

It was this set of findings and conclusions that led me to initiate the 2nd Action Research Cycle in late 1999 and 2000, relating to a business systems analyst development program and the search, design, and implementation of a range of practical techniques for the analysis and design of complex work systems.

The 2nd Action Research Cycle is addressed in Chapter 3.
Chapter 3. Practical techniques.


Purpose

The purpose of Chapter 3 is to tell the continuing story of my research during 1999 and 2000, and the development of an initial set of practical tools for the analysis and design of complex work systems.

Structure of This Chapter

Summary Information
- Focussing Research Questions
- Research Methods
- Key Outcomes

Part 1: Introduction to Chapter 3
- Background
- Significant Features of this Research Design
- Reflection

Part 2: Preliminary Activities & Learning in 1999
- The April 1999 Chaos & Complexity Workshop
- Ongoing Conversations with Dr. Robert Woog
- David’s Book of Living and Being
- A Synthesis of ideas – the Development Program (November 1999)

Part 3: 2nd Action Research Cycle Late 1999 to December 2000.
Research Questions

- “Given that the formal systems thinking techniques we explored in 1998 only went so far, could I develop a set of practical techniques specifically for use by business systems analysts and project officers involved in the analysis and design of business and work systems in complex environments, particularly in an intelligence and knowledge management environment?”

- “Assuming that I could design a set of practical techniques, how could I most effectively introduce techniques and train people in the use of the techniques?”

Research Methods

A critical learning heuristic approach that combines:

1. Participative enquiry and action research;
2. Creative thinking and design;
3. Experiential learning and reflection;
4. Personal musing and reflection;
5. Collaborative and strategic design conversations;
6. Project management and Public Sector organisational management practices;
7. Leadership in analysis and design.

Key research outcomes

1. I developed an effective way of introducing people in the workplace to systems theory and systems thinking techniques where the material was accessible, understandable and applicable in their everyday work as managers and business systems analysts.
2. The first iteration of a range of practical techniques that can be readily and effectively applied in the analysis and design of complex work systems.

3. A successful five-day ATO training program entitled “The Introduction to the Analysis and Design of Complex Work Systems”.

4. Two publications to support the training program:
   - A volume of twenty research papers; and
   - A training course book.

5. Further insights into leading and managing action research and a creative design team in a large complex and geographically dispersed organisation.

6. The further development of two highly-skilled, capable and well-informed research officers who worked for me.

7. My own emergent learning and knowledge.

8. A co-evolving reciprocity of ideas, understanding and learning that flowed between my ATO research team and the University of Western Sydney, Hawkesbury, School of Social Ecology and the Centre for Systemic Development.
Part 1: Introduction to Chapter 3

Purpose

The purpose of Chapter 3 is to relate significant aspects of the action research approach into the exploration and design of practical techniques that I initiated, lead, managed and conducted with my small research team between November 1999 and December 2000 as part of the broader ATO Jacaranda Project.

Significant Features of this Research Design

There were several significant features of this critical learning heuristic research:

- The action research was situated in the broader context of the ATO Jacaranda Project, for which Sally Pegler was the Project Manager and I was the Integrated Design Manager. This research took place concurrently in Canberra, Sydney and Melbourne during the period November 1999 to late December 2000.

- My two research officers, John van Blommestein in Sydney and Stephen Jovanovich in Melbourne, were also studying for post-graduate qualifications. In January 2000, Stephen Jovanovich was studying the first year of a two year part-time Master of Arts (Chaos, Complexity and Creativity) degree offered by the UWS Centre for Systemic Development. Similarly, John van Blommestein was completing the final year of his part-time studies for a Master of Applied Science (Social Ecology) degree at UWS. I actively encouraged Stephen and John to use aspects of our ATO action research as the context and basis for some of their own research and studies. This proved to be an extraordinarily rich project resource and I believe that many people benefited from the broader learning community that combined organisational need with action research and university scholarship and research.
The action research would not have taken place nor achieved the outcomes it did if I had not constantly taken a clear leadership role in a complex mix of empowering, challenging, focussing, managing, driving, motivating, encouraging, explaining, listening and providing feedback to my research officers and others. Equally important was my application of sound project management techniques to effectively manage and conduct an action research project over fourteen months, with my key staff in Melbourne and Sydney while I worked in Canberra. This effective management and leadership capability and practice operating in the background of the action research was particularly important in the context of the broader organisational environment of tax reform, rapid and dynamic change in regard to shifting ATO priorities and resource re-allocation, and the unfolding complexity of the ATO Jacaranda Project.

In this regard I should add that my duties and responsibilities as the Integrated Design Manager were many and diverse, as were those of Stephen and John, and that the action research into practical techniques that I describe in this narrative was only a partial, though vital, component and focus of our ATO work.

From my personal perspective however, the intriguing and exciting aspect of this action research was that I was able to build on my earlier research findings from the first action research cycle that I described in the previous chapter. Over the thirteen to fourteen months period as I conducted this second action research cycle I moved beyond the consideration of how academics and world-renowned systems thinkers and authors believed certain methods and techniques should be applied, into the real-world of well-intentioned busy managers and staff trying to approach often very messy, ambiguous and complex issues equipped only with a poorly informed set of techniques that in many cases were either only half-understood or simply wrong for the task or, more often than not, both. During late 1999 and 2000, I developed a growing confidence in my understanding and assessment of the problem domain and a clear conviction of both my own and the organisation’s critical need for the practical techniques I was pursuing. I also experienced a growing self-recognition that I was in a unique state of mind, circumstance and position to pro-actively
research and meet these needs. I came to recognise that my personal passion for this inquiry was also fuelled by a growing understanding that there was no magical formula or expert’s book that would lead me to a hidden cache of practical techniques just waiting to be discovered. With the passion came, in early 2000, the somewhat hesitant acceptance of the responsibility that as an informed individual with unique gifts and as a social ecologist I would probably need to compile, shape and/ or design the practical techniques myself. This realisation of my design responsibility formed the driving force behind the critical learning heuristic approach to my work and research. At the end of 1999 and beginning of 2000, I had a reasonably good understanding of what I was after and where I wanted to go, and I had decided that I would use an explicit action research approach combined with project management techniques to engage others in the journey and to bring them along with me. Over the next twelve months I began to purposefully shape and design the practical techniques that would form the basis of the suite of ideas, approaches, processes and techniques that I am now calling the Namadgi Technique.

**Richer Understanding and Insight from Adversity**

For a range of reasons that I cannot discuss in this thesis narrative, the Jacaranda Project experienced enormous and unusual hostility and animosity within the ATO during 1999 & 2000. Those who worked on the project, particularly the core management group, experienced a great deal and degree of stress, frustration, exasperation and disillusionment, mainly through the broader organisational ambivalence to the project and the potential change to the status quo that the project represented, as well as through the entrenched inability of many in senior management positions to make clear and timely decisions about strategic design issues. I came to call this shadow aspect of the workplace “organisational madness”. I found that to cope with this organisational madness I needed to search deeply within myself to find inner strengths and values and to trust my own judgement and sense of self when making decisions in the extremely complex, dynamic and paradoxical working environment.
In this regard, much of what happened during and with the Jacaranda Project has informed my thinking, my research, and my exploration and design of practical techniques for the analysis and design of complex issues and work systems.
Part 2: Preliminary Research Activities and Learning in 1999

Purpose

To briefly describe four significant and relevant aspects of my thinking and research during 1999 that contributed to the preparation and shaping of the 2\textsuperscript{nd} major action research cycle that I initiated in November 1999. These four significant aspects are:

1. An action research workshop I initiated in April 1999;
2. My ongoing conversations with Dr. Robert Woog and the development during 1999 of the Master of Arts (Chaos, Complexity and Creativity) program;
3. David’s Book of Living and Being;

I will briefly address each of these four areas.

An action research workshop I initiated in April 1999

One of the emergent learning outcomes for me in 1998 from Project Bijou was that I now had a far better understanding of the type of skill sets and capabilities that our business systems analyst were going to need to tackle the increasing complexity of the environment in which they designed and the changing nature of work. The following twelve months however, were to be a time of great personal opportunity for me to significantly enhance my own systems mapping and systemic analysis skills, when I could refine, develop, test and explore the sorts of systems mapping techniques I described in the final phase of the last chapter.
While 1999 may appear somewhat of a research hiatus, it was actually a highly creative and productive time in which I explored a range of ideas and put in place the foundations for the action research I was to conduct in 2000 and 2001.

**Exploring Chaos and Complexity Theory**

The introductory sessions to complexity at UWS by Dr. Robert Woog and Dr. Vladimir Dimitrov as part of the Leadership program in September 1998, had intrigued and puzzled me. I wanted to know more about complexity and chaos theories. In particular, I wanted to understand how these theories and their implications might inform me in the design of work. If ever there was a time for understanding and applying more effective ways of designing in complex environments, I reasoned, now in January 1999 as we are tasked with designing a “whole new tax system” and business tax regime, that time must be now!

I began to think through and plan the next round of research and inquiry.

In April 1999, I set-up and convened a four-day action research workshop at UWS Hawkesbury, to which I invited eleven other ATO managers and business systems analysts from our learning group and evolving community of practice. The focus and purpose of the workshop was to combine the theoretical frameworks offered by systems thinking and complexity and chaos theories with an organisational exploration of the requisite features and dynamics of an effective business intelligence capability.

Dr. Roger Packham facilitated the workshop. Working from my initial rough outline of the four days, Roger & I co-designed the process as each day unfolded. This was a co-design, with an underlying critical learning heuristic, that brought together academic insight and focus, educational expertise and practical action research experience from Roger Packham, with ATO organisational insight and focus, an understanding of our broad design domain, knowledge needs and the ongoing design conversation in which we were already engaged.
The purpose of the workshop was not to seek an “answer” or “solution” to a specific problem by the end of the workshop, which was the usual pattern of so many of the meetings and “purposeless workshops” that I have so often observed and participated in over the years in the public sector. Rather at the end of this workshop I wanted people to have explored and learnt and discussed and reflected and thought and been challenged at both an individual intellectual level and at a workday analysis and design conversational level. I wanted us to go away from the four days and be ready to seek further learning and to engage one another in an ongoing evolving and well-informed design conversation.

Aspects of our collective learning were subsequently documented in an internal project report, “Exploring the Practical Applications of Complexity Theory” (Jovanovich 1999).

Perhaps though, beyond any immediate benefit for the ATO and the individual participants in terms of knowledge and confidence to apply the knowledge, this workshop proved to be a pivotal milestone in my research and my quest for practical techniques.

At a personal level, I gained a far greater understanding of many aspects of complexity and chaos theories, and particularly found the notions of coherence, resonance, self-organisation, sensitivity to initial conditions, adaptation, co-evolution and the concept of a coherent conversation extremely insightful and useful.

I also gained a deep appreciation of the difficulty people may have in grasping concepts associated with chaos and complexity. During the workshop I had observed that many of my ATO colleagues had each struggled at various times with understanding a range of concepts as well as with the nuances and subtleties of language and meaning. Several were simply uncomfortable with the level of abstraction with which we were dealing and this discomfort was expressed quite explicitly in terms of questions raised about the degree of applicability all of this had in the workplace. I noted that some people had difficulty in bringing the various concepts together as a holistic body of thought which again was expressed explicitly in terms of not being able to see “how it all fitted together”. Some people also
expressed a degree of frustration and exhaustion with the intensity of the workshop and the demand it placed on individuals to think and learn about such complex subject matter. This was particularly in relation to a comparison with the normal pace of learning that they expected and were used to in the workplace and also the much lesser intensity and degree to which any theoretical or conceptual work was actually discussed in the office.

This of course was not everybody’s experience; some people clearly thrived in the learning and workshop environment, while others experienced differing degrees and mixes of the responses indicated above. One of my concerns was that at least half of the twelve participants demonstrated high levels of stress and discomfort during the workshop and a relatively low level of understanding of the subject matter. This last point, that of understanding, became abundantly clear, by the poor quality of some of the one page articles that participants were asked to write at the end of the workshop and the obvious degree of difficulty people had in trying to define the concept or idea that had chosen to write about.

There may too have been many other contributing factors to this, some of them to do with the design and ambitious nature of the workshop, some with the design of the learning sessions and quality of the presentations, some with the complexity of the theories we were exploring, some with individual learning preferences and styles, and some with attitudes and long-term behaviours relating to thinking patterns and learning in the workplace.

The experience, however, was pivotal for me in that I gained an insight into the difficulty that some people may have in accessing, understanding and applying ideas associated with complexity and chaos theories. This could be readily translated into knowledge-for-action (Argyris 1993) by considering that, as an ATO manager working in the field of socio-technical systems analysis and design and who had taken on an added responsibility of developing other managers and business systems analysts in this field, I needed to find more effective ways of making this type of theoretical work more accessible, understandable and applicable to managers responsible for the analysis and design of complex work systems. I came to the conclusion from this workshop and from my subsequent reflections and discussions
with others over the next few months that if people were going to benefit from access to this knowledge they were going to need time, support and encouragement to learn, and that they were going to need access to structured education programs that could be delivered over a relatively long period of time.

This leads me to my second major contributory and preparatory activity.

**My ongoing conversations with Dr. Robert Woog and the development of the Master of Arts (Chaos, Complexity, and Creativity) Degree Program.**

During 1999, I became involved with Dr. Robert Woog in a series of ongoing design conversations about his concept and efforts to establish a new post-graduate coursework degree that he was proposing as a Master of Applied Science in Chaos, Complexity and Creativity to be offered by the UWS Centre for Systemic Development. Robert was keenly interested in whether or not there might be a market for such a program of study and our conversations ranged from broad societal interest and the benefits of such a course of study to individuals and to the community in general, as well as whether this type of program may be both attractive and useful to business, educational, health, research and public sector organisations. For my part I was extremely interested in how such a program of study with an associated transfer of knowledge and understanding might be made best introduced and made available to people in the workplace. Robert’s intention was to have a combination of residential lectures and workshops, occasional seminars, internet web-based modules and communication, semester subject research papers, and face-to-face tutorial support for the external part-time students.

In September 1999, Stephen Jovanovich and I travelled to UWS Hawkesbury to discuss with Robert the sort of curriculum and structure that such a course would have. Robert was growing ever more confident that the proposed two-year part-time course would be approved by the appropriate university committees and processes and available for enrolment in January 2000. It was my intention that if such a course
was offered in 2000, that I would encourage eight to ten people from our learning network in the ATO to enrol. This, I believed, would go a long way towards establishing a critical mass of people learning, thinking, and talking about complexity theory and that these people could form the kernel of a community of practice within the ATO, particularly in the area of the development of a robust and sustainable business intelligence capability. Based on Robert’s confidence that the program would be available I began to seek approval within the ATO for the appropriate resources and infrastructure to support people undertaking this specific course of study. As part of his submission to the relevant UWS committee, Robert asked me if I would be a community referee attesting to both the need and the demand for such a program. I was happy to do so, writing from my perspective as an employer and a manager in the public sector seeking innovative tertiary education programs that could bring together some of the learning needs of public sector management and administration with the rich resources of academic knowledge, insight, rigour and development. In late 1999, Robert gained approval from UWS for his new program of study for a Master of Arts (Chaos, Complexity, and Creativity).

**David’s Book of Living and Being**

My third significant aspect was a personal research project that helped shape my thinking and ideas during 1999. The outcome of this research was a book that I designed, wrote, and produced purely for myself, a book entitled: “David’s Book of Living and Being”. The book had it’s origins in the Leadership program in 1998, when I thought I would try to learn more about soft systems methodology in practice by applying it to a personal enquiry, that of coping with stress and organisational madness.

During June and July of 1998, I had set out to collect notes and ideas for a personal book that I wanted to put together as a sort of “self-help” reference that could help me cope with the pressures and stresses of work and my work environment. I also wanted to find space in my busy life to adequately cope with the many roles I found myself performing. Husband, father, friend, manager, designer of work systems,
public servant, social ecologist, business systems analyst, researcher, individual… well, anyway you get the idea. I wanted something that was useful and practical and that actually worked for me as I muddled my way towards middle age and through the last eighteen months of the twentieth century.

I had done some initial work in this area when I was studying for a Graduate Diploma of Social Ecology at the University of Western Sydney, Hawkesbury during 1993 and 1994. Part of my then area of focus was to research practical techniques for dealing with stress and for helping me cope with a busy working life. These initial techniques proved very successful and I still use a range of them today. However, as time went on, I began to seek something more than just stress management techniques.

By mid-1998, I found myself caught up both in a world of seemingly ever-increasing complexity and in an inner turmoil where I struggled in my soul to find meaning. I looked around and saw others going through similar struggles and confusion, and I initially thought that this whole domain would be worth exploring with others as a collaborative action research program. Others, I knew, were interested. Yet, as I began to think through the domain of where some of my inquiries might take me, I quickly realised that this was not a learning journey I actually wanted to embark upon with others. My search was going to be too personal.

I chose instead to take just one person into my confidence. That person, my good and close friend A., became an extremely important part of my research and this component of my learning journey.

At that time, I was very clear about what I wanted out of my research. I wanted to explore and develop sets of practical ways to help me cope with the complexity of modern life. I thought that if I could find my own ways of coping with the sort of organisational madness in which I found myself working, then, at a later stage, I could also work with others to find common techniques for coping and making meaning. In addition to addressing complexity in the work environment, I also wanted to find practical ways to cope with the extraordinary demands of trying to juggle family, work, travel, university studies, and of finding time for a personal life.
I thought that if I could successfully tackle this area of my life then perhaps I could maintain some control in my life. Perhaps also, I could begin to find meaning and enjoyment beyond simply surviving and being an actor in someone else’s script and timetable.

In a series of rich and increasingly deeply personal conversations with A, I began to explore those aspects of life that were meaningful to me, and that made sense to somebody in my circumstances. I quickly discovered that my search was not just about coping, it was more about living and thriving in the world and rejoicing in the wonder of life. At about the same time, during August and September 1998, mainly through the pressures of work and my own inattention to my health I became ill and run-down and unable to cope effectively. Later, when I looked back at the time, I realised that I was probably physically and emotionally and intellectually exhausted. It was a difficult time for me, yet even then, I knew that it was no longer just a matter of coping, it was now also one of healing and recovery.

I began to reflect on the nature of healing, and on processes for healing and for living in a state of well-being. In doing so, the nature of my research was beginning to broaden and to become enriched by my own experiences and growing awareness and needs. I was beginning to really understand the true nature of my personal inquiry and some of the many paths I would need to explore, if I was to come terms with I who was and with how being who I was contributed to my ability to cope.

In November 1998, I began the initial design of the book but didn’t get very far beyond that and soon the whole research project was set aside as my energies were diverted elsewhere. It wasn’t until winter the following year that I was able focus on it again and then, in a sudden burst of energy and clarity of thought, during late July and August 1999, I sat down and wrote, compiled, printed and bound the book, or at least, the first iteration of “David’s Book of Living and Being”.

It is the sort of book that will never be finished; it will always change, just as the seasons change, and just as I change. So I designed the book as a sort of journal and reference that I could use to help guide me across the landscape of the rest of my life. The full title became:
David’s Book of Living and Being

A guide to moving across the landscape of my life.

Of which the introduction reads:

This book has been designed as a form of personal journey that is part record of where I have been, and part guide on my journey through life…

I have designed it to be:
A book of living and being;
Of richness and wonder and learning;
Of thinking and creativity and inspiration, of dealing with
Demons and shadows and ghosts, of health and well-being and healing.

The things that I included in this version of the journal and guide were:

- Extracts of other people’s works and ideas
- Songs and poems
- Sketches
- Photographs
- Musing and daydreams and idle thoughts
- Reflections
- Learning footprints and signposts
- Ways of making meaning
- Dreams and goals
- Aspects of personal sensuality and sexuality
- Ways of healing
- Ways of curiosity and exploring
- Ways of dealing with demons and shadows and ghosts
- Ways of thinking and creativity
- Ways of living and being…
As part of this book I also wrote a section that contained my own brief self-help book, aimed specifically at me. I have included a copy of this self help book and a few of the photos from the rest of the book in Appendix A to this thesis narrative.

The great value of the research and writing of this book to my thesis research and enquiry was that I was able to identify and articulate aspects of Social Ecology and Ecopsychology that were important and meaningful to me and which I was then able to incorporate into my broader research enquiry. So far, this work has stood the test of time, and I find that I frequently refer to and use the material and information I prepared in this book. Most importantly, this work and the ideas and insights I have included in it have helped me cope with, and at times dismiss, the horrors and the madness of the workplace, and the physical presence of the book serves as a constant reminder to treasure and rejoice in each moment that I am alive. It doesn’t always work, but I believe by researching and writing the book and focussing on this aspect of my life I learnt a great deal about myself and became more self-reliant and resilient because of it.

**November 1999: A Synthesis of Ideas and Thinking**

The final contributory and preparatory activity during 1999 saw the coming together of an organisational opportunity and a synthesis of my ideas, thinking and cumulative research to date.

By November 1999, Sally Pegler and I knew that the initial research, analysis, design, planning and collaboration work in which we had been engaged for the last twelve months, was about to come to fruition as a formally recognised, approved and resourced ATO project. This was to be the Jacaranda Project, the purpose of which was to research, explore and design an ATO enhanced business intelligence capability. This was a very different type of project to the traditional ATO projects that were normally related to legislative and policy changes and the development of appropriate systems of administration to support the changes and associated compliance activities.
Sally was appointed the Project Manager and I became the Manager, Integrated Design. In addition to my direct responsibilities for integrated design I was also responsible for addressing the short and long term development of analytical and systemic thinking and design capabilities in relation to the other managers, team leaders, business systems analysts and project officers associated with the Jacaranda Project. Sally and I had been discussing aspects of this all year, just as I had been engaged in a number of self-initiated research activities and ongoing thinking and planning. As the Jacaranda Project came together in November 1999, so too did my thinking and my actions. This was both synthesis and praxis, where I wrote and produced an internal ATO report that combined a systemic appreciation of the changing nature of work, an understanding of ATO politic, the need for a practical skills development program and the real opportunities for achievable and reasonable collaborative research and learning that were taking shape in the external environment. This seemed to be a very real example of operating at the edge of chaos where, despite the tremendous effort and focus in the ATO on delivering on the Government’s Tax Reform agenda, there was also a unique opportunity for innovation and for exploring different ways of thinking and working.

Although I acted swiftly to seize this opportunity in November 1999, I had also actually been conducting a series of consultative conversations with the several key stakeholders among the ATO senior management as my ideas took shape during September, October and November 1999. Nor was this restricted to senior management. Throughout 1999, I had been engaged in many ongoing analysis and design conversations with my work colleagues and with the Large Business & International Division community of practice that included Information Technology managers, team leaders, business systems analysts and other ATO officers associated the management of compliance and research activities and/ or the enhancement and management of strategic and business intelligence capabilities. Sally and I maintained a fairly broad and eclectic network of people, both within and outside the ATO, who were similarly involved and/ or interested in the type of innovative work we were doing.

By the end of November 1999, I had written and circulated for discussion my proposal for a research and learning development program that would run
concurrently with the Jacaranda Project and meet the needs of people working in Large Business and International, the Jacaranda Project and a number of intelligence and knowledge management capability related areas throughout the ATO. A copy of the Executive Summary from this Development Program proposal follows.

ATO Jacaranda Project

Research and Learning Development Program:
"Designing in Complex and Dynamic Work Environments"

Executive Summary

1. The ATO Jacaranda Project requires a new breed of business systems analysts, people with a high degree of intelligence, curiosity, systemic analysis and design skills, strategic thinking, creativity, an understanding of organisations and communities as complex adaptive systems, and the confidence to work and make sound design-related management decisions in a complex and dynamic environment.

2. Forming a secondary stream of the recent 1999 LB&I Strategic Leadership Program, and building on the learning outcomes and success of the initial 1998 LB&I Leadership in Designing Complex Work Situations, the ATO Business Intelligence Capability Project is proposing the following research and learning development program entitled: Designing in Complex and Dynamic Work Environments.

3. This program has been specifically designed to meet the specialist needs of analyst and designers working in the emerging field of the development of intelligence capabilities within complex adaptive systems.

4. This program will comprise four key strategies:
• a series of **introductory workshops and learning activities** for new and existing project staff;

• skilling selected people in **specific information technology skill sets and techniques**.

• a series of **focussed action-research and learning workshops** and activities involving key managers and staff (including people from selected key stakeholder areas); and

• the **sponsorship of selected people through post-graduate studies**, including a Master of Arts in Chaos, Complexity and Creativity with the University of Western Sydney, Hawkesbury.

David Bruce-Smith
Manager, Integrated Design
ATO Jacaranda Project
November 1999.

**Program Approval**

This program was approved by Jim Killaly, Deputy Commissioner, ATO Large Business and International on 16 December 2003. The scene was now set for some extremely challenging and interesting work over the next twelve months!
Part 3: 2nd Action Research Cycle
Late 1999 to December 2000

2nd Action Research Cycle
Late 1999 to December 2000

My evaluation in November 1999, of the earlier action research, had given me greater insight and understanding into some of the major issues and challenges I was facing in my efforts to broaden the skills base and enhance the analytical and critical thinking capabilities of the business systems analysts working with the Jacaranda Project. I used the three broad conclusions from my assessment and evaluation as the starting point for the design of this development program.

To remind the reader these three conclusions were:

1. That without an encouraging and supportive post-training work environment, people were going to have a very difficult time retaining and practicing their new knowledge and skills sets. I believed in fact, that an unsupportive environment could actually expose those people to undue stress and organisational friction.

2. That the formal systems thinking methods and techniques were not enough; people were still going to need readily accessible and very practical techniques that could be applied in the workplace to encourage systemic analysis and design.

3. Overall, while we come a long way in terms of shared understanding, common language of “systemicity” and a growing appreciation of systems thinking techniques, we did not have, at the end of 1999, the community of practice that we were hoping to draw on as the Jacaranda Project progressed over the next twelve to eighteen months.
It was this set of findings and conclusions that led me to initiate the 2nd action research cycle in late 1999 and 2000, relating to a business systems analyst development program and the search, design and implementation of a range of practical techniques for the analysis and design of complex work systems.

**Two Levels of Inquiry and Hypothesis**

From an action research perspective I was still using the two levels of inquiry and hypothesis:

- At the meta level: that I could bring together practical aspects of social ecology and aspects of systems thinking in the workplace, to inform the better practice of analytical, critical and systems thinking skills in analysis; and

- As my research focus: that there was a very real need for sets of accessible, available, understandable and readily applicable practical techniques for use by managers and staff in the workplace as they undertook a range of problem solving challenges especially those involving the analysis and design of complex work systems. I was actively searching for such a set of practical techniques.

I had addressed the first finding and conclusion by initiating, designing and gaining organisational approval for the business systems analyst development program in late 1999. Throughout 2000 and 2001 this program continued to have senior management support and it was through the framework of this program that I began to address the quest for readily accessible and practical techniques.

My research was to span the full twelve months during 2000, interweaved among the many other tasks and activities associated with the ATO Jacaranda Project. For the purposes of brevity I intend to focus on several of the key critical developments that cumulatively led to the shaping and application of my initial set of practical
techniques. These key critical developments are listed in Table 3.1 below. Also shown in the table is the approximate timeframe in which each development took place, enabling the reader to gain some understanding of the sequential, iterative and cumulative nature of the learning and findings from the heuristic research approach during 2000. The culmination of this 2nd major action research cycle was the introduction of the practical techniques to managers and business systems analysts through a 5-day training program conducted in Melbourne in the first week of December 2000.

Table 3.1 Cumulative research development and learning throughout 2000

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Key Critical Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2000</td>
<td>Reframing heuristic and action research as prototyping approaches</td>
</tr>
<tr>
<td>January 2000</td>
<td>Actively applying and using my principles of social ecology as a personal reflective thinking and behavioural guide (see Table 3.2)</td>
</tr>
<tr>
<td>Late January 2000</td>
<td>The development of a knowledge map outlining the landscape in which we were conducting our research</td>
</tr>
<tr>
<td>March 2000</td>
<td>Visiting IBM research facilities and business intelligence capability sites in the USA</td>
</tr>
<tr>
<td>April 2000</td>
<td>Development of a practical process and technique for conducting Coherent Conversations</td>
</tr>
<tr>
<td>June 2000</td>
<td>Development of the statement of purpose and desired learning outcomes for the analysis and design training program</td>
</tr>
<tr>
<td>June 2000</td>
<td>Development of a heuristic guide for the design of practical techniques</td>
</tr>
<tr>
<td>August 2000</td>
<td>Development of an initial model and technique for the analysis and design of a complex work system</td>
</tr>
<tr>
<td>August &amp; September 2000</td>
<td>Documenting the application of open systems theory and the logical argument underpinning my work system mapping technique</td>
</tr>
<tr>
<td>Late September 2000</td>
<td>Development of an initial set of practical techniques</td>
</tr>
<tr>
<td>September, October &amp; November 2000</td>
<td>Development of the training program and documentation through which to introduce the practical techniques</td>
</tr>
<tr>
<td>October 2000</td>
<td>Development of a visual systemic model combining social ecology enquiry and critical systems thinking</td>
</tr>
<tr>
<td>December 2000</td>
<td>Implementation of the pilot 5-day training program in Melbourne for managers and business systems analysts</td>
</tr>
</tbody>
</table>
Reframing heuristic and action research as prototyping approaches

As mentioned earlier, action research is not a readily understood nor accepted practice in the ATO. Exploring ideas and taking time to reflect and think is in stark contrast to the preferred management behaviour of making simple assessments of the problem and then taking quick action to address the problem and, in doing so, being seen to get things done. It doesn’t seem to matter that this type of behaviour often leads to even more complex problems and issues; this is the behaviour that gets rewarded and so is continually practiced and reinforced.

Rather than a make a big issue of doing things differently I simply designed our research agenda and plan around a series of deliverables and dates that could demonstrate to the organisation we were making clear progress at the same time as allowing myself and my small team to conduct an action research approach and to have time to learn and to explore an incredibly rich and diverse field of enquiry. I would later incorporate this combination of action research and project management as one of the practical techniques that could be used when designing in a complex and dynamic environment. I did this by linking the approach with the accepted technique of prototyping which is often used in Information Technology applications development and engineering research and development. Prototypes are extremely useful because they are trial models that can be put together very quickly in an effort to move from abstract idea or concept to something more concrete or physical. You don’t need to have solved every design issue or detail before you begin development. You learn and discover and test ideas as you develop. And if it doesn't work out then you can stop and reflect and document your learning and start with another model or prototype or design idea. In a public sector organisational context such an approach enables you to move from endless talk to action and focussed and critical thinking. I develop prototypes quickly on whiteboards or on paper and use them to engage others in and to further design conversations. In my experience many people have trouble with concepts and abstract ideas, or least they don’t readily see how the ideas and concepts might be applied in their context and problem situation. But I have
found that people do respond to models that illustrate or demonstrate how an idea might be practically applied in the work environment. And even though these models and diagrams are only roughly and rapidly drawn on whiteboards and a paper or perhaps even a brief PowerPoint demonstration, people understand in this context that the prototypes are not “answers” they are explorations of ideas, i.e. they are hypotheses that we can take action to test without people thinking it is a waste of time or resources. While action research is viewed with suspicion, prototyping is considered to be innovative and forward thinking. Thus I can say to the organisation that I will use a prototyping approach and will deliver various iterative designs on these agreed dates and in doing so I will be seen to be a good project manager. This simply means that I can explore a more systemic understanding of the problem domain and can also explore a range of possible design options without being tied to a “design solution” at the beginning of the project. At the same time it gives me the freedom and ability to conduct a wide ranging research agenda which I can demonstrate produces results that are of direct benefit to the organisation.

**Bringing Together Action Research and Project Management**

It was also a good example of bringing together action research approaches with project management techniques in a large public sector environment. By following up design conversations and reflective thinking with the relative quick design of diagrams and brief documents that captured the essence of the conversations or applied the thinking and that, by doing so, added value and progressed the conversation and thinking, I was able to constantly demonstrate the value of action research. Each diagram and/ or document could be readily distributed via fax or e-mail, people could be invited to comment and give feedback, and there was an electronic and paper record of our research and thinking. From an organisational performance perspective, others could see both progress and the quality of thinking and research, just as they were able to have input and to critique my work. Rather than producing long reports every six months that nobody read, I produced artefacts that were not only useful to me in my context, the same artefacts also could be
applied to the reader’s context and take on a whole new meaning. In a similar fashion, I found that I could readily share knowledge with others in such a way as to continually feed the level of the debate and informed discussion without others, who perhaps less time to spare, feeling that they couldn’t discuss something because they didn’t know enough about the subject. With a one page diagram and/ or a two page summary report people felt informed and willing to engage in the conversation.

Prototypes and Artefacts

From a project planning perspective, I have found that action research is not as threatening or unacceptable when I can demonstrate on my initial project plan that while I will be using an action research approach and that by definition I don’t know the answers before I start, I will be producing relevant and appropriate prototypes by specific dates. The prototypes I will make immediately available to those who are stakeholders/ senior managers etc/ and I will then use these prototypes and artefacts to engage them in meaningful design conversations. I will often go as far as to represent the project plan diagrammatically and show the types of artefacts, i.e. a report, model, process, research findings etc, on the document as specific project milestones. I find that these can be far more meaningful and provide greater assurance of my understanding, intent and competence, that producing endless reams of paper with Microsoft Project plans, timelines and/ or PERT and Gantt Charts.

Hand Drawn Diagrams

I should also mention here that a feature of this approach that I now use most of the time, is that I often give people copies of my initial hand-drawn diagrams. These may be either colour copies that show the importance of colour (I use blue, red and black pens on white or sand coloured paper) or the diagram may be photocopied with all black print onto yellow, gold or sand paper. The simple fact is that that people respond to colour and to interesting diagrams, and that if you can demonstrate
movement via process or representation of action across time, people reading the diagram will start to make their own stories and hence their own meaning. Like effective cinema and theatre, literature, art and poetry, sometimes I only have to suggest aspects of relationships or ideas or action in a diagram and people readily and happily fill in the blanks from their own rich experiences of life and the world.

**Actively applying and using some features and principles of my social ecology as a personal reflective thinking and behavioural guide (see Table 3.2)**

In mid-January 2000, while travelling to Sydney to work with John van Blommestein for a few days I reflected on the features of my notions and understanding of social ecology that I had articulated and documented as part of my research in 1999 for David’s Book of Living and Being. I believe that these features and principles are important to consider in the work that I do and I use them to inform my thinking and approaches to my personal leadership and management style, particularly in my dealings and interactions with others, as well as in my work designing complex work systems. I began to realise that there was also an opportunity to weave aspects of these ideas and features into the design of both the practical techniques and the Business Systems Analyst Development program. These features and principles are listed in Table 3.2 on the following page.
Table 3.2 Features of My Social Ecology.

<table>
<thead>
<tr>
<th>Some Features and Principles of my Social Ecology</th>
<th>Some Features and Principles of my Social Ecology</th>
</tr>
</thead>
<tbody>
<tr>
<td>That people have and need a sense of place, and that a sense of place and belonging is an extension and a part of their identity and selves;</td>
<td>That people are creative and can learn through play and drama and humour and song and music...</td>
</tr>
<tr>
<td>That there can be the “tyranny of a good idea”;</td>
<td>That all human beings are sexual;</td>
</tr>
<tr>
<td>That people can learn, and that there are different personal learning styles, conditions, environments, techniques, circumstances, degrees, depths, and time frames;</td>
<td>That human beings are spiritual;</td>
</tr>
<tr>
<td>That collaborative action research provides great insight for sustainable change;</td>
<td>That theory can inform action and that action can inform theory;</td>
</tr>
<tr>
<td>That there can be propositional, experiential, technical and inspirational learning;</td>
<td>That there are relationships between an individual, his/her communities and the broader contextual environment;</td>
</tr>
<tr>
<td>That all people seek fresh food, clean water, good earth, and peaceful communities;</td>
<td>That people have an ecological identity;</td>
</tr>
<tr>
<td>That all human beings are capable of love and hate, fear and anger, joy and wonder...</td>
<td>That people all struggle to make meaning from complexity;</td>
</tr>
<tr>
<td>That people dream...</td>
<td>That people have a right to determine their own destinies;</td>
</tr>
<tr>
<td>That people’s sense of reality and truth is a constantly changing mix of fact, fiction, observation, dreams, myth, memory, community norms, wishful projections...</td>
<td>That you can use your unique talents and sets of skills to create things that you can leave behind for others to use;</td>
</tr>
<tr>
<td>That drama and theatre requires the suspension of disbelief;</td>
<td>That critical thinking requires the suspension of belief;</td>
</tr>
<tr>
<td>That I believe in plurality, tolerance, compassion and diversity, and that this understanding of the world can be expressed in my ways of thinking and in my actions in both my personal life and my work environment.</td>
<td>That all human beings have an imagination and are capable of imagining different futures...</td>
</tr>
</tbody>
</table>

These features and principles of my social ecology are significant in that they constantly inform my thinking when designing organisational change activities, development programs, training programs, workshops, and conference presentations. They help me to stay in touch with the human side of the workplace and to focus on...
human-centred design that helps other to learn and grow through practical and meaningful experiences. Bear in mind that I do not use these features as some form of checklist or criteria for design. It is never as mechanical or rational as that. These features and principles are part of my design repertoire and skill set that I call upon almost unconsciously when I am engaged in design activities or thinking about creating learning environments in the workplace. They are meaningful to me, part of my way of thinking about the world, part of my worldview, part of who I am.

**The development of a knowledge map outlining the landscape in which we were conducting our research**

In late January 2000, I developed, on an A3 sheet of paper, a model that I named: Aspects of Integrated Design for ATO Business Intelligence Capability. This was a form of knowledge map that captured aspects of where I believed we needed to go in our research and the areas of knowledge and their relationships to one another that we needed to explore. A copy of this model (Diagram 3.1) appears on the next page.

The model comprised eight key components where each component was an indicative category that I used to sort and shape a number of related ideas.

The eight components were:

1. World views (and Principles of Design)
2. Design Approaches and Processes
3. Design Criteria
4. Holistic Work Design
5. Design Frameworks
6. Individual Areas of Enquiry/ Fields of Study (Information Sheets and techniques)
7. Research Agenda
8. Designing Complex Work Systems – Research and Learning Program
Diagram 3.1. Aspects of Integrated Design for ATO Business Intelligence Capability

DESIGN APPROACHES AND PROCESSES
- Action research
- Project management
- An understanding of Contextual Relativism
- An understanding of Methodological Pluralism
- Coping with competing and conflicting world views
- Use of formal, fuzzy and virtual logic
- Stakeholder Management
- Risk management
- Communication

WORLD VIEWS
(and principles of design)
Examples.
- Human Centred Design
- Designing for National Work
- Systems and local work places
- Limits of design
- Cannot create a Complex Adaptive System

RESEARCH AGENDA
- Designing in Complex and Dynamic Work Environments Research and Learning Program

EXISTING ATO DESIGN CRITERIA
(see list and diagram)
Examples.
- Government Reform Agenda
- ATO Reform Agenda and Strategic Directions
- ATO Strategic Statement 2000-2003
- Taxpayers Charter
- Agency Agreements
- Intelligence Best Practice

HOLISTIC WORK DESIGN

INDIVIDUAL AREAS OF ENQUIRY / FIELDS OF STUDY
- Working in an intelligence environment
- Knowledge Management
- New Architecture and Work System Design
- Organisations as Complex Adaptive Systems
- Power in Organisations
- HRM Policy and Strategy
- Financial Management and ATO Strategic Directions
- Complexity and Chaos Theories
- Systems Thinking and Techniques
- Strategic Management System
- Social Ecology
- Human centred design
- Workspace and Workplace Design

126
I now intend to address each of these components, briefly describing the broad category of information and ideas that the various components represented and my thinking and rationale for each category in the broader research and design program that I had set. Following this I will discuss the overall use of this diagram/model and how I used it during 2000 to set and direct a research agenda and to manage the research and writing activities of my small team, bearing in mind that the overall purpose was the design of a training program for business systems analysts in the design of complex work systems.

Component 1: World Views and Principles of Design

The first box was entitled World Views (and principles of design). In this box I simply wrote key world views that I considered essential about the undertaking integrated design for a business intelligence capability. The first was Human-centred design i.e. we were designing for the human workplace, comprising individuals and working communities, with the associated attributes of sense of place, belonging and well-being. We were not simply designing technology solutions. The second was local and national work systems i.e. we needed to address the business logic, work policy, business processes and applied technologies at a national organisational level as well as build in the capability for adaptation, evolution and self-organisation at a local level. The third was recognising that there are limits to design, a concept often overlooked in the world of corporate rhetoric and spin-doctoring. The fourth was the guiding principle for us as designers noting that we cannot simply create a complex adaptive system from scratch. We need to work with the existing and continuous adaptive organisation and to help nudge the evolutionary path of the organisation in specific strategic directions. Such courses of action and desired changes take time, long periods of time, and because the organisation and its environment are constantly in a state of dynamic flux, there can be no certainty of successful outcomes.

The second box was Design Approaches and Processes. Into this box I placed action research as a research and design approach. I also placed project management recognising the organisational imperative for the effective management of people, project resources and time in achieving successful organisational outcomes. To do this
work business systems analysts would need an understanding of contextual relativism, and well as an understanding of methodological pluralism and the ability to cope with competing and conflicting world views, particularly in the hurly-burly of office politic and the executive soup of egos and ambitions and status and exclusion.

Other components of this second box included the use of formal, fuzzy and virtual logic, practical competencies in stakeholder management, sound understanding of risk management and good communication skills and techniques.

The third box addressed the Design Criteria that already had been specified by various levels of recursion in the broader environment in which we operating. For example, at one level of recursion there were criteria already specified by the Federal Government, in terms of the then Reform Agenda including Tax Reform, and at another level by the Australian Taxation Office, in terms of its responsibilities in implementing the Reform Agenda and in its stated strategic directions and goals. Both levels of recursion had already stipulated certain design criteria regarding new products, communications or initiatives being undertaken by the ATO and hence by project managers, line managers, staff and business systems analysts working in the ATO. Then there was another level of recursion, that of the Large Business and International Division, in which the Business Intelligence Capability Project was based. As I began to list these various criteria I began to build a considerable picture of the complexity actually facing the designers of work systems, business processes, IT applications and interactions with taxpayers and the Australian community. The list included:

- Government Reform Agenda (as at January 2000)
- ATO Reform Agenda and Strategic Directions
- ATO Strategic Statement 2000 - 2003
- ATO Business Intelligence Capability Project: Project Initiation Brief
- Taxpayers Charter
- Agency Agreements
- Intelligence Best Practice
- Taxation Administration Act 1953
- Secrecy provisions affecting Commonwealth employment
- Privacy Act 1988
- Australian Public Service Act 1999
- Australian Public Service Values and Code of Conduct

As can be seen from the list of external and internal criteria already specified, managers and analysts faced considerable complexity before they even started on specific problem domains and design contexts. The simple act of putting together this list more than ever convinced me of the need to find practical techniques for people to be able to understand the complex environments in which they were expected to operate.

As far as I know I am the only person in the ATO now or these three years later who has tried to develop a picture of the complexity facing our people in undertaking design work. Certainly, when I showed others this list, people were genuinely shocked to see this picture of complexity that could be simply indicated by putting together readily available corporate information in such a deceptively simple holistic way. I have used this list and other similar iterations over the years to try and impress on managers and staff the need for systemic and creative thinking and also to critically challenge the assumptions made by senior managers in estimating the degree of difficulty and timeframes they set for projects and other initiatives.

The fourth box I simply labelled Holistic Work Design. This refers to the Diagram 3.2 (on the next page) which I use to illustrate the holistic nature of the work environment and the systemically related areas we need to consider as designers of work systems. One of the key messages intended by this diagram is that we are creating human-centred work environments in all their richness and complexity, not simply designing abstract business processes or isolated Information Technology applications.
Diagram 3.2 Systemic and holistic work design

Systemic and holistic work design

An effective, productive and healthy workplace that encourages individual well-being and a sense of community, including a sense of place and belonging.
The fifth box addressed Design Frameworks. There was no one design framework that we were adopting in the design of new work environments that support best practice in strategic and business intelligence capabilities. As designers we would be informed by many disciplines and frameworks and we needed to learn and to adapt ideas from a diverse range of theoretical and practical frameworks. Hence I included the following to illustrate some of the key frameworks we could source and consider:

- Knowledge Management
- Social ecology
- New Architecture and Work System design
- Power in Organisations
- Human resource Management Policy and Strategy
- Financial and Corporate Management
- ATO Strategic Directions (possible and desired futures)
- Workspace and Workplace Design
- Human Centred Design
- Strategic Management System
- Systems Thinking and Techniques
- Complexity and Chaos Theories
- Organisations as Complex Adaptive Systems
- Working in an Intelligence Environment
- Organisation Development
- Community Development

My idea was that these key frameworks would focus aspects of our research agenda and that we would write a series of research papers on these areas to compliment and support the Business Systems Analyst Development Program. Each research paper would be between four to six pages in length and would bridge the gap between a lack of theoretical and informed knowledge in the workplace and the academic texts that were neither readily accessible nor easily readable to managers and staff in the workplace.

The fifth box was for “Individual Areas of Enquiry and Fields of Study”. The idea here was to produce a series on one page A4 sheets that contained brief information
sets and relevant diagrams about a number of practical techniques. Examples of such information summaries could be on the Viable Systems Model, a process for design, the key models and concepts in the ATO Strategic Management System etc.

The sixth box comprised the Designing Complex Work Systems Research and Learning Program addressed earlier in this chapter.

The seventh and last box was that of our Research Agenda that would focus and shape our research and design activities throughout the coming year.

**Using the Knowledge Map**

This knowledge map now became a key artefact of my research. I could use it for a number of purposes:

- To generate a series of specific design conversations relating to the development of business systems analysts and project managers and staff;

- To direct and focus the research activities of my two research officers, Stephen Jovanovich and John van Blommestein. In this regard, the knowledge map became an important management tool. We were a small but highly geographically separated team. Stephen worked in the Moonee Ponds Office in Melbourne, John worked in the Sydney CBD Office, and I worked in the National Office in Canberra. Throughout 2000, I was able to use the knowledge map and the subsequent research agenda to plan and allocate work and to ensure that Stephen’s and John’s research didn’t become too narrowly focussed. Equally, Stephen and John were able to use the knowledge map when discussing their work with me.

Distance management is an extremely difficult way to manage people, however it is a feature of the ATO landscape and one which needs to be effectively accommodated within your own personal management styles and leadership practices. Distance management is also equally difficult on the manager as it is on
the subordinate staff who may find themselves working in total intellectual, project and work type isolation to those who share work stations around them. While we tried to meet every two or three weeks on a rotating city basis, I maintained daily phone contact with both Stephen and John if only to say hello and to listen and encourage and to create a sense of inclusion and belonging. The fact that we were trying to conduct collaborative action research and to design a range of integrated products added substantially to the complexity we were facing. I used a combination of inclusive management practices, my social ecology principles and system design approaches to lead and manage a highly effective and productive research team.

➢ To use in my own reflection and thinking. Some of the questions I was to continually ask myself during 2000 were: “Are there practical techniques that people can use when designing in this complex environment? What exactly were the “practical techniques” that I was seeking? Did they exist or would I need to create them? How can we ask people to undertake this work if we can’t identify and describe at least a basic set of techniques with which to approach analysis and design? Was I expecting and asking too much?” The knowledge map was one of a number of artefacts and techniques that I used to focus my thinking and to keep seeking practical techniques that would help myself and others to design in this complex environment.

I need to also explain very briefly about the broader complex environment in which I was working.

The development of a training program was only one of my many project responsibilities. As the Manager, Integrated Design, my major focus was working with the IBM consultancy team and our various sub-project teams in Canberra, Sydney and Melbourne to develop an integrated design for the ATO Jacaranda Project. While I will not be addressing aspects of the broader project in this narrative, I do want to make the point that the continuing research into practical applications of systems thinking and of organisations as complex adaptive systems was a very secondary focus and responsibility of my work.
Also, between February and July 2000, Stephen Jovanovich, John van Blommestein and I were deeply involved in a range of other analysis and design activities. These included conducting a series of design workshops in Sydney, Melbourne and Canberra, facilitating many analysis and design conversations, intelligence-related research, writing reports, etc.

**Visiting IBM research facilities and business intelligence capability sites in the USA**

A significant enhancement to my understanding and a key research development emerged from my learning and experience when, in March 2000, Sally Pegler and I flew from Canberra to New York to conduct a two week research program of workshops and site visits with organisations throughout the United States that were exploring and/or developing similar business intelligence capabilities.

We visited a number of IBM research facilities and public sector business intelligence project sites in the USA. These visits included a three-day workshop with the IBM Knowledge Socialization Project in White Plains, New York, the Lotus Corporation in Boston, respective State government revenue agencies in Jackson, Mississippi, Baton Rouge, Louisiana, and Sacramento in California. We also visited the IBM Research Facility in San Jose, California where we gained a considerable insight into current developments in information technology applications in the field of industrial and business intelligence. Throughout our travels however, we did not find other organisations that were taking a similar holistic hard and soft system approach to management and work design. Rather they were all exploring enhancements to intelligence capabilities principally through the application of data analysis and data mining information technologies, an approach that simply did not go far enough to meet the outcomes the ATO Jacaranda Project was seeking. For me, the many conversations and information exchanges served to confirm our understanding of the sheer complexity and ambition of our project in the design of an holistic business intelligence capability. They also confirmed my beliefs in the urgency and need to
develop our business systems analysts and project staff to be capable of designing in complex and dynamic environments.

The ambitious nature of the project however was also a two-edged sword, and on our return to Australia we found that because of the little understood need for a complex project to explore and address complex problem domains, the ATO Jacaranda Project was beginning to meet considerable organisational and operational management resistance. One of the paradoxical outcomes from this experience was that it provided me with an extraordinarily rich learning environment from which I gained considerable insights into the politics of design and some of the harsher realities of working in a complex adaptive system. By reflecting on this experience throughout 2000, I was able to use these insights and learning in my development of practical techniques, particularly those techniques that have the potential to be used by a manager or business systems analyst to engage people in design conversations where people are able to rise beyond the internal politic and usual patch wars. Such techniques include coherent conversations, the use of fuzzy logic as a language of inclusion, prototyping, interface design and work systems design. (These techniques are now also part of the Namadgi Technique and my journeyman’s toolkit).
Dr. Robert Woog had introduced me to the notion of a “coherent conversation” during the action research workshop that I convened at UWS Hawkesbury in April 1999. At the time I found the concept a very powerful one, far more so that a somewhat similar notion Richard Hames and Marvin Oka had introduced into the ATO in 1997. Richard’s and Marvin’s technique was called a strategic conversation which was about ensuring the conversation stayed at a strategic level and addressed critical issues and outcomes for the organisation. For me the difference lay in the focus and orientation. One was about organisational behaviour, the other was about human understanding and shared meaning. Without detracting from the usefulness and good sense of Hames’ and Oka’s strategic conversation I found that their concept, in contrast to a coherent conversation, had an element of a mechanical “should-do” that seems to permeate so much management consultancy advice. It had no soul or meaning that engaged me at a human level. Robert’s notion of critical coherent conversations was more universal and not ensnared in the web of organisational and management consultancy language. The concept of coherent conversation, of two people using conversation to move towards greater coherence and shared understanding, was personally empowering and I found a resonance at both the intellectual and emotion level.

It was not however, until twelve months after the April 1999 complexity workshop before I really started to think about the practicality of engaging in a coherent conversation. How would you go about it? What was the process you would use? Did both parties need to initiate it and agree to be involved in a coherent conversation or could just one person start? A particularly complex organisational situation and dilemma in April 2000, became a major catalyst for change and encouraged me to develop a practical application of the theoretical concept. As a matter of necessity, I found myself working through these questions as I designed, and successfully implemented a technique for conducting coherent conversations. I also documented it as a practical process that others could follow in conducting coherent conversations.
From feedback I have received over the years, I know that it has been successfully used by a number of ATO people in their various management roles and in their professional work dealing with clients. The process appears in Diagram 3.3 on the next page.
Diagram 3.3  How do you conduct a coherent conversation?
Reflection: Personal learning and leadership in mid-2000

Meanwhile, the work of the Jacaranda Project progressed. In June 2000, we presented to the ATO Executive our design report with options and recommendations. Our contracted joint design work with IBM effectively finished and the Jacaranda Project found itself in the sort of hiatus that often happens in large organisations between presentation of design recommendations and the decision on whether or not to proceed with the next stage.

I took some of this time as an opportunity to reflect on the experience of being involved in a complex project operating in a dynamic and rapidly changing environment, particularly within a large complex adaptive public sector organisation swept up in the political considerations of delivering the Australian Government’s tax reform agenda on 01 July 2000.

From my perspective as the Integrated Design Manager as well as assistant Project Manager in the Jacaranda Project the experience of being involved in a leading edge design project and working jointly with a private sector management consultancy, the members of which did not share my constructivist world view, was certainly a test of personal strength, resolution, courage, ethical management practices and leadership capabilities.

From my perspective as a social ecologist working in a large public sector organisation and also as a post-graduate research student, the experience also offered unique learning opportunities, particularly in observing through personal involvement and engagement, some of the enormous variance between espoused theory and values and the actual behaviour and values in practice. Aside from enriching my own inquiry and learning here, this experience and my reflections upon the implications of this experience was to greatly influence my shaping of the action research during the second half of 2000.
Development of the statement of purpose and desired learning outcomes for the analysis and design training program

While the politics and the churn associated with the Jacaranda Project flared and raged and ebbed and flowed throughout 2000, I also continued the design conversations and research into the development of practical techniques and the associated training programme. Towards the end of May 2000, I held a small design workshop in Sydney with Stephen and John. The purpose was to review the status of various research papers that John, Stephen and I were preparing and to begin to focus on the identification and development of a suite of appropriate practical techniques. The outcome of this meeting on 29 and 30 May was an agreed format for the research papers, a finalised research agenda and agreement about who would subsequently write each paper. We also reviewed and discussed the key themes which would inform each research paper (either explicitly or implicitly) and a list of other topics that become the subject of a next series of research papers.

In June 2000 I believed that our research into practical techniques was progressing well and, on this basis, I set a tentative date of the last week of November or first week of December 2000, when we would conduct a prototype of the training. I also defined the purposes of the program and specified the outcomes I was seeking:

**Introduction to the Analysis and Design of Complex Work Systems**

**Purpose:**

*To provide business systems analysts with:*

- An understanding of approaches and processes for the design of work systems;

- An understanding of a range of design frameworks that may be relevant to the design of work systems;
An appreciation of using a critical systems thinking approach to the design of work systems;

An appreciation of the nature of organisations as complex adaptive systems;

An understanding of the role of business systems analysts as a designer, and in demonstrating leadership in design;

An appreciation of a variety of practical tools and techniques that can be used in the design of work systems;

An appreciation of the existing ATO design criteria impacting the design of work systems;

And specifically for the ATO Business Intelligence Capability:

An understanding of the Business Intelligence architecture and the DCASAL process (DCASAL is an acronym for an intelligence process: Direction, Collection, Analysis, Synthesis, Action, Learning);

An appreciation of practical tools and techniques for establishing and implementing Business Intelligence infrastructure and best practices.

These statements of purpose and implicit outcomes began to give a very real shape to the proposed training program and enabled me to focus on the design and structure of the training workshop.

Development of a heuristic guide for the design of practical techniques

During June 2000, I also began to focus my thinking on the notion of criteria or guidelines for the design of practical processes and techniques. Even though the
practical techniques were being drawn from a range of theoretical frameworks such as systems thinking, complexity theory and the notion of organisations as complex adaptive systems, I believed that I should be able to at least articulate some form of guidelines, if only for my own use, that would address the concept of ‘practical, yet still informed by theory’, rather than simply theoretical. What I actually developed in June 2000 was the following heuristic comprising three focussing questions:

- **Is it accessible?** (in language, vocabulary in use, familiar idea or shape or symbol etc);
- **Is it readily available?** Will it be readily available in the workplace? (in a book, document, desk guide or electronic file that people can quickly locate/ find, see/ read, and reproduce);
- **Is it useable and or readily applicable by itself?** (in the work context).

The development of this heuristic became an important artefact, one that focussed my thinking and gave me confidence as I moved closer to being able to select, specify and/ or design the initial suite of practical techniques for use in the analysis and design of complex work systems. I now use this form of heuristic approach in all my design work by thinking about the user and/ or reader and continually asking myself these questions as I shape and design an artefact. I use a similar heuristic at a higher level of resolution whenever I write intelligence or diagnostic reports, or document the outcomes of action research in the office.

**Development of an initial model and technique for the analysis and design of a complex work system**

Throughout 2000 while working on the Jacaranda Project I kept circling around the issue of practical techniques for design. There always seemed to be an abundance of analytical tools, but when it came to design there seemed to be more principles and conceptual advice rather than practical techniques. In August 2000, I looked around the ATO organisational environment and did a quick stocktake of many and various management consultancies that were engaged by different parts of the ATO and
which were each recommending a different approach to organisational change and design. Richard Hames and Marvin Oka (1997) had provided the ATO with Strategic Navigation, as a systemic and ecologically-informed approach to strategic planning and internal capability design, incorporating what I considered to be a very powerful, sophisticated and liberating combination of ideas and conceptual models for environmental scanning, niche identification, furturing and scenario planning, strategic conversations and aligning the organisational design and strategic directions around the niche and strategic intent. The area of IBM with whom we had been working was focussed on the application of purpose-built information technologies, combined with financial management systems, to shape and influence the design of the organisation. Accenture (previously Andersen Consulting) contracted by the ATO on another project at the time, was proposing a total Client Management focus, with possible outsourcing of many of the ATO’s processing functions. Similarly, other companies also advocated specific software and the use of data warehouse and data mining technologies, just as various management consultancies variously championed a range of approaches based on a relatively traditional and conventional organisational design along the lines of Mintzberg’s (1979) notions of function versus market, and dominant criteria such as geography, scale, niche etc to influence organisational design.

When I looked at the sort of literature that was reasonably accessible and available in the office and was more frequently referred to than any other management or leadership texts it is hardly surprising that often middle and senior managers, with only a cursory “flick through” reading, were confused and uncertain about how to tackle the more complex problems and decisions relating to issues of strategic direction, strategic design and huge financial commitments to long-term Information Technology investment.

Prusak (1998) on knowledge management to inform organisational design and corporate behaviours and practices, and Arie du Geus (1997) who pursues an ecological metaphor in ‘The Living Company’ and identifies key features and characteristics for organisational survival built around two main hypotheses, that of:

- The company as a living being;
- The decisions for action made by the living being resulting from learning process (Arie du Geus 1997, p.201);

During 1999 and 2000 these ideas and others were all equally entertained in the corporate discourse on leadership, strategic management and organisational design. From my perspective I was able to observe that in the ongoing meta-pattern of corporate behaviour in a complex adaptive system the discourse drifted away as senior managers struggled to think through the practical implications of some of these ideas in informing organisational design and management behaviours. To be useful and informative for senior and middle management engaged in the actual design there was going to need to be a translation from the world of theory into the world of practice. There needed to be practical processes and systemic techniques for both analysis and design. Where were such processes and techniques?

In mid-August 2000, I organised a meeting between Richard Hames (The Hames Group), KB (real name changed) from IBM Knowledge Management, and myself to discuss this issue, and to see whether collectively we could identify some practical processes and knowledge management techniques that could be readily applied to the design of intelligence capabilities in a public sector environment. During the meeting we explored a range of ideas from our respective knowledge, experiences, expertise and professional backgrounds. We revisited some of the authors mentioned above, including Richard’s Strategic Navigation model. The meeting proved to be a highly stimulating discussion and one of the outcomes from our conversations was that we identified a number of useful conceptual approaches and high-level strategic techniques. While these approaches and techniques were not necessarily at the level of practicality that I was looking for, they were certainly indicative of the approaches to design that I was after and I came away from the meeting in a positive and optimistic mood.
As we walked out of the meeting room and along the corridor KB said to me that he was interested in these ideas about systems and complexity, but that he didn’t see how they could be readily used in the world of management consultancy or knowledge management. “Can you somehow show me how they might fit together and when I might use them?” he asked me.

This was an intriguing idea. Could I demonstrate how many of these ideas and techniques might fit together in a useful way for the purposes of analysis and design?

The next morning I flew to Sydney to conduct some work there for a few days. On the plane I stared out the window and reflected on the meeting and on KB’s question. I quickly began playing with a number of ideas simultaneously. One of these ideas was a basic diagrammatic technique, building on my concept and use of knowledge maps. This was different to the sort of knowledge map I had developed around the concept of systems mapping in 1998. Here was a very simple question: where did all these techniques fit together in the scheme of things? Given that somebody understood how to use the various ideas and techniques, where in the broader process and how would they use them? Why would they use them?

I pulled out my A6 sized notebook and began sketching and listing some of the approaches and techniques that a person might use. I then thought about where you might use some of them in systems analysis. This begged the question of a process for systems analysis. “Ah ha!’ I thought, “I would need to do this and then this and then I could apply this technique here and…”

A complex diagram began to take shape, as did the process for analysis and the process for design along with the discreet and complimentary techniques you might use. Twenty minutes later as the plane landed in Sydney I had sketched out a draft of the diagram that I entitled “Analysis and Design of Intelligence Environments” and that now appears on the following page (Diagram 3.4).
Diagram 3.4  Analysis and Design of Intelligence Environments
This was an early prototype of an analysis and design process and proved to be a very useful model in that it enabled me to communicate with people like KB and others, who possibly had no formal introduction to systems thinking, the how, when and why of the different methods that could be applied in a broader process of analysis and design. Instead of retaining this sort of conceptual model in my head as tacit knowledge, I could now demonstrate to others via this explicit model the potential application and usefulness of various theoretical models and techniques.

If nothing else the model at once became a corporate artefact that I could readily use and give to others and that they could then look at later and think about and come back and ask me any questions. While it was only a single sheet of A4 paper that connected differently labelled boxes (with each box representing whole bodies of knowledge about methods and techniques etc) via straight lines with steps in a very high-level analysis and design process, it was an important synthesis of my thinking at that stage and focussed my design thinking in late August 2000 when I selected and shaped my initial set of practical techniques, and later in September and October 2000, as I began to design the detail of the five-day training course that Stephen, John and I were developing.

By the end of November however, I had moved away from this actual model for use in my current work, adopting instead three different yet related models to illustrate aspects of my holistic approaches. The first model was a more conscious exploration and application of open systems theory that I used to illustrate the work systems mapping technique. (See next section below). The second was a process for analysis, and the third a process for design. The significant relationship between all three models was that, having developed the work systems mapping technique, I was able to express the processes for analysis and design in more holistic terms by illustrating both of them as work systems maps. This meant in semiotic terms that each time I introduced people to a different model during the training program they saw the same meta-pattern and underlying logic, and I believed that this sense of recognition and resonance greatly assisted in people’s individual learning and understanding about holistic and systemic approaches and techniques.
Documenting the application of open systems theory and the logical argument underpinning my work system mapping technique

Perhaps the most significant research outcome for me during 2000 was when I decided to argue my development of the work systems mapping technique from first principles using open systems theory and expressing the argument diagrammatically rather than relying on predominantly written text. My reason for approaching the unfolding of the argument diagrammatically was because I wanted to show others the basis of the modelling technique in a highly visual way that was readily readable, understandable and accessible in the workplace and in training workshops. I believed that if I could demonstrate the theory and logic of the work systems mapping technique by actually using the practical technique itself, then time-pressed managers in the workplace would more readily understand and realise the potential for using the hand-drawn mapping technique in their everyday work.

Space constraints mitigate my showing the whole argument in this Chapter, however I later produced this work in booklet form as an occasional paper in April 2004 for circulation and discussion with my UWS post-graduate social ecology research colleagues, and I have included the whole paper as Appendix B to this thesis. In this section in Chapter 3, I will simply and briefly describe the key aspects of the argument.

My basic argument is that I can use the features and characteristics of open systems to develop a visual model of a “generic” system. If I then take the basic underlying logic of a transformational system (i.e. purposeful human activities of transformation from a conscious human perspective) I can include in the visual model the notion of inputs, outputs and outcomes and I can also show the sub-systems as being in dynamic non-linear relationships with one another. Applying this systems theory into an organisational context, I can introduce the notion of work systems, where a work system is defined as:
A work system is the purposeful and intentional combination of people, processes, resources, technologies, intellectual capital and place to achieve a planned business outcome.

This is useful because I can now say that if an organisation wants to achieve specific planned business outcomes then it will need an effective work system to deliver that business outcome. That is, if an organisation wants to achieve a specific planned business outcome then it will need to purposefully and intentionally design the internal capability so that it can effectively do so.

Diagram 3.5  A work system (adapted from Flood & Jackson 1991. p.6)

In this work system technique I differentiate between outputs and outcomes by describing outputs as the planned, tangible, concrete products and services such as reports, plans, and the provision of information sets, while outcomes can be described as the desired behaviours and/ or practices that can now occur by drawing on those planned products and services, e.g. well-informed decision making. Feedback refers to information sets that you receive about the quality, effectiveness and/ or usefulness of your outputs and outcomes as experienced by other work systems in the organisation, i.e. from your work system’s external environment.
Using this as my basic argument I can then model work systems as open systems across the organisational/ community interface which becomes a very powerful visual systems thinking technique when analysing and designing compliance strategies and intelligence and risk capabilities. A summary diagram (Diagram 3.6) of the technique appears below.

**Diagram 3.6** A work system in dynamic relationship with its environment.

The full argument and set of diagrams are in my paper “Aspects of Applied Systems Thinking: An Introduction to Work Systems Mapping” included as Appendix B.

I have developed this work system mapping technique in response to what I believe is a gap in the literature of systems thinking and organisational design and a corresponding lack of specific effective technique for gaining a holistic and systemic understanding of the complex nature of work in the public sector. I have also developed it because, from my background in socio-technical systems design, I believe there is an urgent need for practical visual techniques that are informed by theory and that can be readily and usefully applied with rigour and confidence by managers in the workplace. The areas of work in which this technique could be immediately applied include strategic planning, risk management, compliance management, organisational design, work design, human resource management,
information technology application development, resource management, performance management and policy development.

In fact I believe that aspects of this visual technique can be usefully applied in many areas of complex problem solving that confront managers everyday in their diverse fields of business planning, organisational management, the provision of services and the administration of public policy.

Development of an initial set of practical techniques

In late September 2000, in discussion with Stephen and John and based on our collective understanding and the cumulative learning from our heuristic research, I drew up an initial list of practical techniques. I believed that the many techniques and approaches that comprised this list could, with appropriate diagrams and process narrative, satisfy my heuristic criteria and would be extremely useful for managers and business systems analysts in undertaking holistic approaches to the analysis and design of complex work systems.

The list comprised:

**Analysis and Design Tools**

- A process for analysis (Bruce-Smith)
- A process for design (Bruce-Smith)
- An holistic understanding of work and organisations (Bruce-Smith)
- The use of narrative
- Diagrams and illustrations
- Interview techniques
- The use of lists, and sorting by categories and criteria
- Process diagrams
- Organisation charts
- Information flows
- Knowledge maps
The use of stories
Mind mapping
Rich pictures (as rich contextual pictures)
Relationship diagrams
Work mapping (Bruce-Smith)
Interface analysis across the organisational/community interface (Bruce-Smith)
Systems mapping - a basic model
Work systems mapping (Bruce-Smith)
Design of effective work systems in complex environments (Bruce-Smith)
Workspace and workplace design (Bruce-Smith & van Blommestein 2000)

Critical Thinking Techniques
- The Five Why’s Questioning Technique (Rick Ross in Senge 1994: 108-112)
- Levels of Conversation (Hames and Oka 1997)
- A practical process for using and applying the Levels of Conversation (Bruce-Smith)
- The hand of man and the 6 basic questions (Bruce-Smith)
- How to develop and use Focusing Questions (Bruce-Smith)
- The use of poetry in “capturing” and succinctly describing systems of meaning and behaviour (Bruce-Smith)

Managing Analysis and Design Activities in an Organisational Context
- Strategic Management System and Strategic Navigation (Hames and Oka 1997)
- Use and benefits of Prototyping
- Information and ideas modelling techniques
- A process for conducting Coherent Conversations (Bruce-Smith)
- Project management and planning
- Understanding and mapping your contextual environment
- Stakeholder management
- Heuristic approaches and Action Research
- Fuzzy logic
- Creative thinking
- Documentation management techniques
- Knowledge management techniques
- Critical systems thinking, including Ulrich’s 12 Questions (Bawden, McKenzie, Packham 1998)

**Business Process Analysis and Design**
- Input, transformation, output process design
- Designing purpose, intent and outcomes
- Business logic
- Use of stories to document process
- Value chain analysis
- Change of state diagrams
- Logical and physical models

**Specific Systems Thinking Techniques**
- Viable systems model (Stafford Beer 1985)
- Critical systems thinking (Packham in Bawden et al 1998; Midgley 1996)
- A social ecology enquiry (Bruce-Smith)
- Work systems mapping (Bruce-Smith)
- Considering practical aspects of complexity: including co-evolution, adaptation, self-organisation, sensitivity to initial conditions (Bruce-Smith & Jovanovich 2000)

Many of these techniques are in the public domain and in common organisational usage. The names appearing after various techniques indicate the original author where I believe it is appropriate to acknowledge the designer. Where my name appears indicates an original technique that I have developed (eg work mapping technique) or where I have taken a concept and developed a practical process for actually making use of the concept in an organisational context. With this list we could now begin to design the training program and to develop the appropriate documentation for use in both the training and, post-training, in the workplace.

It would be later, through feedback from managers and business systems analysts who attended the training program and then subsequently began to apply the
technique in the workplace, that we would test the efficacy of this combination of
techniques and to test our assumptions inherent in the inclusion and/ or design of
each technique.

Development of the training program and documentation
through which to introduce the practical techniques

The training program began to take shape.

I believed that the way in which people were introduced to systems thinking
techniques and the notion of organisations as complex adaptive systems was just as
important as the practical techniques themselves. Without a robust and stimulating
adult learning environment and experience, the training would be wasted time and
effort, and would in all probability return to the workplace and never use the
techniques.

The course was directed at experienced managers, business systems analysts and
project officers. As such it was my explicit intention that the material and techniques
we covered were to complement the already existing skills and body of knowledge
and experience that each participant already had. Our job was to introduce ideas and
techniques as succinctly and with as much as clarity and contextual meaning as
possible, but we could not take on responsible for delivering the enormous body of
theory and academic critique that may accompany any of the ideas or fields of study.

During late October and early November, I project managed and coordinated the
final design of the course. Working with Stephen and John by phone, e-mail and fax
I designed the training activities, finalised each module and developed appropriate
diagrams and documented processes and notes for each technique in the initial set of
practical tools. I found that as soon as I focussed my attention on the need for
specific practical tools, the techniques quickly began to emerge and to take shape.
This was a period of heightened creativity for me and a synthesis of much of my
thinking and research and practical experience over the last four or five years. The
conscious and unconscious selection process that characterised the emergence and shaping of the practical tools and techniques was at once creative, intuitive, rational and quite deliberate.

In designing the course I was exploring a number of things including systemic approaches, catering for different learning styles and preferences, use of theatre, semiotics, social ecology, fuzzy logic, self-organisation etc. I wanted in my design approaches to use and model the very techniques that I was proposing participants would use when designing actual work systems. I was particularly interested in whether semiotics could give me some insight into designing material for the course in such a way that participants could intuitively recognise common models and representations for a range of similar ideas rather than having to methodically work through the theoretical framework before they could understand a specific technique and/or application. A simple example of this was where I wanted to use the same basic model of “Inputs, transformation, outputs” to represent a business process, a work systems, and a complex adaptive system. An early version of this appears on the next page (Diagram 3.7) where you will note that I also positioned the business process, the work system, and the representation of the complex adaptive system across the organisational/community interface. I introduced this model during the prototype training program in December 2000, both in its printed form and as a quick sketch on the whiteboard on several occasions during various presentations and training activities. Participants responded well to these related symbolic images and I found them extremely useful as simple visual representations of complex ideas.
Diagram 3.7  A business process, a work system and a complex adaptive system modelled across the organisational/community interface
During this period I was designing simultaneously at a number of different levels of abstraction. One level of abstraction was the concept and theory underlying the technique or activity. Another level was the application of the technique itself and creating a context in which the technique could be applied. Yet another level was the training activity which I needed to design that would simultaneously provide participants with a propositional, technical and experiential learning opportunity. Other levels of abstraction included thinking about the participants as individuals, as members of a learning community that would be formed by the training course, and as members of the broader ATO environment. The broader ATO environment was particularly important in terms of being able to present material, ideas and activities that would challenge the individual and collective participants at the same time as my being aware as a designer of limits in terms of what the organisation would tolerate and accept. And perhaps the final level of abstraction was designing the fine detail of each training session and the whole course at the same time, so that I was confident the logic, sequence, timing, unfolding story and flow of the whole week made sense. In this last aspect I drew on my experience in drama and live theatre as well as my love and understanding of stage musicals and musical comedy to build an internal logic and cohesion to the five-day program.

Throughout my working life, like many other people with an expertise in any particular area, I have taken most areas of my tacit knowledge for granted and not necessarily bothered with clear or exact definitions. The experience, however, in late October and early November 2000 of having to design a week long training program at a meta-process level as well as at a detailed design level, forced me to have to think more deeply about many of the previously unsurfaced assumptions I held about knowledge, learning and applied critical thinking.

I had planned and designed much of the structure and activities of the five-day course around an experiential learning model. But I was also acutely aware that I needed to equally draw on other forms of learning theory by preparing material and sessions in the form of propositional learning and technical learning. (Bawden 1998) (UWS Social Ecology Handbook 1993, 1994, 1995, 1996). For instance, sessions on “Systems Thinking” and “Designing in Complex Environments” had a propositional learning focus, the afternoon training activities had an experiential focus, while
sessions like “How to Design a Business Process” needed a stronger technical learning focus. Participants would develop their own individual practices, rules of thumb, and conceptual models of designing in a complex environment over time and with experience. But, for example, for the afternoon of Day 2, I wanted participants to understand business process design and to actually use aspects of this process to successfully engage in the afternoon training activity. Hence the need for participants to learn the technique in a relatively structured way, i.e. a technical training session.

**Other Learning and Insights**

There were also instances of other learning and insights that surfaced for me throughout 2000 and that I incorporated into the “Introduction to the Analysis and Design of Complex Work Systems” training programme. These included:

- Wall maps, as a technique in which to engage others in a series of design conversations over time;
- Knowledge maps, as creative components of rich contextual pictures;
- Coherent conversations;
- Moment of truth diagrams;
- Strategic conversation diagrams and models;
- Bringing together action research and project management;
- Prototyping, as a political strategy and as a rapid way of moving between idea and exploring the potential and practical application of that idea.

All of these techniques became important in providing people in project teams and business systems analysts with practical approaches to addressing some of the politics of design and dealing with a problem domain that shifts and changes and evolves in a dynamic and complex organisational environment.

Table 3.3 on the following pages demonstrates the relationship between each module and the key ideas and/or practical techniques that were included in each module.
Table 3.3  Relationship between training course modules and the content and/or technique.

<table>
<thead>
<tr>
<th>Training Course Module</th>
<th>Content/ Techniques</th>
</tr>
</thead>
</table>
| Introduction                                  | Outline of course  
Purpose  
Expectations                                      |
| What is work? What is a work system?          | Various definitions of work  
Features of a work system                         |
| Role of the designer of work systems          | Glossary  
Worldviews  
National work systems  
Local work systems  
Limits to design                                 |
| What is design?                               | Simple design process                                                                |
| Analysis of systems. What is a system?        | Features of a system  
System models  
A way to represent a system                        |
| Analytical tools and critical thinking        | Work mapping  
Mind mapping  
Interface analysis  
Process diagrams  
Use of stories  
The 5 whys  
Levels of conversation/iceberg  
Rich pictures  
Narrative  
Relationship diagrams  
Poetry                                           |
| Syndicate session & feedback                  | A reflective model  
How to write a learning journal                                                        |
| Analysis and design in context               | Prototyping  
Modelling  
Coherent conversations  
Fuzzy logic                                       |
| Project management and action research        | Project management model  
Action research model                                                                       |
| Business process design                       | Designing purpose, intent and outcomes  
Business logic  
Use of stories  
Value chain  
Change of state  
Logical and physical                               |
| Design as a creative process                  |                                                                                     |
| Syndicate presentation and feedback           |                                                                                     |
| Designing in complex organisations           | Features of an organisation as a Complex  
Adaptive System  
Strategic Navigation  
Self-organisation  
How to recognise and articulate components of complexity |
| Work system design                            | Features of a work system  
How to draw/document/describe a work system  
How to design a work system  
Designing for and measuring outcomes             |
| Designing for intelligence environments       | Features of an intelligence organisation  
Knowledge management best practice               |
Completing the Design

By early November 2000, we had completed the design of the course and the identification, selection and, in some cases, design of the practical techniques I wanted to include and that I believed would be practical, useful, readily understood and applicable by participants in both the course and the workplace. By mid November we had finished our prototype courseware. This courseware now comprised the following two key booklets that we published internally through the Australian Taxation Office:


A copy of each booklet would be made available to each participant. The courseware also included substantial Power Point presentations for each module as well as instructional material for the training activities in which the participants would be engaged.

**Development of a visual systemic model combining social ecology enquiry and critical systems thinking**

During October and early November 2000, while designing the training program, I had also been thinking intermittently about how to represent the concept of social ecology in some sort of visual model. My thinking came together one afternoon when I brought together a model of social ecology enquiry expressed as a system with a similar model of critical systems thinking expressed as a system. The final model is shown below in Diagram 3.8.

**Diagram 3.8** A System of Social Ecology Enquiry

A key feature of this model includes the notion of critical systems thinking being expressed as a nested system within a social ecology enquiry where both systems are...
in a dynamic interrelationship. Also prominent is the representation of both systems as having three sub-systems each that are also in dynamic relationship with one another, and with the boundary of the other larger system. Other features include the use of fuzzy boundaries to denote that they are both complex adaptive systems that together form yet another complex adaptive system.

Using this diagram, I can show that a system of Social Ecology Enquiry, while simply an artificial construct, could also be useful when seeking improvement that is ethically desirable and ecologically and environmentally sustainable. It is a system of enquiry and learning and of collaborative approaches to change, that I believed could prove extremely useful in encouraging managers and business systems analysts to take holistic and systemic approaches to the analysis and design of complex work systems. It could also be used as a framework to inform their thinking when exploring the inter-relationships, co-evolution, and emergence of patterns and complexity within all social systems. While I had been working with all these ideas for last two or three years I had not actually put them together in such an elegant and profound way before. This way of representing a social ecology enquiry as a system of enquiry made very clear sense to me, and, at the time, I believed that the model could be a very powerful and readily accessible framework for introducing business systems analysts to the analysis and design of complex work systems.

I have now used this model many times since November 2000 and find that it is easy to demonstrate and to use, and believe that it has enormous practical potential and application when analysing and designing complex work systems.


While I was designing the detail of the training program I was also fortunate to receive encouraging feedback about my ideas and models from a range of colleagues and peers working in variously related fields of management and organisation design
and the use of systems thinking in addressing complex problem domains. This occurred when, in November 2000, I presented a fully-refereed conference paper (Bruce-Smith 2000) at the 1st International Conference on Systems Thinking in Management which was held in Deakin University, Geelong, Victoria. The conference paper addressed parts of my action research during 1998 on critical systems thinking, methodological pluralism and in introducing ATO managers and staff in the Project Bijou to systems thinking techniques. The conversations among my systems thinking colleagues and their feedback from my presentation at the conference were an important aspect of my research in that I was able to discuss my research and work and to test my ideas and argument with extremely well-informed peers from around the world. During the six years of my research I have found that attending professional conferences such as this one and presenting refereed papers enables me to test my ideas in the wider world and to receive feedback from professional colleagues, at the same time as listening to the ideas and experiences of others working in the field of applied systems thinking.

Implementation of the pilot 5-day training program in Melbourne for managers and business systems analysts

During the week of Monday 02 to Friday 06 December 2000, Stephen, John and I conducted the prototype of the five-day “Introduction to the Analysis and Design of Complex Work Systems” training program in Melbourne for twenty two ATO officers.

Monday and Tuesday we conducted the program at the Melbourne Zoo and on Wednesday, Thursday and Friday at the Melbourne Museum. At the Melbourne Zoo we had hired a large venue near the butterfly house and that was a suitable for Presentations and group work. Similarly, we had also hired a slightly smaller meeting venue on the ground floor of the Melbourne Museum where we had ready access to the Museum galleries and displays and where we could work in both syndicate and plenary groups.
I had structured each day so that mornings were a combination of presentations, discussions, brief group and syndicate activities, and some instructional sessions on the use of particular techniques. The afternoons were designed as experiential learning activities, with a final feedback and debriefing session to finish the day.

Setting the prototype of the program at the Melbourne Museum and the Melbourne Zoo was not a practice that most people would associate with a training workshop conducted by the Australian Taxation Office, but both venues proved to be great places to introduce adults to aspects of systems thinking and complexity theory. This was particularly so with the afternoon experiential activities that encouraged participants to wander around the Zoo and to look at the world with the new eyes of a systems analyst. The activities aside though, I only had to look at the participants eyes and faces on that first Monday morning to see their sense of wonder and feelings of being involved in a training course that was both special and different. Throughout the week, participants often commented that they couldn’t believe they were doing a training course for the ATO in the Zoo and/ or the Museum. I believe that the sense of presence and of the wonder of life that we all got from seeing the animals and birds in the Zoo added a heightened state of peacefulness, gentleness and preparedness to learning new things and thinking about the world differently from our normal workaday perspectives.

The afternoon training activities asked the participants to focus on the animal enclosures and to map and analyse aspects of the entirely designed environment in which the animals were kept. Participants selected an animal enclosure of their choice and looked at the physical design and engineering of that enclosure, identifying features that were designed to recreate the natural environment in which the animal may live in the wild as well as features that that acknowledged the physical characteristics of the particular animal and the need for physical stimulation and exercise. Participants were also asked to use their eyes and ears and sense of smell and touch and intuition and imaginations and experience of being in the world, and to map processes that they would expect and associate with feeding the animals, cleaning the enclosures, maintaining the animals health and well-being, and with the animals being part of a research and breeding program. They were also asked to consider what evidence they could see for how the public areas and animal
enclosures reflected aspects of maintaining public safety, animal safety, zoo keeper safety, all the while maintaining viewing access to the specific animals.

These afternoon activities, particularly at the Zoo, quickly established a learning environment that encouraged critical and analytical thinking, not just around the activities and sessions I had designed, but also in relation to individual participants’ broader lives. The most obvious example was how it focussed people on the plight of animals and the roles and practices of zoos in modern urban societies. Many issues were raised and discussed relating to animal well-being, endangered animals, breeding programs, fund-raising and revenue for zoos, costs of running zoos, special feeding diets and food preparation, the shift to open plain zoos for many types of large carnivores and grazing herd animals, and the importance of zoos for public education and community well-being. Less obvious examples were the many individual conversations I had with people about how they hadn’t been to the zoo since they were kids or since they last took their own kids ten or fifteen years ago. These conversations raised issues such as how we should live and spend our limited time on earth, how we each have a responsibility to care for other living creatures and for trying to make the world a better place. There was a reflective and self-critical aspect to these conversations, as individual adults were re-ignited by wonder and the joy of being alive compared to the dullness that had crept in their everyday working lives.

The whole week worked well, and it proved to me to be an invaluable prototyping and action research experience. So much of the design that Stephen, John and I put into the program was the result of good research and sound experience in our various backgrounds and capabilities, that we found the sessions all flowed well and made good sense to the participants.

**Mental Light Bulbs and Focussing Questions for Evaluation**

Mental light bulbs seemed to go on all week, and there was a wonderful sense of a learning community and healthy enthusiastic learning environment. By Friday
afternoon we had seen some wonderful presentations of work systems design that the syndicate groups had worked on since lunchtime on the previous day. During the last half hour of the course, following feedback and debriefing, participants spent writing their individual reflections and evaluations of the course in response to the four questions I had set them. These questions were:

1. **Has this course changed your understanding of how you can approach the design of work systems?** How? Why?

2. **Has the course changed your understanding of your role as a designer?** How? Why?

3. **What will you do differently as a result of this course?** How? Why?

4. **Is there any other feedback about the course that you would like to provide?**

**Major ATO and Post-graduate Research Milestones**

The successful completion of the training program and the implementation of the practical techniques in December 2000 was a major milestone for the ATO and a major achievement and outcome for my heuristic research. It was the culmination of a number of years research and thinking and heuristic social ecology enquiry during which I had the great fortune to work in an innovative working environment and also the immense privilege and pleasure to work collaboratively with my two highly professional and talented colleagues and friends, Stephen Jovanovich and John van Blommestein. Personally, I believed that I had come a long way along a strange journey to finding the practical techniques that I had been seeking for the last three years, and that, with the enthusiastic support of my colleagues, I had been able to bring together aspects of social ecology and aspects of systems thinking in such a way that these aspects of both social ecology and systems thinking could be readily, usefully and practically applied in the workplace.
Together with Stephen and John, I had created and tested a sophisticated and unique training program that could engage adults in a meaningful and enjoyable training experience that saw them finish the week with a real sense of individual and group accomplishment. Participants also left expressing an enthusiasm for taking these ideas and techniques back into the workplace and applying them in a wide range of ATO contexts and situations. And finally, the participants had left expressing a sense of privilege and good-fortune at having had the opportunity to attend such a high-quality and enjoyable training program.

I have since run this program fourteen times in the ATO between December 2000 and December 2004, and even though I have modified parts of it and introduced new material, nearly all the participants at each course have expressed the same feelings of accomplishment at meeting the challenges I have presented them with and the sense of enthusiasm for returning to the workplace and applying these techniques.

I have also had the great pleasure to see the systemic approaches and techniques that I specifically designed being used effectively and successfully by many managers and staff throughout the ATO.

Postscript to Chapter 3 – A Reflection

Through the project milestone in December 2000 of presenting this course, I had now introduced into the ATO a new suite of practical tools that I believed could contribute to a significant improvement in people’s analytical, critical and systemic thinking capabilities. The course book was now an authentic corporate artefact that had been purposefully designed to be of practical use both during the course and as a reference source to participants following their return to the workplace.

My knowledge and experience of how organisations work in practice also led me to believe that over the next twelve to twenty four months I would receive request from many different parts of the office for copies of the course book as well as for specific
diagrams or sessions covered in the course. This is one of the myriad, mysterious and informal ways in which knowledge and information spreads in a complex adaptive system. It is also one of the ways that ideas and techniques are often picked up and used by others. People in many different geographical and functional areas of the office and who have had no direct contact with me would come across copies of the material left at a photocopier or a fax or in a meeting room and, intrigued by the visual and attractive nature of the book, would flip through it and think about a particular diagram or model that later they would apply in his or her own context.

Through the formal birth in an organisational rite of passage, such as a training program and a demonstrable project management deliverable, ideas and diagrams take off on their own organisational journeys and are found and used and adapted in many unimagined and unanticipated ways.

I had tried to design these ideas and techniques as a cohesive information set, but also so that each representation of idea and format of practical technique was to a large degree self-explanatory and robust enough to make sense and meaning on its own to the reader and user.

Whether or not these techniques would be used for effective analysis and design in the workplace and throughout the organisation only time would tell. After three years of inquiry and action research and determined pursuit I had designed and shaped these techniques to be readily accessible, readily understandable and hopefully inherently practical. Now, through the five-day training program on 04 to 08 December 2000, I had made them available to the organisation to use and trial, apply, adapt and critique. The action research spiral of hypothesis or idea to design conversation to exploration and play and testing to reflection and evaluation had been completed. My ideas had formally become explicit knowledge and were now in the form of intellectual capital that could reside in corporate artefacts of books and papers and electronic files on the ATO intranet. Through the medium of these various corporate artefacts, these ideas and many variations of them would, over-time, begin to reside in the minds of many men and women as tacit knowledge. In this way, new cycles of experiential learning and action research and journeys of exploration and discovery would begin.
In addition to my own use of these techniques and my ongoing reflection and modification, I would follow up with course participants and others over the next few years to monitor and evaluate how accessible, understandable, available, practical, applicable and effective these techniques actually were for those who use them. Some of this reflection, evaluation and ongoing design inquiry and conversation are addressed in the following Chapters 4 and 5.
Winter in Canberra.
Early June 2003, 7 degrees at 10 am.

The seasons change. Early drafts written in summer lie discarded and dusty with other notes in a large cardboard box resting gently under the old paint table against the back wall of my study.

Outside my study window the sky is a wonderful light blue, the lemons are bright yellow, the brittle gum is white and the eucalypt leaves dull green, sunshine bathes the world and a gentle breeze adds to the simple joy of the day.

Inside Louis Armstrong plays “La Vie En Rose” and encourages me to write my 15th attempt at this chapter. In the last few days I have gathered all my different beginnings to Chapter 1 in the last 2 years and all the half-completed pages, and I have sorted and shaped and caressed them gently into a one-page visual knowledge map, all duly catalogued and cross-referenced into a new historical perspective and record of an erratic journey across the unsettled landscape of my restless mind.

This chapter is about my choice of interpretative framework and my identification of a research niche in the messy, ever shifting, problem domain as I understood it in late 1997 and early 1998. It is also about the melting pot of ideas and thinking and influential authors and texts and experiences that led me to a richer, more meaningful appreciation and understanding of the opportunity/problem domain as a dynamic, complex adaptive system. The
significance of understanding that my action research is taking
place within a complex adaptive system, and that in doing so,
myself as the researcher and my action research and the context in
which I am conducting the research can also be seen as part of an
even larger, even more dynamic complex adaptive systems, is that I
often am challenged and need to find creative and innovative ways
to approach complex situations, just as I sometimes need to find the
wisdom and insight to leave certain situations alone as events and
actions unfold and an often totally unexpected resolution emerges
and self-organises and the original situation is transformed or
dissipates or both. Informing me in all this has been the
metaphorical melting pot, which has simmered away in the
background of my mind through the five years of my action
research nurturing my thinking and decision-making, just as it still
simmers and is a source of warmth and wonder and inspiration to
me today.

A melting pot as a muse.

In terms of my research and this narrative, however, most of the
components that found their way into the pot were there within the
first eighteen months to two years i.e. 1998 & 1999. Over the last
five to six years I have drawn on ideas and concepts and
information sets and applied them in many varied and different
ways. I have learnt and reflected and added my new and emergent
knowledge to the melting pot, I have sought new avenues of
inquiry and also added what I found there to the pot. Conversations
with many colleagues, friends, UWS fellow researchers, others, and
conversations with myself have added spice and flavour, the rich
broth of learning and knowledge and experience and conscious
reflexivity at once an old familiar friend and yet also a total and
inexplicable mystery. An action research approach and an
unfolding literature search tumbling together down an uncertain
path in search of meaning.
I write from my perspective of June 2003. I am sitting in my winter study looking back at the many paths I travelled and I am hoping to capture with these brief words some of the sense of wonder and uncertainty that I experienced in late 1997 and early 1998, as I stood poised at the beginning of a research journey into the unknown that was rich with promise and expectation. And, to be perfectly honest, it was also rich with a sense of threat and menace, a vague fear of not achieving my goals, the risk of revealing to myself and others that I was not clever or resolute enough to complete my research.

From the “now”, the June 2003 perspective, I am only just gaining confidence that I will ever finish writing this thesis. Nonetheless, I certainly have adventures and insight and knowledge to relate in my narrative and in my research findings. And at the end of the day, I have the booklet of the Namadgi technique that I carry with me proudly as a visible and demonstrable artefact of my achievement. More importantly though, I know a lot more about my own strengths and weaknesses and aspects of my character and my capabilities than I did when I began the research in 1998.

I write my narrative of a learning journey and journeyman’s learning viewed through my hindsight window of autumn and winter 2003, into an earlier world of opportunity and experience and social ecology inquiry. In doing so, I am:

- Writing to explore where I have come from.

- Writing to think briefly and fleetingly about the butterflies’ chaotic yet purposeful journeys among the blossoms and the flowerbeds of early summer in the backyard.
Writing to remember the other days of joy and wonder and light and shadow and the stories and the long meandering journeys that all began with the first step.

Writing to tell a story of the finding and shaping of meaning.

Writing to finish the thesis!

Writing to reflect and learn…

Writing towards my own Ithaka…
Ithaka (excerpt)

As you set out for Ithaka
Hope your road is a long one
Full of adventure, full of discovery.
……

Keep Ithaka always in your mind.
Arriving there is what you’re destined for.
But don’t hurry the journey at all.
Better if it lasts for years,
So you’re old by the time you reach the island,
Wealthy with all you’ve gained on the way,
not expecting Ithaka to make you rich.
Ithaka gave you the marvellous journey.
Without her you wouldn’t have set out.
She has nothing left to give you now.

And if you find her poor, Ithaka won’t have fooled you.
Wise as you will have become, so full of experience,
You’ll have understood then what these Ithakas mean.

Excerpt from Ithaka
By C. P. Cafavy.
Translated by Keeley & Stannard.

Chapter 4. Workplace Applications.

January to June 2001
Action Research Cycle 3:
2nd Iteration of the Design of Practical Techniques
during the ATO Jacaranda Project.

Purpose

The purpose of Chapter 4 is to relate aspects of the 3rd Action Research Cycle during January to June 2001, in which I continued my ongoing research into more effective ways of introducing systems thinking techniques into the workplace and encouraging managers and staff to use them.

Structure of This Chapter

- Research Questions
- Research Methods
- Key Research Outcomes
- Part 1: Overview and Background
- Part 2: Initial Evaluation and Further Design
- Part 3: A 2nd Training Course, April 2001
- Part 4: Three approaches for encouraging methodological pluralism in the workplace
- Part 5: Reflection: “When I design…”
- Part 6: Strategic Thinking Techniques
- Part 7: Cumulative Learning and Reflection
Research questions

➢ “What had we learnt so far?”
➢ “Could I improve on the initial set of practical techniques and the introductory training workshop?”
➢ “How might I encourage managers, business systems analysts and other staff to use these approaches and techniques in the workplace?”

Research Methods

The research questions were considered using a critical learning heuristic approach that combines:

1. Participative enquiry and action research;
2. Creative thinking and design;
3. Experiential learning and reflection;
4. Personal musing and reflection;
5. Collaborative and strategic design conversations
6. Evaluation – feedback and reviews;
7. Project management and Public Sector organisational management practices;
8. Leadership in analysis and design.

Key Research Outcomes

The key research outcomes from the 3<sup>rd</sup> action research cycle:

❖ My greater understanding of effective ways to conduct introductory workshops and to encourage managers and staff to use the holistic approaches and systemic techniques in the workplace;
❖ An accelerated heuristic research experience;
❖ My decision to initiate a 4<sup>th</sup> Action Research Cycle;
An enhanced set of practical techniques for the analysis and design of complex work systems and that were now being applied in a number of ATO projects and workplaces;

An enhanced introductory training workshop and associated documentation;

Three practical and accessible approaches that could be readily applied in the workplace by managers and staff engaged in the analysis of complex problem domains and the design of complex work systems;

A greater understanding and insight into how I personally approach design situations, captured in a reflective piece of writing entitled “When I Design…”

A ‘Five-step, many step; Design as dance’ model that illustrated a practical approach to the design of complex work systems. Each step had clearly defined deliverables, all of which was illustrated a single sheet of A4 paper;

A ‘Six-step, many step’ model for systemic analysis and appreciation, presented in a similar form to ‘Five-step, many step; Design as dance model’;

An A3 coloured laminated desk guide that illustrated the essential components and techniques as a summary of the course for use by participants when they returned to the workplace;

Part 1: Overview and Background

This relatively short action research cycle between January and June 2001, involved the further exploration of more effective ways of introducing systems thinking techniques into the workplace and encouraging managers and staff to use them. This began in January 2001 with the evaluation of the December 2000 “Introduction to the Analysis and Design of Complex Work Systems” training program. Following some minor re-design of both techniques and sessions, in addition to some further innovation, the training program was conducted again, this time for twenty six ATO officers in Melbourne in April 2001. At the same time I also began to explore potentially effective ways of encouraging managers and staff to use these techniques in the workplace.

The 3rd action research cycle was in many ways similar to the 2nd action research cycle with the exception that it occurred in a much shorter timeframe. Having developed the initial set of practical techniques and the associated training program in 2000, we were now in a position to apply our cumulative learning and knowledge by reviewing, refining and enhancing the existing material rather than starting from scratch as we did twelve months earlier.

In terms of my narrative for both Chapter 4 and Chapter 5, I intend to also reflect this increased speed of learning and applied design by writing sparingly of the detailed research process and to focus instead on the key activities, findings and outcomes. This will serve two purposes. The first is to keep the remainder of the narrative brief and succinct. The second is to represent in some form the personal experience of accelerated learning and my emergent shift from conscious competence to unconscious competence in applied design.
Part 2: Initial Evaluation and Further Design

What Had We Learnt So Far?

Stephen, John and I met in Melbourne for two days on 18 & 19 January 2001, to go through a debriefing from the training workshop we conducted last December, and to review the feedback and the evaluation from the participants and to document our learning.

In addition to our individual observations, ideas and reflections on our experience of conducting the course we also had the participants written responses to the “Reflection and Evaluation” questions I had asked at the end of the five-day training program last December. The written set of four questions that I had asked were:

1. Has the course changed your understanding of how you can approach the design of work systems?
   How? Why?
2. Has the course changed your understanding of your role as a designer?
   How? Why?
3. What will you do differently as a result of this course?
   How? Why?
4. Is there any other feedback about the course that you would like to provide?

The responses provided by the participants were all positive and enthusiastic and many described in detail the specific techniques that they would now use in the workplace and the circumstances in which they would use them. In addition to Stephen’s and my facilitation, the participants had enjoyed the experiential learning components set in the zoo and the museum and greatly appreciated the “non-tax” contexts and case studies with which they were introduced to systems mapping and work systems design. Based on our collective experiences and the feedback from participants we confidently believed that the techniques were practical and useful,
and that the design, level and structure of the training program were appropriate, manageable and effective.

One area of concern though, was in how we introduced people to complexity and chaos theories. Many participants commented that they had struggled with the notions of complexity and chaos and expressed the need for time now to digest all that they had learnt and experienced. Some also suggested that they may need to perhaps revisit in say six to twelve months via a follow-up course that addressed the idea of complex adaptive systems and the application to work systems analysis and design.

In terms of the immediate application of some of these techniques, of the eight participating managers who were specifically responsible in their respective areas for the design of intelligence capabilities, they all believed that the course had provided them with significant insight and practical tools that would prove immediately useful in the workplace and in the ongoing design of intelligence capabilities.

One of the considerations for our two-day meeting was to plan the presentation of a second five-day course. I had already received a number of enquiries and requests to attend the course, mainly based on managers hearing about the course through the extraordinary word-of-mouth network that operates within the organisation. As the Jacaranda Project was drawing to a close, we were keen to run the course for those who wanted to attend, prior to the project resources being allocated elsewhere. I also wanted to conduct the course a second time from a research perspective, so that I could incorporate and test the learning we gained from the first course, as well as to expand the potential number of people in our evolving community of practice. I believed that in conducting the course a second time I would be broadening the research base and the practical experience that would in turn inform my assessment and evaluation report for the ATO. After discussing the matter with Stephen and John, I set a date for early April 2001 to conduct the program again in Melbourne.
Re-design and Work Allocation

During the rest of January, February and March, the key areas on which I focussed this second iteration of design were:

- What I came to call “five-step, many step; design as dance” model as I improved the work system and process for design;
- A process and work system for Analysis, which I had not explicitly included in the first course. This became known as the “six-step, many step” analysis model;
- An enhanced set of focussing questions associated with the Levels of Conversation technique. This would evolve into the Iceberg Analysis technique;
- A better set of examples for use when introducing the concept of fuzzy logic;
- A major re-thinking and redesign of the experiential activity for work space design and work system design set in the museum on Day 3;
- An A3 sized laminated coloured deskguide on which I presented illustrations of the key techniques, concepts and the design work system covered in this course. I designed the A3 desk guide as a memory jogger and a summary of the course for use by participants when they returned to the workplace. In the last two years this corporate artefact that has proven to be highly successful in that it is readily accessible, available, and is a highly visible reminder of practical techniques and approaches. An A4 copy of this deskguide appears on the next page as Diagram 4.1

While I re-designed the techniques, Stephen revised the associated PowerPoint presentations and John began a new series of research papers to support our work during 2001.
Diagram 4.1: Work Systems Desk Guide
Concluding the ATO Jacaranda Project.

During February and March 2001, Sally Pegler and I also began to disband the Jacaranda Project and the project team. We had achieved what we had set out to do in the project and many of the intelligence capability designs that resulted from our project were already being incorporated into a range of other organisational areas. Also, the organisational environment was changing, and shifting priorities meant that many of our project staff were being sought for other work. Within the space of a few weeks all the members of Jacaranda team including Sally had been re-assigned to other projects and areas. All that is, except Stephen, John and me. Through discussions with Jim Killaly, Deputy Commissioner Large Business and International, I had an opportunity to build on the research and work I had been doing in Project Bijou and the Jacaranda Project.

By the end of March 2001, I had formed a new organisational unit within the Large Business & International Division (LB&I) called the Work Systems Design & Research Unit for which I became the Director, while John and Stephen stayed on as my two research officers. The new unit enabled me to continue my work in the analysis and design of intelligence capabilities and also gave me a roving brief to undertake a range of innovative research and action research to support productivity improvement with the ATO and LB&I.
Part 3: A 2\textsuperscript{nd} Training Course in April 2001.

In the week of 2 to 6 April 2001, we conducted the 2\textsuperscript{nd} course for twenty six managers and staff in Melbourne. This second iteration of the program and of the set of practical approaches and techniques incorporated our learning and reflections from the first course, and proved to be just as successful as the first course.

During the course I introduced the ‘Five-step, many step; design as dance’ technique for the first time. I also introduced the work system and process for analysis and was able to immediately observe that both techniques proved to be readily accessible, sensible and practical for the participants. The major enhancement that both techniques represented also meant that the technique for analysis and the technique for design could be presented simultaneously as both processes and work systems. Further, as each diagram had been prepared in Microsoft Word and fitted onto an A4 page, the techniques could be made readily available and visible to people back in the workplace.

Participants’ feedback and comments at the end of the course clearly indicated that many found the A3 laminated coloured deskguide that I had designed extremely useful. In fact people had asked for two copies so that they pin could both sides up on the wall of their work stations, enabling a summary of the key techniques and the design work systems to be visible at all times.

Once again we had the feedback and evaluation sheets with the four focussing questions that the participants had addressed at the end of the 2\textsuperscript{nd} course. This combined with our own individual observations, experiences and reflections, gave us a great deal of relevant information upon which to base our ongoing assessment of both the techniques and the training program.

During the last week of April, as one my final activities associated with the Jacaranda Project and as part of my ongoing knowledge management practice, I shaped my thinking, notes and findings into an organisational evaluation report that I
could formally use as a recognised organisational artefact and ATO acknowledged historical reference. The evaluation report was presented to the Commissioners and Deputy Commissioners in early May 2001.
Part 4: Three approaches for methodological pluralism in the workplace

In this section I intend to briefly describe three practical approaches that I have developed for use by managers and business systems analysts in applying these techniques in the workplace when seeking to analyse and gain a holistic understanding of complex problem domains and/ or complex work systems. These approaches are:

1. The combined application of the analysis and design processes, as introduced to people in the training program;
2. A tutorial designed around using a range of techniques to build a rich systemic collage of understanding;
3. A process for designing a work system to support a strategic intervention.

**The combined application of the analysis and design processes**

The first approach to analysis and design was the one that I designed and introduced during the training program in December 2000.

For introduction and training purposes I had defined analysis and design as two separate processes. I described analysis as the exploration and understanding of ‘what is’ and ‘why it is’ about the current situation, and also the potential consequences of the current situation continuing to happen. By contrast, I described design as the exploration and understanding of possible futures, of ‘what might be’ and ‘what could be’.

This definitional approach enabled me not only to emphasise the difference between analysis and design, it also enabled me in the training workshop to discuss with participants the different management reporting expectations between an analysis report and a design report, as well as enabling me to discuss broader behavioral and
organisational issues associated with the different politics and dynamics driving an analysis activity in contrast to a design activity or project. In this way, holistic approaches to analysis and design could be discussed and participants could be introduced to the subtle differences in applying the same individual practical technique (e.g. mind mapping, interface diagrams etc) in an analysis activity as well as in a design project.

**Diagram 4.2:** The ‘five-step, many step, design as dance’ approach to design.

During the first training workshop I had introduced the design process as an illustrated work system, i.e. to look like a system map, as can be seen in Diagram 4.2. I had deliberately not numbered the sub-systems with their implicit descriptive processes as I did not want to imply a linear process or sequential relationship. However, I observed that participants found the work system confusing and many made the comment “but where do you start”. I also surmised that people felt far more comfortable with the recognisable pattern of a process. I addressed this issue by modifying the design process so that I still kept the visual work systems presentation but I also numbered each of the five sub-systems. By doing so, the design model could be used as both a sequence of five logical steps as well as a set of five sub-
systems, with the five sub-systems shown as all being in simultaneous dynamic relationships with each other. Behaviourally this catered both for those who liked structured systematic logical process and for those who were perhaps more creative, liberated and intuitively systemic in the way they approach design. I called this technique the ‘Five-step, many step; Design as Dance’ model of design.

The five steps comprised:

1. Develop self-awareness and establish clarity of purpose.

2. Identify the purpose and outcomes of the proposed work system.

3. Develop a prototype model of the work system with several levels of resolution.

4. Develop a detailed design, including work maps and interface models.

5. In collaboration with others, take action to test and a conduct a critical evaluation.

The "Design as Dance" process gives people a way of developing visual models of proposed new work systems, relationships, desired behaviours, business processes, applied information technology and workspace. These models can be developed relatively quickly using prototyping techniques and enable people to use these models to conduct strategic design conversations and to engage others in collaborative and strategic design conversations.

As each step in the five-step process has a specific deliverable or set of deliverables that the user needs to produce I have been able to incorporate explicit critical thinking and critical learning processes and practices into the detailed model. These processes readily challenge the user to think systemically, to surface and articulate assumptions, to consider issues of inclusion, boundaries, plurality, diversity, coherence, as well as to consider and specify practical considerations of intent, purpose, desired outcomes and logic. Equally, the whole model and the techniques
associated with the model encourage designers to take a more holistic social ecology perspective and to explore and work through notions of the desired and possible relationships between the individual, relevant communities and the contextual and broader environments.

The metaphor of dance refers to the notion of a person learning to dance using formal steps rather slowly and self-consciously as a beginner, going faster with experience and a growing sense of confidence, and finally starting to move faster and to vary the sequence of the dance steps following a more creative freer form that still has its foundation in a recognised pattern of steps. Hence, the five-steps are shown in a linear and sequential format, while the many steps are many iterations that become more rapid, non-linear, intuitive, emancipatory and inspirational with experience and enable the user to take a more systemic and creative approach to design.

The "Six Steps to Understanding and Analysis" Process

The purpose of the "Six steps to understanding and analysis" process is to provide participants with a systemic model for undertaking the analysis of existing organisational and work systems and complex problem domains. The six steps are:

1. Establish self awareness and group identity.

2. Identify the problem domain or area of concern.

3. Map the current human, social, business and organisational work systems.

4. Identify and understand the contextual deep systemic drivers of current behaviours and practices.

5. Identify strategic leverage and points of strategic intervention for transformation.
6. Take action and undertake critical evaluation.

This process is similar to the five step design process in principle, however it has different outcomes and different uses and applications in organisational life.

Using the same reasoning as I did with design process, I then developed the ‘six-step, many step’ model of analysis, which appears below as Diagram 4.3.

**Diagram 4.3:** The ‘Six-step, many step’ approach to analysis

A Model of Analysis as a Process and as a system of Inquiry

As an experienced business systems analyst I know that many managers and business systems analysts have trouble developing models that differentiate between current and future models of business processes and work environments. In fact people often develop models that are a mixture of the current organisation and workplace as well as ideas for the future and anticipated changes that may be in the pipeline. In my experience this confused “current and future” modelling of information sets and ideas triggers some very muddled and limited thinking and leads to poor design decisions and designs that are never going to identify systemic interventions with
which to address the problem domain. Similarly, the associated analysis is often simply a statement of facts and figures about "what is" with very little real analysis of what this may mean for the organisation and without any synthesis of what actually needs to be done to address the complex problem situation embedded in a complex problem domain. With this sort of behaviour in mind I set out to distinguish clearly between analysis and design and offer the following guidelines for use:

- If you are asked to develop an deep appreciation of a problem domain and to identify the systemic drivers and dynamics at play in the current world use the Six-step systemic analysis process;

- When asked what we can do to address a situation or to design something new, use the five-step systemic design process.

- Choosing when to use one or the other is matter of your understanding of your focus context and intent.

The second significant enhancement to the presentation of these models in the introductory workshops was to demonstrate the specific techniques that could be used in each step of both analysis and design. Diagrams 4.4 and 4.5 on the following pages illustrate this relationship between each step/sub-system and the appropriate techniques. Using the participants from the first workshop as an evolving community of practice I trialed these diagrams in the workplace and received the consistent feedback that both diagrams were useful, easy to understand, easy to use, and that they were excellent summaries and memory joggers of analysis and/or design activities.

Capitalising on this response, I made the diagrams available as deskguides in a laminated A3 coloured diagram format which people could readily display in their individual work stations and work areas. These deskguides, as with others that I designed in 2001, are still widely in use and openly displayed throughout the office.
Diagram 4.4: Analysis Process and Deliverables Expressed as a Work System
Diagram 4.5: Design of an Effective Work System in a Complex Environment

DESIGN OF AN EFFECTIVE WORK SYSTEM IN A COMPLEX ENVIRONMENT

Use the design process illustrated and select from the range of techniques.

A Design Opportunity or Problem Domain
- A rich picture
- An understanding of the complex adaptive and evolving contextual environment

Intent
- A statement of your identity and intent

Deliverable
- Self-awareness and clarity of purpose

Deliverables
- Implementation strategy
- Rationale
- Design hypothesis

Deliverables
- Point of strategic leverage
- Criteria for viability and sustainability
- List of key assumptions

Deliverables
- High level work system [inputs, transformations, outputs, purpose, boundaries and outcomes]

Deliverables
- Work systems and sub-systems
- Model of key components & relationships

1. Self-awareness and clarity of purpose
2. Identify the purpose and outcomes of the proposed work system
3. Develop a prototype/model of the work system with several levels of resolution
4. Develop a detailed design, including work maps and interface models
5. In collaboration with others, take action to test and conduct critical evaluation

Deliverables:
- Implementation strategy
- Rationale
- Design hypothesis
I should also add that while I initially considered it, I refrained from combining the two diagrams to form one large ‘analysis and design’ work system as I believed that it would visually become too complicated, intimidating, and confusing.

**A Work Based Tutorial for Systemic Analysis**

The second significant approach that I developed and trialed with managers and business systems analysts was a tutorial that could be used in the workplace following a person’s attendance at the introductory training workshop. I designed the tutorial around the literary conceit of a person preparing to leave a work area and briefing a new person to take over his or her work. I also designed it so that the different models produced by the different analysis techniques could be used to build a holistic visual collage that I hoped would encourage profound discussion and insights about the meta-level of work and organisational work systems.

Participants worked through this tutorial at their own pace in the workplace and then, depending on time available and geographical location, would either arrange a meeting in which Stephen, John or I could go through their analysis and findings with them and give them feedback in person, or they could fax us copies of their analysis activities and diagrams and we would discuss the analysis and provide feedback via the phone.

The features of this tutorial included:

- It was designed as an exploration of the participant’s individual work area;
- There were twelve separate areas of enquiry displayed in a tabular format;
- Most of each of the twelve areas of enquiry comprised the application of a specific technique, e.g. mind mapping, relationships diagrams, business process maps etc;
- Most of the techniques had been specifically covered in the introductory training workshop. Those techniques that hadn’t been covered e.g. social & cultural analysis, comprised focusing questions that could be answered
using narrative and/or a combination of narrative and visual techniques, e.g. mind mapping, rich contextual pictures etc;

- The two additional areas not included in the tabular format were aspects of time and timing, and management and financial information. The first, ‘time and timing’ was relatively straightforward and the relevant time-related information could be readily recorded elsewhere throughout the emerging collage. The second technique, ‘management and financial information’ relied on information sets and techniques that I did not necessarily cover in the course. As my intent was always to complement existing skills sets I relied on managers and business systems analysts being able to draw on their other professional skills and suite of techniques to consider this type of information;

- The collage technique involved putting all the analysis diagrams and information models together on a large sheet of paper or on a wall and then standing back to look at the whole picture. This often led to more systemic insights and holistic perspectives about the work area being explored and generated many informed discussions about the meta-design of work, strategic work systems, and the management and organisation of work as well as about the changing nature of work and the myriad implications of these changes.

The tutorial appears on the following page.

This tutorial encouraging holistic analysis proved to be a very powerful and successful way to reinforce the learning from the introductory workshop as well as a very effective tool for the transition of knowledge and ideas from training to application in the workplace. It also became an effective tool in its own right and is currently used by managers, business systems analysts and others responsible for the ongoing development and enhancement of effective intelligence and risk management capabilities.
Tutorial:
Focusing Questions and Techniques for
A Systemic Appreciation of Your Own Work Environment

Your Focus:

Explain aspects of your work and the work of your area and/or team to a colleague who will be taking over your job when you soon move on.

You can develop this systemic appreciation by using a range of systems mapping and analysis techniques.

As you develop the individual visual analytical models you can begin to arrange them on a wall or other display area to create an holistic collage of analytical insights and perspectives of your work.

<table>
<thead>
<tr>
<th>Mind Mapping Technique</th>
<th>Knowledge Mapping Technique</th>
<th>Relationship Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask questions about my work, like:</td>
<td>What are the essential information sources/ sets/ flows that I need to do my work?</td>
<td>Who are my external and/or internal clients?</td>
</tr>
<tr>
<td>➢ What do I do?</td>
<td>➢ What are the key corporate documents that inform my work?</td>
<td>Who are the key people with whom I interact in doing my work?</td>
</tr>
<tr>
<td>➢ What should I do?</td>
<td>➢ What is the key legislation that influences the work and the management of this work and/or work area?</td>
<td>Who are the key clients of this work and work area?</td>
</tr>
<tr>
<td>➢ Why does this work need to be done?</td>
<td>➢ What is the key intellectual capital required to effectively do this work? Where is it physically and/or electronically located?</td>
<td>What is the nature of these relationships?</td>
</tr>
<tr>
<td>➢ How does the work get done?</td>
<td>➢ Who else is involved in my work?</td>
<td>Are there any formal and/or informal networks? Forums? Committees?</td>
</tr>
<tr>
<td>➢ What does and doesn’t actually get done?</td>
<td>➢ Where does it fit into the ATO/ Market/ BSL “big picture”?</td>
<td></td>
</tr>
<tr>
<td>➢ Who else is involved in my work?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ What is the nature of these relationships?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ Are there any formal and/or informal networks? Forums? Committees?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interface Analysis Technique</td>
<td>Business Processes Mapping</td>
<td>Rich Contextual Picture Technique</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>What is the key interface between my work/ work area and the clients to whom I/ we provide services/ products/ information/ relationships?</td>
<td>What are the key business processes I use in my work?</td>
<td>Develop a rich picture that captures the essence of your work and you feel and relate to the work and the organisation.</td>
</tr>
<tr>
<td>What are the current behaviours, relationships, information flows across the interface?</td>
<td>What is the value add /transformative nature of these processes?</td>
<td>What is the key narrative and other stories you wish to tell about your work and workplace and organisation?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work Systems Mapping and Analysis Technique</th>
<th>Workspace and Workplace Diagrams</th>
<th>Changing Landscape and Changing Nature of Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the main work system in which you are engaged?</td>
<td>Where does this work physically take place? Is there more than one physical work space or workplace involved? Does some of the work take place in virtual workspace? Is the work dependent upon a specific workspace, workplace or geographical relationships?</td>
<td>Are there any changes currently impacting on the work/ workplace? Is the design of the current work systems in a state of transition? What other key influences and/ or imminent changes are likely to impact on this work and workspace in the near future?</td>
</tr>
<tr>
<td>What are the secondary work systems in which you are involved?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social and Cultural Analysis</th>
<th>Organisational Structure</th>
<th>Information Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there a sense of community in this organisation/ work area? Do people come together apart from work in social activities? Are there any significant ceremonies, rituals, icons, mythologies, metaphors, beliefs, shared values, shared meanings, patterns of behaviour, sense of place and belonging? What is important to people in the workplace?</td>
<td>What is the organisational structure of your work area? To whom do you report? Who reports to you? Where are they located? What is the organisational structure of the larger Team/ Segment/ Project/ Committee/ ATO/ Market/ BSL/ Cross BSL/ Inter-Departmental organisation (s) in which your work and you are located?</td>
<td>What are the key IT applications and/ software used in this work? How effective are they? What do they do? How do they support strategic &amp; operational management, decision-making, risk management, resource management, intelligence gathering and analysis, information dissemination, knowledge management, statutory record keeping?</td>
</tr>
</tbody>
</table>
Systemic Appreciation Techniques

<table>
<thead>
<tr>
<th>Mind Mapping Technique</th>
<th>Knowledge Mapping Technique</th>
<th>Relationship Diagrams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface Analysis Technique</td>
<td>Business Process Mapping</td>
<td>Rich Contextual Picture Technique</td>
</tr>
<tr>
<td>Work Systems Mapping and Analysis Technique</td>
<td>Workspace and Workplace Diagrams</td>
<td>Changing Landscape and Changing Nature of Work</td>
</tr>
<tr>
<td>Social and Cultural Analysis</td>
<td>Organisational Structure</td>
<td>Information Technology</td>
</tr>
<tr>
<td>Time &amp; Timing</td>
<td>Management &amp; Financial Information</td>
<td></td>
</tr>
</tbody>
</table>

Aspects of Time and Timing

As you put the holistic collage together also consider aspects of time and timing:

Annual cycle, monthly, weekly, daily, periodic, intermittent, predictable, non-predictable, lag, delay...
**Management and Financial Information**

You will also need to consider appropriate contextual Management and Financial Information, including:

<table>
<thead>
<tr>
<th>Budgets, income, cash flow</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial position and projections</td>
<td>Productivity and performance measures</td>
</tr>
<tr>
<td>Numbers of staff</td>
<td>Requisite skills and experience</td>
</tr>
<tr>
<td>Technical knowledge</td>
<td>Workforce planning</td>
</tr>
<tr>
<td>Management information and reporting</td>
<td>Contextual opportunity and risk assessments</td>
</tr>
<tr>
<td>Work plans</td>
<td>Strategic business plans</td>
</tr>
<tr>
<td>Progress and status against business plans and planned business outcomes</td>
<td>Scenario planning; possible and probable futures</td>
</tr>
<tr>
<td>Problems and issues</td>
<td>Current productivity improvement initiatives</td>
</tr>
<tr>
<td>Strategic navigation</td>
<td>Strategic intent</td>
</tr>
<tr>
<td>Niche</td>
<td>Business logic</td>
</tr>
<tr>
<td>Aspirations</td>
<td>Intelligence capability</td>
</tr>
</tbody>
</table>

This type of information can be presented in graphs, tables, text, reports, etc and included in your holistic collage.
Designing a Work System to Support a Strategic Intervention

The third approach also began life as a technique for conducting a case study in the training workshops but soon became an accepted tool for analysis and design in the workplace.

Like most of the experiential learning I encourage in the training workshops, I designed the broad analysis and design process which participants would then apply to their own problem situations from the workplace. This meant that participants learnt about the approach and technique while working through a contextual problem domain that was meaningful to them, and that they could also take the initial findings from these training activities back to their respective workplaces for further consideration. During the training activity, having worked through the analysis and design activities embedded in the process, participants would then present aspects of their analysis and design findings, and finally, would reflect on the overall learning experience. Part of my strategy in introducing this process was to limit the time available and put pressure on participants to move quickly through the different steps and the use of the different techniques. I did this because I wanted participants to practice and gain confidence by learning to use the systemic techniques quickly, getting to the essence of the problem domain and identifying the proposed strategic intervention so that they could present their thinking and understanding without getting lost or bogged down in the detail. This was an essential skill of being an effective manager and leader and one that was expected of all middle and senior managers in the ATO. I also believed that this approach could provide managers with an effective and practical systemic alternative to the more common non-systemic “quick fix” solution approach. As an internal consultant I now often use this rapid analysis and design approach to prepare and present to senior forums and committees aspects of complex problem domains and proposals for systemic interventions for significant productivity improvement.

In its simple three x A4 page written process format this case study technique also readily made the transition from training workshop activity to ready application in
the workplace, and is currently in use in the ATO. This technique appears on the following pages.
Introduction to the Analysis and Design of Compliance Systems and Other Complex Work Systems

Case Study: Designing a Work System to Support a Strategic Intervention.

Outline

The case study comprises four stages:

1. Systemic analysis.
2. The design of a work system.
3. Presentation of your analysis and design.
4. Reflection.

Systemic Analysis:

1. Define your focusing question:

   ➢ What is the focusing question that is driving your systemic enquiry? What do you want to know? What do you want to find out?

2. Develop a mind map to explore your current understanding of the situation and other factors and considerations, as well as aspects of the landscape through which you may travel on your journey of enquiry and design.

3. Develop a high-level interface diagram locating the problem domain and the nature of the problem situation.


5. Create a rich contextual picture that captures the essence of your story and your understanding of the complex forces, influences and drivers that are shaping the problem domain.

6. Develop a statement of strategic intervention, e.g.:

   ❖ “I/ we believe that a key point of leverage to improve this problem situation is……….”

   ❖ “I/ we propose that an effective point of strategic invention is……..”
The Design of a Work System

7. Write a clear statement of individual/group identity and intent.

8. Draw a strategic interface diagram demonstrating the proposed strategic intervention, and showing how the proposed work system relates to the external environment.

9. Develop a high-level work system diagram, showing the work system name, purpose, outcomes, business logic and transformation.

10. Create a prototype of the proposed work system, including:

   - Sub-systems;
   - Sub-sub-systems for at least one sub-system;
   - Key contextual work system elements and the major relationships and dependencies between the key elements.

11. Further develop the detailed design including all aspects of the work systems and the component elements that you believe are relevant.

12. Draw an operational interface diagram showing the delivery of appropriate products and services, key process and information flows, and client relationships and expectations across the interface. Also show the requisite conditions required in both the external environment and the organisational environment for the proposed strategy to succeed and for your organisation to effectively achieve the planned business outcomes.

13. Create a workspace/workplace diagram, showing the requisite conditions and the key features of the designed physical environment that are essential for contributing to an effective, supportive, healthy and productive workplace where the work will actually be performed.

14. Identify criteria for viability and sustainability, including requisite conditions in both the external and internal environments.

15. Develop a list of key assumptions embedded in your design and which are fundamental to the success of your proposed design.

16. Use your design to develop a table of interrogative questions that can be used to conduct a diagnostic of the existing capabilities.

17. Develop an initial action plan to engage others in conversations about the design, and to further test the prototype, the ideas and the assumptions. How will you progress from this work to an appropriate strategic decision making point? What do believe needs to happen after that to see your design taking shape in the real world and being implemented?

Presentation of your analysis and design

18. Present a summary of your diagrams, work maps, research findings, thinking, learning and design rationale.
Reflection

19. Reflect on the experience and document your thoughts and learning as well as the feedback you received and any emergent ideas that arose through your presentation.
Part 5: Reflection: ‘When I Design…’

Emergent Thinking and the Writing of “When I design…”

It was while working on the redesign of the process for design I began writing “When I design…” which now appears below and is also now included in my Journeyman’s Toolkit. A brief reflection on the process of writing “When I design…” over a period of six months also follows.

When I design...

When I design I need to engage my hands and my heart and my mind.

I need to engage all my senses, my intuition and my knowledge and understanding of past, present and future.

I need to engage others in critical conversations as together we move towards coherence, informed action, communities of learning and ethically desirable and sustainable improvement.

I bring together thought and action, knowing and not knowing, certainty and play and day dreaming and ambiguity. I create new from old, the unfamiliar from the familiar, the unknown from the known. I shape songs and poems from wisps and noise and babble, I create images from other’s stories and shades of light and a moment in time, I arrange and re-arrange words to find new meaning.

When I design I enter a world of great wonder and creativity, I hear the whispers of “what might be” in the universe, I delight and play with the miracle of “what could be”.
When I design I suspend disbelief.

I tap into ancient rhythms and patterns to shape ideas and to weave the magic of being into the creation of the new.

When I design I am at once both here and not here, I am conscious and yet not conscious, I am human and physical and spirit and ethereal. I enter a place where time stands still and where all things can be and where all things that have been and that will be are.

When I design I explore complexity and elegant simplicity, I see the spontaneous connections between all things, I find inspiration in the infinite.

When I design I learn about life and the world and about myself.

When I design I dance with the gods.

When I design, I am.

David Bruce-Smith
14 September 2001

Thoughts on “When I design…”
Weetangera, A.C.T.

I began writing this piece one afternoon at work in early March 2001. I had been working on a large design sheet pinned to the office wall and on which I had been designing the “five step, many step, Design as Dance” design process model which I intended to introduce in the training program on 2 to 6 April 2001. I had taken a few steps back from my work and was paused in reflection on what I had done so far,
when I started thinking about the state of mind I experience when I am engaged in a
creative or design process. The words began to take shape in my mind and I grabbed
a marker pen and started to write the words diagonally across the top left hand corner
of my design sheet. I was lost in thought and had written three or four sentences
when I was interrupted by a senior manager who wanted some particular piece of
information.

As soon as he spoke I was immediately jogged back into the reality of the workplace.
I spent the next twenty or so minutes in conversation with the manager and when he
had gone I turned back to what I had written on the wall. Unfortunately, like
Coleridge interrupted when writing his poem “Kubla Khan”, the mood and thought
had totally gone. Rather than force what I had been trying to say, I decided to leave it
and get on with something else. One way or another I did not return to the piece of
writing during March, nor for the following two months. The design sheet stayed on
the wall and each morning as I walked into my work area, I looked at the words that
had been taking shape across the top of the “five step, many step” model and I
thought “I must finish that sometime”.

Then in late May 2001, I transcribed what I had written onto a sheet of A4 paper and
began to play with it again. Within ten minutes I had captured most of what I wanted
to say. Once again I was interrupted, this time by a phone call. The paper went into
my briefcase and came home with me only to find a place among the shemozzle of
my research papers that covered the dining room table. I found it again in June when
I typed it into a computer file and made some further notes and one or two other
ideas I wanted to express. At the end of June my parents came to stay for a few days
and the dining room table was reclaimed by my wife Sally in the interests of
community dining and conversation. I had to clean up all my notes and shift
everything to an already crowded study. The 2nd and 3rd drafts of “When I design”
now resided on a 3.5 inch floppy disk, still unfinished to my satisfaction.

In July I realised that I had lost the disk. Like a lot of other things my thesis was put
on hold during July and August and the writing only resumed on 10 September when
I began a nine week leave break. Last Monday I began a rescue mission. Notes and
books and files were sorted and carefully placed in specifically allocated spaces on
the reclaimed dining room table. Floppy disks were trawled from many nooks and crannies in the study, their files reviewed and the disks carefully labelled. I had found my file. On Friday 14 September 2001, I was walking with Jamie the dog in the local Canberra Nature Park when the words came to my mind again. I came home, sat down at the computer, played with words and within an hour I had finished “When I design…”

“When I design…” is an attempt to explain aspects of myself in a creative state and an act of design or writing. I offer it to others as a way of providing some insights into the creative process that may be required when designing work systems.

DBS
Part 6: Strategic Thinking Techniques: A Concurrent Interrelated Action Research Project

In March 2001, I had also initiated and managed a second concurrent action research project to design practical processes and techniques to support senior and middle managers involved in strategic planning and decision-making. This research, undertaken by myself and Stephen Jovanovich, involved the application of the techniques we had developed in Action Research Cycle 2 to the theoretical and conceptual models suggested by Hames’ and Oka’s (1997) Strategic Navigation System.

My action research comprised the analysis, design and the prototyping of specific practical techniques and processes for strategic thinking and planning, which we tested with twenty senior and middle managers throughout the ATO during May to July 2001. The outcome was a series of A3 desk guides and an A4 sized booklet of practical techniques published internally by the ATO LB&I Work Systems Design and Research Group: Bruce-Smith & Jovanovich (2001) Some Strategic Thinking, Planning and Problem Solving Tools.

This popular booklet is available in two forms, that of black and white printed pages or full-colour printed pages, both of which are currently in use by many managers and staff, particularly those working in the complex area of Large Business and International Tax. I published it in the two different forms for two reasons, the ease of electronic transfer and printing on standard office printers, as well as the simple fact that some people preferred black and white, others colour.
June 2001 was a time of reflection.

I had begun this research in late 1997 with the intention of seeking better ways to introduce the application of systems thinking methods and techniques into the workplace and encouraging managers and staff to use such techniques. My research journey had taken me a long way to finding some practical answers to this focussing question.

During 1998 I had explored an educational approach through the UWS Centre for Systemic Development to introducing systems theory and thinking into the workplace. While there appeared to be some success with this approach I also realised that the formal systems thinking methods, e.g. soft systems methodology, viable systems method, critical systems thinking, learning systems, had limited application in relation to the type of analysis and design activities the ATO was expecting of managers and business systems analysts, particularly in the context of Project Bijou. I began to look further a-field for practical systems mapping techniques that could be readily applied in the workplace and that were also readily accessible, understandable and useful. My findings and journey led me to initiate the 2nd Action Research Cycle in November 1999, in which I took a two-fold approach to my quest by exploring and designing an initial set of practical techniques as well as a five-day training program through which to introduce the techniques. The successful outcomes from my research during 2000, combined with my experience and cumulative learning enabled me to initiate the 3rd Action Research Cycle in January 2001 in which I could review and refine the practical techniques and training workshop from December 2000, as well as use my growing knowledge and expertise to design a number of approaches and techniques that managers could readily apply in the workplace. By June 2001, I had established a small but enthusiastic community of practice, comprising managers, business systems analysts and project officers who were now applying the practical techniques as part of their everyday
professional suite of tools and approaches to a wide range of problem solving activities and design projects.

June 2001, I thought, was a time to take stock of the progress of my research, and to begin the task of writing my research thesis. While my work and research as part of my ongoing ATO duties would continue, I believed that the 3rd Action Research Cycle had reached a natural conclusion and so too had the active research component of my thesis. I now had an extraordinary body of knowledge developed over the course of my research and, after a considerable period of reflection during June 2001 about the nature of this knowledge and my learning and research journey, I planned to take a period of long service leave and to write the thesis narrative.

However, that was not quite how things turned out; there was one more area I needed to address.

**An Emerging Community of Practice**

Knowledge of the training course and of the approaches and techniques continued to spread by word-of-mouth and, over the period of the next twelve months or so, I was often asked when I was going to run the program again. In May 2001, I had also sent a copy of the evaluation report to all of my management colleagues with whom I had worked on the Jacaranda Project, as well to all those who had contributed to the development of the practical techniques and the training program over the last few years. This, plus the publication and distribution of various office documents and artefacts illustrating the practical techniques, created a new language that gradually accelerated and reinforced the development of self-organising networks, and I began to see the emergence of a robust and enthusiastic community of practice.

**Further Research**

I had originally intended to finish my post-graduate research with the completion of the 3rd action research cycle, however, the concern of how to effectively introduce managers and staff to practical aspects of complexity and chaos theories still niggled me. I was also intrigued by the notion of viewing organisations as complex adaptive
systems and felt that there was a lot more research I could do in this area to fully understand the types of practical techniques that could be useful here. In mid-November 2001, following a period of long service leave, I turned my mind again to the idea of viewing an organisation as a complex adaptive system. A number of intriguing questions were beginning a sort of slow gently forming, swirling motion in my head. What might this mean for the analysis and design of work systems? What practical techniques might I use? What were the features of a complex adaptive system that would be useful to consider in the analysis and design of work systems? How might I demonstrate and explain the idea of an organisation as a complex adaptive system to others?

Were there better ways of introducing people in the workplace to the concepts of complexity, chaos, fuzzy logic and complex adaptive systems? How might these concepts be usefully applied to the work of middle management and intelligence capability development?

These questions led me to initiate Action Research Cycle 4 so that I might pursue this area of intrigue. I resumed my research and work in the spirit of finding better, more effective and more practical ways for people to design robust and sustainable work systems in the public sector. The brief story of aspects of this further research is addressed in Chapter 5.
The narrative begins:

Alone on a windy hill silhouetted against a grey sky he stood…

“No, no, no,” sighs Solomon Tortoise, “no wonder you never get anything written! This is the time for writing your thesis, Davo m’boy, not a novel or a poem or a letter or even a card to a friend. Now forget the distractions and various work avoidance techniques; take a deep breath, focus on the task and write…”

Oh well, here goes.

The narrative begins again.
Sometime later.

Solomon Tortoise comes in to check on my progress. He peers at the screen and pauses in thought. “Davo m’boy,” he says after a while, “at this rate I suspect that you won’t finish this chapter until May or possibly June 2004.”

“Yes, yes,” I answer curtly,” it’s because people like you keep interrupting and suggesting I go on bush walks or have a few beers in the afternoon sunshine or sing songs from old musicals while dancing in the moonlight that I never get anything done”.

“Hmm, you may have a point.” Solomon considers wisely. “Perhaps we should have a beer and talk about this.”
“But that’s just what I mean!” I cry in exasperation, banging my fist onto the desk between my portable computer and an already dangerously toppling pile of uni. papers, books and other notes. Solomon looks on in wonder as the sudden rush of wind causes my hand-written notes to fly spontaneously into space, tracing a gentle arc in the late afternoon light before to floating gently down onto the cat sleeping on the floor between the edge of the wooden desk and a disreputable pair of second-hand gumboots that Georgie bought at the school fete and left in here last year.

“Oh no!” I cry, scrabbling to catch the freedom loving sheets of escaping A4, ‘those are my notes for Chapter 5!’

Misty the cat wakes up in alarm and makes a bee-line for the study door; he has a low tolerance of intellectual capital falling unexpectedly from the sky and interrupting his afternoon snooze. A butterfly emerges from one of the gumboots and circles slowly above the melee, all the while sneezing in response to the dust now swirling in little whirlwinds of varying velocities and intensity.

“Look,” says Solomon with great interest and wonder, pointing at the butterfly, “sensitivity to initial conditions! You should write this into your thesis”.

“Agh!” I groan. I clutch my in head in the face of mounting madness. Who can write under such conditions?

“You seem a little stressed Dave,” says Ptolemy Penguin climbing down from the bookshelf where he has been reading love poems written by mysterious 8th century Antarctic poets. “Perhaps you need to get some fresh air. Come outside into the garden and we can have a few beers and listen to Louis Armstrong as the afternoon gently drifts by.”
“Exactly,” nods Solomon in agreement, already heading out of the study for the fridge in the kitchen.

“Oh all right”, I sigh. “I probably need a break anyway. I guess I’d better make sure the cat is OK. Say Ptolemy were you thinking of Louis’s Greatest Hits or …”

“Mmm,” reflects Ptolemy thoughtfully, “some of Louis’s very best tracks on that, but I think the Great Chicago Concert of 1956 would be perfect on such a November afternoon.”

“A fine choice”, I say as we follow Solomon outside. I can already taste the beer and smell the freshly mown lawn in the slight afternoon breeze. I can always write a bit more tonight, I think. Behind me I hear the sounds of an internal avalanche as the pile of papers and books finally fall from my desk onto the floor with a great calumph, followed by an eerie silence. Ah well, there’s always tomorrow.

The next day.

Quick. While nobody is around. Start writing.
Chapter 5. Aspects of organisations as complex adaptive systems.

Exploring practical technique for modeling aspects of organizations as complex adaptive systems.

October 2001 to September 2002

Critical Learning Heuristic Cycle 4

Purpose

The purpose of Chapter 5 is to briefly tell aspects of the continuing story of my research during August 2001 to September 2002, and the development of several visual models for use in introducing managers and staff to notions of organisations as complex adaptive systems.

Research Question

Could I develop models of organisations as complex adaptive systems that would help others to visualise and understand these concepts more easily?

Introduction

Using a Critical Learning Heuristic approach in mid to late 2001 and 2002, I designed several visual models to illustrate aspects of organisations as complex adaptive systems. While I was partly motivated by my professional practice of introducing practical notions of systemicity and complexity to managers and staff as part of the long-term development of ATO and LB&I intelligence capabilities, I was
also motivated by a personal sense of intrigue and enquiry, and a desire to play with ideas and see where it might take me.

I intend in this chapter to briefly discuss four of the visual models that I developed and that I am continuing to use in the workplace. The principle research techniques I used included a heuristic approach with personal creative design and a series of ongoing informed critical design conversations with my work colleagues and other managers and staff as appropriate.

The four visual models that I will be discussing are:

1. Work systems design of intelligence capabilities;
2. Work systems mapping of an organisation as a complex adaptive system;
3. An illustration of a public sector organisation in dynamic relationship with the surrounding community, society, culture and landscape;
4. A model of a problem domain viewed as a complex adaptive system.

**Work Systems Design of Intelligence Capabilities Technique**

Following the conclusion of the ATO Jacaranda Project in March 2001, and the 2nd iteration of the “Introduction to the Analysis and Design of Complex Work Systems” training program in April 2001, I re-focused my attention and the work of the Work Systems Design and Research Unit to the practical application of the techniques I had been developing.

Of particular note was my use of the work systems mapping technique, in August 2001, to visualise and design an intelligence capability for ATO Large Business & International Division (LB&I). This systemic model of the LB&I Strategic & Business Intelligence (S&BI) capability was quickly adapted as the S&BI framework and is still in use as the logical design architecture and capability diagnostic framework today (December 2004). This set of work system models has also become
a corporate artefact that over the last few years has significantly influenced the thinking and design of similar intelligence and risk identification capabilities throughout other areas of the ATO.

On the following pages I have included copies of the original work systems models I developed in August 2001. The first one (Diagram 5.1) illustrates the Strategic & Business Intelligence work system and the key sub-systems I believed were required to support an effective capability. These key sub systems are:

- Leading and managing the intelligence capability, functions, activities and resources;
- Managing knowledge, intellectual capability and learning capabilities;
- Applying and using the LB&I Cooperative Compliance model and approach;
- Enabling and enhancing Strategic & Business Intelligence capabilities and activities throughout LB&I and ATO;
- Identifying risk and developing enhanced understanding of the market and business environment through the use of ATO/ LB&I risk engine;
- Generating, inspiring and motivating ways of learning, ways of thinking, ways of knowing, ways of behaving, and ways of being (at work and in the workplace);
- Applying Strategic & Business Intelligence approaches, practices and techniques (Applying DCASAL).

For ATO security reasons I will not elaborate on the model, nor on the rationale behind the key sub-systems that I designed, except to say that, having defined the work systems purpose and the business logic underpinning the need for such a work systems and capability, I designed and included those sub-systems that I believed were required to achieve the organisational and management outcomes sought.

The second diagram (Diagram 5.2) illustrates the next level of resolution (i.e. sub-sub-systems) for the “Applying DCASAL as a Work System” sub-system. This sub-system is essentially about the everyday operational perspective of conducting intelligence analysis activities. The acronym DCASAL stands for the key word of each of the 6 sub-sub-systems. These are:
1. Direction (i.e. setting direction);
2. Collection (i.e. conducting research and collecting specific information sets);
3. Analysis (i.e. analysing all the information sets);
4. Synthesis (i.e. synthesizing and designing new meaning within the organisational context);
5. Action (i.e. taking action);
6. Learning and evaluation.

A generic, though linear, version of this DCASAL model (known as DCASA) can be found in the recent Fleisher and Bensoussan (2003, p.6), though it should also be acknowledged that an earlier similar model to this generic version influenced the ATO Business Intelligence Capability design in 2000, i.e. the model was readily available in the broader intelligence and knowledge management community of practice. The key differences in the ATO model are that in 2000, I added the sixth area of “Learning, Reflection and Evaluation” (the L in DCASAL), and that having done so I was then able to transform the original linear process into a dynamic work system, in which all six areas are in dynamic and systemic relationship with one another. This DCASAL model has been a very effective and useful base for communicating to managers and staff the notion of a designed intelligence environment having specific processes, relationships, information flows, management practices, desired individual and organisational behaviours, and responsible leadership in an effective intelligence environment. Perhaps more importantly, it has enabled me in my many diagnostic activities and strategic design conversations to demonstrate and emphasise the critical importance, at all levels of recursion and resolution, of feedback, reflection and learning, and of the dynamic, evolving and systemic nature of an effective intelligence environment and capability.

Both of the intelligence capability models shown as Diagram 5.1 and 5.2 on the following pages were developed using the work systems mapping technique and the “five-step, many step” design approach.
Diagram 5.1  LB&I Strategic and Business Intelligence
Diagram 5.2  Applying DCASAL as a work system
Since August 2001, between September 2002 and December 2004, I have conducted and facilitated the “Introduction to the Analysis and Design of Complex Work Systems” training program a total of twelve times for managers and staff working in intelligence and risk management areas throughout the ATO, and have been using these work systems maps both as examples of the technique and as the focus for a number of case studies and training exercises. I have found these diagrams of complex work systems to be particularly useful in introducing and skilling managers in the design of enhanced intelligence capabilities and in conducting the diagnostic and analysis of existing intelligence capabilities.

Wall Mapping Activity

During late May and early October 2001, I took several periods of long service leave. On my return to work in mid-October 2001, I began to tackle the idea of different ways to introduce people to notions of organisations as complex adaptive systems. I was particularly interested developing in a visual model that I could easily use and that would be more readily understood by people, rather than readings or presentations based on abstract mathematical or scientific theory.

My approach to this research and applied thinking was to firstly create a design space in which to I could work and be creative without disrupting other people working nearby, but that at the same time would allow people to see the research as it evolved.

Similar to the rich picture of Systems Mapping that I developed in 1998 (see Chapter 2), I began with a blank sheet of drawing paper. This time, instead of an A3 blank sheet however, I used a much larger sheet of high-quality drawing paper that I pinned to the gyprock office wall adjacent to my work station.

The large sheet was 1.5 metres high and 2.3 metres wide.
I then used this large blank sheet as my artist’s canvas onto which over the following two to three weeks, I crafted and shaped my ideas and thoughts about organisations as complex adaptive systems. The photographs on the following pages illustrate aspects of the information sets and their relationships to one another as they were positioned on my unfolding canvas.

As I began to develop this large rich picture over a number of weeks I was also able to engage people in focused design conversations using the evolving diagram as the focal point for our discussions. The whole effect was one of personal creative design while developing an evolving visual model that immediately became a much-talked about corporate artefact and that intrigued people as well engaged them in creative and innovative research.

I began with some first principles, such as with what I understood of the basic characteristics and features of systems and complex adaptive systems.

On the left side of the sheet I wrote the features and properties of open systems, on the right side I wrote notions of complex systems and aspects of Ralph Stacey’s (1996) work on organisations as complex adaptive systems.

Photograph 5.1: The author with the wall map exploring aspects of organisations as complex adaptive systems.
Photographs 5.2 & 5.3: Detail from the wall map.
Photographs 5.4 & 5.5: detail from the wall map.
In the centre at the top of the page, I included aspects of my model of a social ecology enquiry expressed as a critical learning system and a list of the six key systems tools and techniques:

- Critical systems thinking
- Soft systems methodology,
- viable systems method,
- systems dynamics,
- learning systems, and
- my recently developed “systemic analysis, holistic design” technique.

Deliberately leaving the centre of the large sheet blank, across the lower part of the paper I started to capture information sets about what I considered to be some of the key dynamics that are at play in shaping our culture and way of life in Australia at the beginning of the 21st century. I was particularly interested in expressing these dynamic forces and influences in terms that could be readily understood by other managers and staff in the ATO. The essence of my enquiry and thinking at this stage was building on the notion of a complex system as one in which two or more rules interact to give rise to unpredictable behaviour. With this as a working definition of a complex system I believed that I could begin to apply it a practical exploration and articulation of the Australian Public Service and the broader Australian community as a complex adaptive system.

Under the broad area of Dynamics of Complex Systems (that is, sets of rules), I began to iteratively build up portraits of the various dynamics under the five key headings of:

- Australian Community;
- Community and Culture;
- Public Sector Organisations;
- Corporate Life and Behaviours, and
- Continuums of Common Behaviours.
In modeling these last two areas I used the visual device of expressing human behaviors in terms of continuums because I wanted to illustrate and emphasise the whole subjective nature of a general unpredictability of human behaviour. Organisations and communities could be viewed as complex adaptive systems because of the many diverse and different human beings that comprise and inhabit and shape those organisations and communities.

The use of continuums enabled me to express ranges of behaviours and also to weave a narrative of shades of experience and degrees of behaviours, nuances and subtleties not often acknowledged in the broader discourse of organisation and management theory.

With this, and the whole miraculous mystery and wonder of life and of being alive in mind, I added a sixth key aspects to the dynamics of complex systems, that of “Aspects of the Human Experience and of Being Alive”.

In this sixth category I listed examples of the many, many emotions, feelings, experiences and qualities of being human and being alive.

Over the next three weeks I developed and shaped and explored the visual exploration of the system “rules” that influence and shape the human condition and experience of being alive, together with the rules and laws and theories by which we humans organize ourselves into communities and organisations, e.g. how we govern the Australian nation state and administer the Australian Public Service.

While it can be argued that such an enquiry would be never-ending and would ever continue to grow just as life itself and society ever continues to grow and adapt and change and evolve, I believed that in the three weeks I had covered enough areas in my research enquiry to inform my thinking and considerations to enable me to move on to beginning to address the focusing question:

“Could I develop models of organisations as complex adaptive systems that would help others to visualise and understand these concepts more easily?”
As with so much of my later research, the answers came not as the logical outcome of rational thought and applied reasoning, but by the creative combination of logic and reasoning with play and physical movement and activity and reflection and sleep and daydreaming and exuberant imagination and creative design mind space and very, very brief moments of inspiration and explosive vision and insight. (See “When I Design…” in Chapter 4).

There were two very different models that were inspired by this research and that emerged from my thinking and reflection. These were:

- **Diagram 5.3** The model of an organisation as complex adaptive system that I developed on an electronic whiteboard using a rich contextual picture and work systems mapping techniques.

- **Diagram 5.4** An illustration of an organisation in dynamic relationship with the broader community. Both are the organisation and the broader community are components of a larger society that can be considered as a complex adaptive, ever evolving and dynamically changing system.

They were also developed in two very different ways, though both were developed through that mysterious combination of my rational and reasoned thoughts processes with my more imaginative and creative mental states.

**1st Model – A Conceptual Exploration of an Organisation as a Complex Adaptive System.**

The first model was designed through the use of an electronic whiteboard in my work space and on which I began to work from first principles and use the work systems mapping technique to develop a work systems model of an organisation as a complex adaptive system.
My hypothesis here was that an organisation could be represented as a complex system comprising a number of work systems in dynamic relationship with one another. I reasoned that this should allow me to use the work systems mapping technique to develop a model of the larger organisational system. With this in mind I began to softly sing snippets of songs from the musical “My Fair Lady” and to dance around the whiteboard, tap-dancing my way into a creative state of mind and to also use the whiteboard as an artist’s canvas. There were many insights and “ah ha” moments that I experienced as I created and shaped this model in the office one Friday morning in November 2001. The model (Diagram 5.3) appears on the next page.

This model was extremely useful and meaningful to me, though I knew instantly that it would not be readily understood by others in the office, and that ultimately it was not the illustration/model I was seeking. Nonetheless, it was an extremely important development in my thinking and would enable me to represent critical aspects of social ecology perspectives of organisations as complex adaptive systems. Over time, it would also prove extremely useful in being able to test and explore ideas about strategic design interventions into various aspects of current and future intelligence and management capabilities.

The creation of this seemingly logical and rational explorative model of an organisation as a complex adaptive system certainly informed and stimulated my thinking about a practical way of illustrating of complex dynamics, organisational paradox and unpredictable behaviours. Two years later in 2003, by building on this learning from work systems modeling of an organisation as a complex adaptive system I was able to visualise and develop the notion of a complex problem domain as a dynamic complex adaptive system.
Diagram 5.3  The model of an organisation as a complex adaptive system.
The second model I developed at home one evening. I sat at the dining room table with a blank sheet of A3 paper, and tried to synthesize my thinking and ideas through an illustration that would immediately convey to others the notion of an organisation as a complex adaptive system that was contemporaneously in dynamic relationship with the broader community and which was also a part of a broader socio-economic political complex adaptive, ever-evolving and dynamically changing system. I had been thinking about some form of illustration for quite a while, especially while I had been driving through parts of California with my family while on long service leave in September 2001, but so far I hadn’t managed to turn the faint glimpses and ideas in my mind’s eye into anything tangible. I was also plagued with self-doubt about my ability to draw and actually capture the ideas should I have any.

As I began to develop the wall map however, my sense of immediacy to tackle this hurdle also grew and finally one evening in late October I thought, “What I have got to lose? If I don’t try, it will never happen”. Sitting at the dining room table that was now half-covered in thesis notes and reference books, I meditatively picked up one of my preferred black “Uniball fine deluxe” pens and selected a blank A3 sheet of sand-coloured paper and, with a sense of adventure and a suspension of disbelief, I began to draw.

An hour later I had finished my diagram. Diagram 5.4 now appears on the following page.
Diagram 5.4 An illustration of an organisation in dynamic relationship with the broader community.
I sat back and looked in wonder at the diagram I had created and drawn. Solomon Tortoise came in, peered over my shoulder and said gently “So, Davo m’boy, what was all the fuss about?”

The free-hand diagram is a representation of a public sector organisation located within a broader Australian community, where the organisation has the responsibility of administering compliance and strategy relating to specific law and government policy on behalf of the government and the community.

One of the key features with the diagram was to show the public sector organisation as a cut away office building so that various work activities, organisational features and employees can be seen as they go about their work. Outside of the office building is the broader community shown as both an urban environment and a rural environment. Thus, in the foreground are the city streets and other government agencies, shops, commercial organisations and professional practices e.g. doctors and lawyers. To the left of the office building can be seen the beach and the sea, to the right is a hospital, graveyard, school, airport, farm, and finally in the background are the mountains with signs indicating both national parks and state forests. Throughout the diagram are people going about their daily lives, being human and experiencing all the joys and sorrows, pleasures and pains and wonder of being alive.

I use this diagram frequently in the office to introduce people to the concept of complex adaptive systems and to the notion of the Australian Taxation Office as a complex adaptive system in constant and dynamic relationship broader Australian community. The community can also be seen as a complex adaptive system, just as together, the ATO and the community, form an even larger complex adaptive system.

I can readily explain interfaces between the organisation and the community at both a physical level (e.g. brick walls as a physical barrier denoting notions of “inside” and “outside” the organisation), and at a conceptual logical level, (e.g. the strategic purpose and intent of the organisation in relation to its accountability to government and its accountability to the Australian public in the administration of law and public policy).
Because of the very nature of the diagram I can weave myriad stories into my presentation and training activities depending upon the context and the background and levels of the managers and staff I am addressing and working with. In addition, people can readily understand the diagram and are very quick to begin weave their own stories and to make meaning based on their own perspectives and experiences.

Since November 2001, using photocopiers, scanners, PC technology and digital photography I have reproduced this diagram many times in its original A3 size and in other on-screen and paper-based coloured and black and white forms, though always as the original hand-drawn diagram. The diagram appears in the coursebook for the “Introduction to the Analysis and Design of Compliance Systems and other Complex Work Systems” training program that I now conduct frequently in the ATO. Participants are also given an A3 sized copy for various activities and presentations, and are introduced to the diagram via both an A4 overhead version and a projected PowerPoint image version.

In whatever form it is presented, I have consistently found the diagram instantly resonates with most people.

In the three years since I designed the diagram I have used it many times in my presentations and find that people always respond readily and enthusiastically to the story and the illustration. This single diagram illustrates instantly recognizable and universal aspects of people and their daily lives, and more than any other information set I may use, this diagram enables me to relatively quickly introduce and communicate ideas of complexity and complex adaptive systems without having to go through difficult and dense mathematical and scientific theory.

At the same time, depending on the context, I can also use the diagram to readily introduce contextual and everyday examples of theoretical features of complex systems e.g. bifurcation, non-linearity, co-evolution, phase space, strange attractors, sensitivity to initial conditions, fuzzy logic, fractals, emergence, requisite variety, and autopoeisis etc, in ways that people usually readily understand and accept.
The morning after I had drawn this illustration I sticky-taped a photocopy of the A3 diagram into the blank space I had been reserving in the middle of wall map.

A model of a problem domain viewed as a complex adaptive system

In 2003, as I drafted and wrote and re-wrote a number of versions of Chapter 1 of this thesis, I began to think about the nature of the problem domain that I had chosen to explore in 1998. As I reflected upon the shifting dynamic nature and boundaries of the problem domain I began to realise that if I tried to diagrammatically represent the problem domain in systemic terms I would need to be able to demonstrate in the diagram how the focus and shape and components of the problem domain ebbed and flowed and shifted and swirled and eddied and rushed and roared and whispered over time, depending upon my perspective and domain of attention and immediate contextual focus at any particular time.

While the core of the problem domain may remain the same, the fact that the problem domain was embedded in a broader organisational context and environment meant that however initially defined, the problem definition would be in a constant state of change. As the many different individuals and groups within an organisation viewed, interpreted, and created their different contextual meanings to explain aspects of the problem domain, it became obvious that the collective constructed meaning could only ever be an approximation of what any one person subjectively understood. Add to this dimension the notion that people’s understanding and organisational politic change over time and it becomes apparent that the problem domain and the interpretations of the problem domain are constantly and dynamically changing over time.

Could I develop a model of this to help people understand the notion of problem domains as complex adaptive systems? Could I use such a diagram to try and address the predominant behaviour in current project planning where a problem was defined at the beginning of a (say) eighteen month to two year management project and never
revisited, so the project resources and efforts went into “solving” and overcoming a problem that had long since moved on and evolved into some other form?

In complexity terms, there was also a notion of phase space in all of this, and a sense of trying to show the problem domain occupying many different phase spaces over time. Intrigued by these ideas I began, using the work systems mapping technique, to draw a representation of a complex adaptive system showing the dynamic, pulsating, continual shaping and re-shaping nature of the fuzzy boundaries and other forces at play in the environment.

Two diagrams emerged from my thinking. One was an attempt to illustrate a complex adaptive system (Diagram 5.5), and the second was an attempt to illustrate a problem as a complex adaptive system, i.e. a dynamic, evolving, complex adaptive problem domain (Diagram 5.6).

A copy of Diagrams 5.5 and 5.6 are shown on the next two pages.

Over the last twelve months these diagrams have become extremely useful in helping managers to more fully understand the complexity of the issues facing them and to develop their understanding of the different types of approaches that can be taken to problem solving depending on:

- The type of problem and the organisational timeframe in which it is expected to be addressed;
- The worldviews of the key stakeholders and the person with organisational responsibility for addressing the problem (e.g. positivist or constructivist; reductionist or systemic etc);
- The context;
- The myriad strategic political, organisational and community considerations;
- The understanding of knowledge and information sets in terms of fuzzy logic, constructivism, subjectivism and contextual relativism. (I often introduce these concepts to people through the use of the Thinking Rainbow diagram (Diagram 5.7) that I designed in 2003).
Diagram 5.5  A diagram of a complex adaptive system (2003).
Diagram 5.6 A problem domain viewed as a complex adaptive system.
Diagram 5.8  The thinking rainbow
At the time of writing (December 2004) I am further developing this model to include references to the different types of research approaches and techniques that can be taken in both short-term and long-term problem solving.

**Conclusion**

This completes my narrative of the critical learning heuristic and action research approaches to developing models for exploring and understanding organisations as complex adaptive systems. During 2001 and 2002, with the exception of the last two diagrams above, I designed and discussed and listened to feedback and tried and modified and refined and further developed a number of different ways of introducing people to notions of work systems and of organisations as complex adaptive systems. These models and diagrams were incorporated into the five-day training program that I recommenced running in September 2002, and that in the last two years has been conducted for over two hundred and thirty ATO managers and staff.

I believe that the use of the illustration in particular is a very effective, innovative, imaginative, engaging and practical way of introducing adults in the workplace to notions of complexity and complex adaptive systems. It is an image that immediately resonates with people and that they remember as being a symbolic representation of a multitude of complex theories, ideas, narratives and images of everyday life.

This chapter also concludes the action research “data” chapters of my thesis. My cumulative learning and understanding that came from the experience of conducting creative research and social ecology enquiry between 1998 and 2002, would now become the focus of the final phase of my thesis, that of making meaning of my experience and my learning and writing the narrative.

However, it was not to be the end of my enquiry. I soon found that the adoption of a reflexive writing (“writing as enquiry”) technique, together with two years of concurrently conducting systemic analysis and design activities during 2003 and
2004, as well as training others in the use of these techniques, involved me in a prolonged and very intense creative period of my life.

One of the major outcomes from these last two years has been the emergence of the Namadgi Technique and the development of several different prototype versions of my book that currently has a working title of “A Journeyman’s Toolkit”. Aspects of the Namadgi Technique and development of my journeyman’s toolkit are briefly addressed in Chapter 6.

**A Final Note**

Many of the techniques designed between 1998 and 2005 have been tested and applied and discussed and modified in a range of organisational contexts and circumstances. Most of the techniques have now taken on a life of their own as people throughout the organisation use and adapt them as they feel appropriate. They are no longer “my” techniques but simply tools that people find useful in the workplace as they go about their jobs and the broad strategic task of achieving planned business outcomes. I can look at this meta-pattern of organisational life and behaviour and know that my time and effort over the last seven years in bringing aspects of social ecology and open systems theory into the workplace have been both organisationally productive and personally effective.

I see the meta-patterns and people see and use the practical tools. In this way, I know that my work as journeyman has been done and that it is now time for me to move on.
<table>
<thead>
<tr>
<th>Diagram No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>A Work System Model of a Strategic and Business Intelligence Capability, showing the key sub-systems (03 August 2001).</td>
</tr>
<tr>
<td>5.2</td>
<td>A Work System Model of a Strategic and Business Intelligence Capability, showing the sub-system and sub-sub-systems (03 August 2001).</td>
</tr>
<tr>
<td>5.3</td>
<td>The model of an organisation as complex adaptive system that I developed on an electronic whiteboard using a rich contextual picture and work systems mapping techniques (18 December 2001).</td>
</tr>
<tr>
<td>5.4</td>
<td>An illustration of an organisation in dynamic relationship with the broader community. Both are components of a larger society that can considered as a complex adaptive, ever evolving and dynamically changing system (31 October 2001).</td>
</tr>
<tr>
<td>5.5</td>
<td>Diagram of a complex adaptive system (2003).</td>
</tr>
<tr>
<td>5.6</td>
<td>Diagram of a problem domain expressed as complex adaptive system, i.e. a complex adaptive problem domain (2003).</td>
</tr>
<tr>
<td>5.7</td>
<td>The Thinking Rainbow (2003).</td>
</tr>
</tbody>
</table>
Chapter 6. The Namadgi Technique.

A Journeyman’s Toolkit: The Namadgi Technique

The purpose of Chapter 6 is to briefly introduce aspects of the Namadgi Technique. The Namadgi Technique is the name I have given to the collective set of practical approaches, tools and techniques that, as a result of my research and cumulative learning, now comprise my journeyman’s toolkit.

Why name it the Namadgi Technique?

Namadgi National Park lies to the southwest of Canberra and comprises 46% of the land area of the Australian Capital Territory. It is a place of incredible beauty, diverse landscape, native eucalypt forests, Australian birds and wildlife, and a source of enormous recreation and pleasure for many people who live in Canberra and the surrounding areas.

I have been regularly visiting and bushwalking in Namadgi and the Tidbinbilla Nature Reserve for the last fifteen years and over that time I have developed a very deep sense of place and a spiritual connection with this land. I go to Namadgi to breathe and to get in touch with my sense of self, I use the landscape for physical exercise and for practicing my hobby of photography, I use it for exploring who I am, who I have been, and who I am becoming. I wander through the valleys and forests and climb the ridges and poke among the granite boulders and sit beside mountain creeks in gentle wonder and awe at the incredible, incomprehensible beauty and simple elegant complexity of life and existence.

I think of Namadgi as a wonderful landscape in which I can physically move and be in touch with my physical and sensual self at the same time as thinking through complex situations that face me in my working life. I often go to Namadgi to focus on a particular problem and issue and to think and reflect well away from the solemn
grey monotone walls and the impersonal dreariness and chatter of the public sector working place.

Whether listening to the diverse birdlife, watching clouds float across deep blue skies, climbing mountains, sitting peacefully in the extensive eucalypt forests or simply focussing on an ant or a tiny coloured wild flower, Namadgi always fills me with joy and a sense of peace and well-being.

Insights from studying Ecopsychology in the mid-1990’s gave me enormous understanding of my self in relation to the wilderness and landscape, and the experience of practical and focussed learning in the gullies and forests and ridges of a weekend gave me an enormous confidence to bring aspects of Namadgi and Tidbinbilla with me into the workplace in both my work as a systems analyst and as an educator of other adults. It was through this extraordinary building of a relationship between the natural environment of Namadgi and the constructed artifice of the public sector work environment that I really came to understand what it means to be a social ecologist in practice.

A lot of the work that I have included in this narrative of my action research over the last five years has had its origin in my thinking as I wandered through the beauty and ecosystems of the Namadgi National Park.

So when I found myself seeking an appropriate name for the overall approach and technique that I have developed, it seemed to be a natural form of honouring the source of much of my inspiration and spiritual strength by calling it the Namadgi Technique.
The Four Key Components of the Namadgi Technique

At its simplest level the Namadgi technique is a practical approach to the analysis and design of complex work systems. Visually it comprises four key components:

- A model of social ecology enquiry (a model to support a social ecology approach) which is a visual representation of critical systems thinking as a nested system within a social ecology enquiry system shown as the relationship between the individual, the community and the contextual environment, all of which is in relationship to the broader, external environment of the world).

- A learning journey, which is a visual representation of a critical learning heuristic expressed as a system.

- A six-step, many-step process for systemic analysis illustrated as a work system.

- A five-step, many-step process for systemic and holistic design illustrated as a work system.

This visual representation these four components is shown in Diagram 6.1 on the following page.
Diagram 6.1  The Namadgi technique – the four major components
In addition there are a number of key approaches and techniques that include:

- Work systems mapping;
- Interface analysis;
- Rich contextual pictures, developed using a collage of information models and diagrams formed from the application of linear and non-linear analytical techniques;
- Critical thinking techniques;
- Iceberg analysis technique;
- A suite of complementary linear and non-linear analysis techniques.

**About the prototype booklet**

During the first five years of my research I spent considerable time and effort designing practical techniques for use by others in the ATO in the work of analysing and designing complex work systems. The approaches and techniques are now documented in a number of internal ATO publications, most notably training course books, as well as A3 desk guides, electronic Microsoft Word and PowerPoint files, and other management supporting materials.

As I began the task however of writing this research narrative I began to think about some form of book in which I could bring all these techniques together in the one repository. I wanted to develop a book of practical techniques, but the task of doing so, in addition to my normal work load and the writing of the thesis, seemed to be enormous and formidable. The more I thought about it however the more I realised that unless I actually wrote and developed the book I would never be satisfied and in a way my thesis would seem unfinished and incomplete. I decided therefore to go ahead with the project but on the basis of an heuristic approach where I developed the book as a series of prototypes. I set myself the following focussing research questions:

- In regard to a booklet specifically for myself, what is useful to me in my practice as a social ecologist, a facilitator and a management consultant?"
“What may be useful to me in other organisations and work contexts?”
“What would I want in booklet specifically for use by me?”
“How would I want to arrange the information and which specific techniques, information sets and diagrams would I include in my booklet?
“What did I want to capture from my learning over the last five years?”

Between October 2002 and December 2004, the process of concurrently writing the narrative and answering these questions led to the iterative development of three prototype versions of my book.

In June & July 2003, I developed the first prototype of the book of practical techniques as a form of management text that others could use for ready reference in the workplace. However, the book as I had first envisioned it proved to be too ambitious and my initial structure proved to be cumbersome and an unsuccessful way of organising and accessing the information. Learning from this experience, I developed the second prototype in September 2003, as a smaller book, one which I personally trialled in the workplace and during many analysis activities and training workshops conducted throughout late 2003 and early 2004.

Reflection, learning and experience now gave me greater insight into what I actually wanted and I decided to focus on meeting my own needs rather writing the book as a general management text. What I needed, I decided, was a journeyman’s toolkit, one that could include aspects and practical applications of social ecology, ecopsychology, systems thinking, complexity and chaos theory, socio-technical systems design and organisations as complex adaptive systems. I also adopted a form for the book modelled on the structure of an anthology of poetry, with various techniques and approaches arranged around the most common activities in which I was often engaged in my professional practice and work. In this way between late April and early June 2004, I developed the third prototype as a journeyman’s toolkit, which I am now using in the workplace and from which I am planning to shape a final book for professional publication.

I have tried to design this booklet to have some of the features and properties of a complex adaptive system. By designing it as a prototype I am enabling the book in its
current form to grow as I learn and to change and adapt to the different environments in which I find myself working. In this regard, some of the techniques are the faithful and reliable set of basic tools that I always carry in my toolkit, while some are yet still emerging and gradually taking shape as I better understand the nature of work systems and the types of analytical and design techniques required to enhance effective capability in an intelligence environment. At the end of each section I have included two blank Note pages to allow for notes and changes and ideas to be recorded as I trial the book over the next six to twelve months.

This 3rd version of the journeyman’s toolkit is currently about 350 pages in length and, as such, is impractical to include it in this thesis narrative. Instead, I have selected just some of the key techniques to include in this preview of the journeyman’s toolkit that now forms Appendix C to this thesis. The techniques included in Appendix C are listed in the following table.

Table 6.1  Techniques included in Appendix C.

<table>
<thead>
<tr>
<th>Technique/ Tutorial/ Diagram</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagram 6.1</td>
<td>The four key components of the Namadgi Technique.</td>
</tr>
<tr>
<td>Diagram 6.2</td>
<td>The “6-step, many step” process for systemic analysis, illustrated as a work system.</td>
</tr>
<tr>
<td>Diagram 6.3</td>
<td>The “5-step, many step” process for systemic and holistic design, illustrated as a work system.</td>
</tr>
<tr>
<td>Tutorial 1</td>
<td>Drawing a Work System – the basics of drawing and naming a work system.</td>
</tr>
<tr>
<td>Tutorial 2</td>
<td>Designing a Work System – to begin to design your own work system.</td>
</tr>
<tr>
<td>Tutorial 3</td>
<td>Developing a Systemic Appreciation of Your Work.</td>
</tr>
<tr>
<td>Tutorial 4</td>
<td>Designing a Work System to Support a Strategic Intervention.</td>
</tr>
<tr>
<td>Diagram 6.5</td>
<td>The Iceberg Analysis Technique.</td>
</tr>
<tr>
<td>Diagram 6.6</td>
<td>Deconstructing the Iceberg Analysis Technique.</td>
</tr>
<tr>
<td>Diagram 6.7</td>
<td>A summary diagram of techniques for visualising complex adaptive systems across the organisation/ community interface.</td>
</tr>
<tr>
<td>Technique 6.1</td>
<td>Rich Contextual Pictures.</td>
</tr>
<tr>
<td>Technique 6.2</td>
<td>24 useful Ideas.</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>Complete Table of Contents from the current version of the journeyman’s toolkit.</td>
</tr>
</tbody>
</table>
Reasons for inclusion in Appendix C

The diagrams, techniques, processes, illustrations, narrative and other forms of displaying information that are included in Appendix C are representative of the wealth of knowledge and practical ideas that have emerged through my research and that now reside in the journeyman’s toolkit. The seven diagrams, four tutorials and two techniques in combination cover the essential approaches and tools that managers and business systems analysts can apply to gain a systemic understanding of complex problem domains and to initiate holistic approaches to the design of effective work systems in complex organisational and socio-economic environments.

The significant factor and/or individual reason for including each diagram, tutorial and or technique is addressed below.

- Diagram 6.1 illustrates the four key components of the Namadgi Technique and is used to provide managers and staff with a visual framework of the overall technique as outlined in Chapter 4.

- Diagrams 6.2 and 6.3 are enlarged illustrations from Diagram 6.1, showing the respective detail of analysis as a work system and design as a work system. Both diagrams are also made available as A3 desk guides in the workplace.

- Diagram 6.4 shows key aspects of the work systems mapping techniques, including the relationships between work systems, sub-systems, and sub-systems viewed as component diagrams.

- Tutorial 1 introduces the user to the basics of drawing and naming a work system. These basics are essential to gaining a successful understanding of the work system mapping technique.

- Tutorial 2 introduces the user to a step by step process for designing a work system. It draws on the “five-step, many step” design approach and also
provides the user with further techniques and information expressed in the form of a more detailed series of sub-sub-systems.

- Tutorial 3 encourages the user to explore a number of different techniques and perspectives in developing a systemic appreciation of the management and organisation of work, including local workspace and workplace.

- Tutorial 4 encourages a relatively rapid systemic analysis of problem situations and the subsequent holistic design of a systemic intervention using a range of visual analysis and design techniques. It is particularly designed for use by managers in succinctly and effectively presenting to senior management aspects of complex problem domains and ideas for strategic interventions.

- Diagram 6.5 illustrates aspects of the Iceberg Analysis technique which is a key practical critical systems thinking technique for encouraging managers and staff to explore deep systemic analyses of complex problem situations and problem domains.

- Diagram 6.6 is called “Deconstructing the Iceberg Analysis technique” to provide managers and staff with insights and visual reminders about the ideas informing aspects of the Iceberg Analysis technique.

- Diagram 6.7 provides a visual summary of the applied systems mapping techniques used to explore and map aspects of complex adaptive systems across the organisational/community interface. This diagram is also documented in Appendix B.

- Technique 6.1 contains practical information and ideas that can be used in creating rich contextual pictures for systemic analysis and the presentation of complex issues and ideas. In particular the technique includes a table that summaries the key types of information that can be displayed using the various linear and non-linear modeling techniques.
Technique 6.2 is a one-page summary and memory jogger of twenty four ideas and techniques that I find useful in my work as a social ecologist and manager responsible for effective socio-technical systemic analysis and design in a large public sector organisation.

The final item included in Appendix C is the complete Table of Contents from the current (at June 2005) prototype version of the journeyman’s toolkit. It is included to present the reader with an initial understanding of the overall scope of the journeyman’s toolkit.

**Reflection**

The major outcome of five years of focussed action research has for me been the emergence and design of the Namadgi Technique, which comprises a suite of approaches and practical techniques for the analysis and design of complex work systems.

I have used the name “the Namadgi technique” to bring together the various sets of practical techniques, approaches and thinking that have come from my research and practice as a social ecologist working in a large public sector organisation. I use the terms “emergence” and “design’ because that is exactly how I have experienced the gradual unfolding over time of the many intricate layers of knowledge and understanding that comprise the body of knowledge and applied theory I call the Namadgi Technique. There are many aspects of the technique that I have intentionally and deliberately designed. There are other aspects that have emerged as I applied the design in the real world. Experience, understanding, knowledge, both tacit and explicit, now reside in the intellectual construct and the real-world artefact that I think of as the Namadgi Technique. By definition, much of my experience and understanding and knowledge remains tacit, some of which will hopefully however have also found its way into my narrative and discourse. The explicit knowledge I have tried to shape and describe in the various artefacts that I have designed and created and tested for use by others. These artefacts include models and diagrams,
research papers, training notes, workshop booklets, desk guides, documented processes, PowerPoint presentations and overhead slides, as well, of course, as this thesis narrative and the booklet of practical techniques that I am preparing.

The Namadgi Technique grows, evolves and is adapted as I learn and practice my professional skills as a systems thinker, business systems analyst, researcher, educator, leader and social ecologist working with others to make meaning from some of the complexity and chaos confronting us in our working world and our daily lives.
Chapter 7. Summary of Key Findings and Outcomes

Purpose

The purpose of this chapter is to provide a summary of my key research findings and outcomes.

Introduction

My critical learning heuristic and action research program conducted over the last seven years has produced a range of significant findings and outcomes. Many of these findings and outcomes have been iterative in their development and the learning from them has been cumulative, often experiential, and always reflective. In this regard, this summary is intended to be indicative of my evolving body of knowledge and expertise and of my cumulative findings and learning, rather than an exhaustive or detailed list.

Focusing Research Question

The original idea for my research was based on a problem domain that I continuously observed in the workplace, namely:

Systems theories and methods, when introduced into large organisations often do not appear to be readily accessible, easily understandable nor immediately relevant to many operational managers and staff. The pressures of time, need for quick results, limited resources and office politic often mean people negate a
systemic approach to design and problem solving in favour of the short-term “quick fix”.

The research question I felt compelled to address was:

How could the application of systems thinking methods and techniques be better introduced into the workplace and managers and staff encouraged to use such techniques?

**Key Research Findings**

Within the context of my research and the organisation in which I work:

**Finding 1** There are effective ways to introduce systems thinking methods and techniques into the workplace, based on applied adult learning principles and a social ecology approach that encourages personal creativity and critical thinking combined with practical approaches and techniques for the analysis and design of complex work systems.

Two Early Findings from Action Research Cycle 1:

**Finding 2** That without an encouraging and supportive post-training work environment, people were going to have a very difficult time retaining and practicing their new knowledge and skill sets.

**Finding 3** That the formal systems thinking methods and techniques were not enough. As they were currently packaged and presented from an academic perspective, the formal techniques such as soft systems methodology, viable systems method, learning systems and critical systems thinking were not readily applicable nor fully useful in approaching the complex organisational and situational problem domains that the business systems analysts were expected to tackle. People were still going to need more readily accessible and very practical
techniques that could be applied in the workplace to encourage systemic analysis and design.

Cumulative Findings from Action Research Cycles 2, 3, 4

Finding 4 There are practical techniques, informed by systems and complexity theories, that managers and staff can use to gain systemic analytical insights and understanding about the design, organisation, management and evaluation of productive work systems. These sets of practical techniques are designed to complement, not replace, the existing professional skills, knowledge and tools that managers and staff already have.

Finding 5 There are effective ways of skilling people to use these techniques, based on a creative, challenging and intellectually stimulating mix of propositional, technical and experiential learning.

Finding 6 There are effective ways to encourage managers and staff to use such techniques, particularly through the encouragement and nurturing of communities of practice and the use of skillfully designed desk guides as well as well-written and attractively designed documentation that is readable, accessible, applicable and useful in the workplace.

Finding 7 I could bring aspects of social ecology and systems thinking together in the workplace in practical ways for the benefit of other people engaged in the analysis and design of complex work systems to enhance and improve organisational productivity and the successful achievement of planned business outcomes.

Finding 8 My concurrent personal enquiry research and development as an individual and a professional social ecologist was an integral and vital component of my overall research, and that without this ongoing personal enquiry and development I may not have persevered with the research over the last seven years, nor had the insight and confidence to shape my learning and findings into the evolving Namadgi Technique.
Finding 9  In social ecology research terms, this emergence and shaping of the Namadgi Technique, represents a significant research milestone and achievement as I believe it now addresses a fundamental gap in the current suite of formal systems thinking techniques and provides practical techniques that could be applied in a wide range of disciplines and fields of enquiry including management theory, organisational theory, socio-technical systems design, productivity improvement, community development, strategic planning and management, the development of applied information technology applications to the evolving and changing nature of work.

Finding 10  I believe that the practical techniques and approaches I have researched and developed during the last seven years in addressing the research question can provide managers and staff with effective ways to learn about, access and readily apply systems thinking to some of the complex problem domains that confront them in the modern public sector work environment.

Finding 11  I have been able to express the praxis of theory and practice through the iterative development of my journeyman’s toolkit that contains many of my detailed findings, practical techniques and that is deeply informed by both theory and by my own learning and experience.

Finding 12  In conducting this critical learning heuristic and action research approach I have been able to combine a process of subjective and qualitative action research with the more expected ATO management practice of objective and quantitative project management. At the meta-level, I have also been purposefully and consciously able to take a critical learning heuristic approach and to weave into this combination of heuristic research and project management a personal component of creative design that gave my long-term research a cohesion and demonstrable purpose and kept me intrigued and motivated for so long.

Finding 13  The effective conduct of long-term heuristic and action research in large public sector organisations requires a strong sense of self, personal identity, intuition and personal judgement. In addition to the application
of a strong project management focus and the use of prototyping approaches, I found that practice of situational leadership is the most closely aligned to the principles of critical systems thinking and the associated desire to incorporate pluralistic and inclusive management practices.

**Finding 14** The heuristic and creative design has continued during the 6th research phase of writing the narrative, and I believe that the adoption and adaptation of Laurel Richardson’s reflective writing approach has proved, for me, to be a very good technique for writing up seven years worth of intense social ecology thinking, practice and research.

**Key Research Outcomes**

**Outcome 1** In organisational terms, the major outcome from my research has been the emergence and shaping of the Namadgi Technique which comprises:

- Work Systems Mapping Technique: A new practical technique for visualising and mapping work systems.

- Interface Analysis and Design Techniques. A suite of techniques for analysing and creating effective work systems across the organisational/community interface.

- The Iceberg Analysis Technique: An enhancement and adaptation of an existing technique for encouraging people to undertake a systemic and holistic exploration of a complex problem.

- The 6-Step, Many Step Analysis Approach: A new practical approach for the systemic analysis of complex work systems.
The 5-Step, Many Step Design Approach: A new practical approach for the systemic design of work systems that need to function effectively in complex work environments.

A complementary set of linear and non-linear techniques that is equally applicable in the analysis and in the design of complex work systems.

Accessible and understandable diagrams and documentation for use by managers and staff in applying these techniques in the workplace.

The Namadgi Technique grows, evolves and is adapted as I learn and practice my professional skills as a systems thinker, business systems analyst, researcher, educator, leader and social ecologist working with others to make meaning from some of the complexity and chaos confronting us in our working world and our daily lives.

In addition to these practical techniques, there have also been several key insights that I have developed into visual models and practical approaches to complex issues and that are now in use in the ATO. These insights include:

- A model of a social ecology enquiry represented as a system in dynamic relationship with critical systems thinking represented as a nested system;

- A model of a learning journey represented as a work system, comprising sub-systems of leadership, critical thinking, learning and developing, and analysis and design;

- A model of an organisation represented as a complex adaptive systems and illustrating various key features and characteristics of viable systems methodology, soft systems methodology, open systems theory, work systems, organisational and management behaviours and practices, requisite variety across the organisational-environment interface, fuzzy logic, complexity theory, complex adaptive system theory and behaviour;
- A diagram of an organisation and its immediate environment that I use as an accelerated learning tool when introducing managers and staff to aspects of systems and complexity theory;

- A model of a problem domain represented as a complex adaptive system;

- the following heuristic comprising three focussing questions:

  1. **Is it accessible?** (in language, vocabulary in use, familiar idea or shape or symbol etc);
  2. **Is it readily available?** Will it be readily available in the workplace? (in a book, document, desk guide or electronic file that people can quickly locate/ find, see/ read, and reproduce);
  3. **In the work and workplace context, is it useable and/ or readily applicable by itself?**

The development of this heuristic became an important artefact, one that focussed my thinking and gave me confidence as I moved closer to being able to select, specify and/ or design the initial suite of practical techniques for use in the analysis and design of complex work systems. I now use this form of heuristic approach in all my design work by thinking about the user and/ or reader and continually asking myself these questions as I shape and design an artefact. I use a similar heuristic at a higher level of resolution whenever I write intelligence or diagnostic reports, or document the outcomes of action research in the office.

**Outcome 2** A range of training programmes and material that can be readily adapted to the appropriate context and circumstance for skilling managers and staff in aspects of analytical, critical and systemic thinking.

**Outcome 3** A number of internal ATO publications including:

- Training course books;
- Desk guides;
➢ Research papers;
➢ Booklets on practical techniques that can be used in the workplace.

**Outcome 4** Refereed, published conference papers:


**Outcome 5** Other non-refereed conference papers and presentations.

**Outcome 6** Managers and staff skilled in the use of these techniques and who are applying their skills to the enhancement of effective and productive work systems throughout areas of the ATO.

**Outcome 7** A prototype booklet of the Namadgi Technique (a journeyman’s toolkit).
Outcome 8  My personal learning and greater understanding of qualitative social research methods and approaches, as well as a far greater understanding of systems mapping, systems analysis, systems design and the design of effective management and work systems in organisations.

Outcome 9  A personal sense of satisfaction and achievement in having led, managed, designed and conducted nearly seven years of significant, innovative, original and creative action research to develop practical techniques for the analysis and design of complex work systems.

Outcome 10  A personal sense of satisfaction and achievement in being able to usefully and productively practice as a social ecologist for the benefit of others in a highly challenging, complex and difficult organisational environment.

Outcome 11  A personal sense of satisfaction, achievement, wonder and pride at having completed post-graduate research in Social Ecology.

Outcome 12  A number of emergent ideas and proposals for further research and exploration, including:

- Developing the prototype booklet into a more substantial and publishable book of the application of these systemic approaches and practical techniques in five key management and decision-making areas:

  - The analysis, design, development and evaluation of public policy in health, education, welfare, ecology, environment and natural resource management, and rural and urban development;
  - Organisation design and management practices;
  - The analysis, design, development, testing and implementation of Information Technology business systems applications;
  - Conducting qualitative social research and social ecology enquiry;
  - Enhancing individual and organisational strategic and business intelligence capabilities.
In addition to a generic explanation of the Namadgi Technique the book would address specific case studies and examples for each of the five key focus areas.

The development of visual software to support the use of work systems mapping and design by managers and business systems analysts in the workplace. Such software would not only considerably enhance the ease of developing systemic appreciations and designs, it would add aspects of rigour and critical thinking to the systems modelling activities as well as also greatly encourage a computer-literate work force to use systemic and holistic approaches as part of their everyday normal suite of productivity improvement and problem solving tools and approaches.

The development of a model(s) displaying an organisation and its business and social environment as a complex adaptive ecosystem. I believe that such a visual model would have many significant applications in organisational life, including scenario planning, environment scanning, intelligence recognition and analysis, risk identification, analysis, prioritisation and management, designing strategic research agendas, assessing, diagnosing and designing organisational capabilities, understanding client behaviours and relationships, cooperative co-design of effective and better targeted compliance strategies and performance measures, and in skilling middle and senior management in areas of systems thinking, understanding complexity and improved strategic management practices.

A new series of laminated A3-sized desk guides illustrating a range of practical approaches and techniques for application and use by managers and staff engaged in ATO compliance management, risk management and intelligence and analysis related activities.

A range of ATO management research papers, demonstrating the practical application of these techniques to contemporary organisational, revenue performance, compliance and management issues.
➢ A new series of laminated A3-sized home and office desk guides illustrating a range of useful ideas, practical approaches, and techniques for personal use by people interested in aspects of Social Ecology and Ecopsychology. Such a wide-ranging series could include guides for qualitative social research, critical heuristic research, personal development, and spiritual, physical, and well-being, sense of place and belonging, and for reminding busy men and women about taking the time and effort to “replenish at the well”.

➢ Further development of practical approaches to qualitative social research and critical heuristic research in large public sector organisations.

➢ Future papers at international conferences in 2006 and 2007 (which I am currently considering).

And finally, while I work in a corporate world of other more predominant paradigms and epistemologies, such as positivism, reductionism and objectivism, I find the constructivist paradigm to be both intellectually and spiritually liberating and a very powerful framework with which to engage others in the search for meaning and in making sense in complex human, social, and organisational problem domains. This deep personal understanding has developed over time as a direct outcome from my research, and for me it is probably one of the most important outcomes of my studies and research.
Chapter 8. Conclusion.

My research journey and this narrative are coming to an end.

The journey has been an extraordinary one, rich with discovery, friendship, joy, learning and intellectual reward. The last seven years have been an extremely challenging, creative, stimulating and in many ways exhilarating time of my life, though it has not been without the accompanying shadow side of creativity. In this context I have also experienced the isolation and “alone-ness” of leadership as well as professional self-doubt, mental and physical exhaustion, ill-health, stress, anxiety, depression, frustration and personal despair. There have been many times when I wished that I had not undertaken such a challenging area of research or set out on what was to become such a long, hazardous, and arduous journey. Nonetheless, at the time of writing, June 2005, I can look back over the seven years of postgraduate research experience and social ecology enquiry with a great sense of satisfaction, achievement and wonder.

Reason (Reason and Bradbury 2003, p.2) suggests that “a primary purpose of action research is to produce practical knowledge that is useful to people in the everyday conduct of their lives”.

In this context I believe that through my research and actions and my professional practice as a social ecologist I have made a small though significant contribution to enhancing the working lives of other men and women with whom I work.

In support of this belief and to conclude my narrative I will now briefly review the unfolding and cumulative nature of my research, learning and the interpretation of my findings since 1998.

I began my research in early 1998 with the intention of exploring and trying to find improved ways of introducing systems thinking methods and techniques into the
workplace and effective ways for encouraging managers and staff to use such techniques.

My initial explorations involved the engagement of University of Western Sydney, Centre for Systemic Development, and the formal introduction of systems thinking techniques to managers and business systems analysts involved in Project Bijou for the re-design of existing work systems. Although there was some initial success with this approach, I soon realised that the formal techniques of soft systems methodology, viable systems method, critical systems thinking and, to a lesser extent, critical learning systems had a limited applicability to the type of analysis and design work in which we were engaged.

While the techniques had limited application however, there were very real benefits from having introduced ATO managers and business systems analysts to systems thinking in this way. In two important aspects this approach was a major significant improvement on any previous attempts to introduce systems thinking into the organisation. It was important firstly because we took an educational approach, treating people as adult learners in a difficult and challenging learning situation, and giving people time to learn, to ask questions and to challenge what they were hearing from the course facilitators. It also gave them time to reflect on their own preferred ways of learning, as well as time to reflect on what they were actually learning and how this new knowledge might be applied in the workplace. This approach was substantially different from the more common organisational approach of a one or two day workshop that was typically facilitated by a management consultant expert who had no real interest in either taking time to explain theoretical concepts and the associated ontological and epistemological assumptions underpinning the theory, nor any real interest in seeing a genuine transference of learning and knowledge from facilitator to participant. In contrast to this, the model of learning presented by the University of Western Sydney, Centre for Systemic Development opened up very different possibilities for learning in the workplace.

The second important aspect of this approach was that we introduced people to a new language with which to enhance their understanding of the world and to approach the
analysis and design of complex work systems. Notions of systems and systemicity and of being systemic quickly transformed aspects of our team management and design conversations from the positivist and reductionist problem solving to ones of endless possibilities and opportunities. These opportunities were created by our individual and collective understandings of ideas and features such as open systems, feedback loops, fuzzy logic and fuzzy boundaries, viable systems, recursion, requisite variety, external environments, soft systems of human behaviour and of cultural dynamics and influences, emergence, emancipatory approaches and methodological pluralism. Equally, from our brief introduction to complexity and chaos theory came notions of adaptive systems, co-evolution, self-organisation, sensitivity to initial conditions, autopoeisis and the dynamics and unpredictable behaviours of complex adaptive systems.

From this program of learning in 1998 came a new language and vocabulary to enhance people’s existing knowledge that enabled and encouraged greater insight, subtlety, nuance, differentiation and sophistication when considering complex problem domains and wicked problems. If soft systems methodology, viable systems method and critical systems thinking were not each directly applicable in the workplace, aspects of each of these techniques, particularly combinations of aspects from each of them, certainly were useful and applicable.

The formal educational approach in 1998 was also extremely important in liberating thinking patterns and introducing new ideas about ways of knowing, ways of thinking and ways of learning. Over the following years I was able to frequently reflect on this experience and to continue to build on the insights and ideas that these ways of thinking and knowing provided me with.

There were three major early findings from Action Research Cycle 1. These initial key findings can be usefully categorised as constituting an organisational perspective, a personal research perspective and a research method perspective.

1. From an organisational perspective, through the use of new conceptual models and a new language of systems and systems thinking, we had
established a critical mass of people who now formed an embryonic community of practice in systems and complexity thinking.

2. From my personal research perspective, the pursuit of different ways of knowing and thinking soon took me on previously unimagined journeys. The creative development of my initial suite of systems mapping techniques in late 1998 and the reflective development, in David’s Book of Living and Being, of some features and principles of my personal approach to and understanding of social ecology in 1999 were both equally important to my experiential, intellectual, emotional, and spiritual growth at the time. I came to understand that the nurturing and evolution of my inner self was as important as the development and refinement of my professional expertise and persona in successfully conducting creative and original heuristic research. My joy of bushwalking and photography came together with notions of ecopsychology and sense of place and I was able to draw both explicitly and implicitly on these experiences and understanding as I conducted my research in the public sector workplace. Personal resilience, self-reliance, judgement, determination, courage and the inner peace needed for bushwalking by myself in Namadgi National Park and Tidbinbilla Nature Reserve, also informed and shaped my understanding of the type of situational leadership skills and abilities that I actually required to conduct critical heuristic and action research over long periods of time and across a number of different Australian states and cities in a generally risk averse, conservative and hierarchical large public sector organisation.

3. From a research method perspective, I realised that in combining the emancipatory and exploratory nature of heuristic research with the organisational expectation and practice of project management, demonstrable concrete outcomes, and prototyping, I gained both professional management credibility as well as a sense of trust and respect from the organisation that in turn enabled me to take more holistic and creative approach to my research and work.
All three of these perspectives explicitly contributed to an integral understanding of myself in my contextual environment that, through later reflection, I came to see as an essential form of cumulative learning and intellectual, emotional and professional preparation for undertaking Action Research Cycles 2, 3 and 4 over the next three years.

The ATO Jacaranda Project in late 1999 refocussed my thinking on the original research question and I began two concurrent yet interrelated lines of research and enquiry. The first was the design of practical techniques for use in the analysis and design of complex work systems, and the second was into the nature of the training and appropriate documentation with which to introduce these techniques in such a way that they could make the transition from training into a form of accessible and useful intellectual capital in the workplace.

Action Research Cycle 2 during late 1999 to late 2000 saw the exploration and development of an initial set of practical techniques and an associated training program, while Action Research Cycle 3 in 2001 provided opportunities for the refinement of the techniques and training, as well as a more thoughtful and determined focus on documentation and artefacts suitable for the workplace.

I believe that my key findings from Action Research Cycles 2 and 3 now make a significant and profound contribution to the complementary fields of systems thinking, adult learning, leadership and management, and the praxis of social ecology and qualitative social research. These key findings are that:

- There are practical techniques, informed by systems and complexity theories, that managers and staff can use to gain systemic analytical insights and understanding about the design, organisation, management and evaluation of productive work systems. These sets of practical techniques are designed to complement, not replace, the existing professional skills, knowledge and tools that managers and staff already have.
There are effective ways of skilling people to use these techniques, based on a creative, challenging and intellectually stimulating mix of propositional, technical and experiential learning.

There are effective ways to encourage managers and staff to use such techniques, particularly through the encouragement and nurturing of communities of practice and the use of skillfully designed desk guides as well as well-written and attractively designed documentation that is readable, accessible, applicable and useful in the workplace.

Equally important were the interrelated and co-evolving key outcomes from this research, which included:

- **Work Systems Mapping Technique.** A new practical technique for visualising and mapping work systems.

- **Interface Analysis and Design Techniques.** A suite of techniques for analysing and creating effective work systems across the organisational/community interface.

- **The Iceberg Analysis Technique.** An enhancement and adaptation of an existing technique for encouraging people to undertake a systemic and holistic exploration of a complex problem.

- **The 6-Step, Many Step Analysis Approach.** A new practical approach for the systemic analysis of complex work systems.

- **The 5-Step, Many Step Design Approach.** A new practical approach for the systemic design of work systems that need to function effectively in complex work environments.

- Accessible and understandable diagrams and documentation for use by managers and staff in applying these techniques in the workplace.
I have called this collective set of practical techniques and approaches the Namadgi Technique, which now appear in my prototype book with the working title: *The Namadgi Technique: a Journeyman's Toolkit of Practical Approaches and Techniques for use in the Analysis and Design of Complex work Systems.*

In mid-October 2001, I turned my mind again to the idea of viewing an organisation as a complex adaptive system. A number of intriguing questions were beginning a sort of slowly revolving, gently forming, swirling motion in my head. What might this mean for the analysis and design of work systems? What practical techniques might I use? What were the features of a complex adaptive system that would be useful to consider in the analysis and design of work systems? How might I demonstrate and explain the idea of an organisation as a complex adaptive system to others?

These questions led me to initiate and conduct my 4th action research cycle between October 2001 and September 2002, so that I might pursue this area of intrigue. I resumed my research and work in the spirit of finding better, more effective and more practical ways for people to design robust and sustainable work systems in the public sector.

My focussing research question was:

- “Could I develop models of organisations as complex adaptive systems that would help others to visualise and understand these concepts more easily?”

This led to the development of two new models, each one illustrating a different perspective of organisations and communities as complex adaptive systems. I developed prototypes of both these models and now use them to engage many people in a series of both theoretical and practical design conversations, particularly as an effective way of introducing people to notions of complexity in our daily lives and organisations and communities as complex adaptive systems during the five-day training program.
Towards the end of October 2002, I began the complicated task of writing this narrative of my research. At that time I thought I had finished my practical research, however, the combination of the reflective “writing as enquiry” technique, my ever-enquiring mind, and the fact that, during the period from October 2002 to April 2005, I would conduct the training program another twelve times for a total of two hundred and thirty ATO people, led me to use this extended time as the fifth phase of my research in which I not only wrote the narrative, but also wrote and developed the draft book of the Namadgi Technique.

The draft book and the Namadgi Technique emerged in response to my research, thinking and activities to answer the following focussing questions:

- In regard to a booklet specifically for myself, what is useful to me in my practice as a social ecologist, a facilitator and a management consultant?”
- “What may be useful to me in other organisations and work contexts?”
- “What would I want in booklet specifically for use by me?”
- “How would I want to arrange the information and which specific techniques, information sets and diagrams would I include in my booklet?
- “What did I want to capture from my learning over the last five years?”

Between October 2002 and July 2004, the process of concurrently writing the narrative and answering these questions led to the iterative development of three prototype versions of my book.

In June & July 2003, I developed the first prototype of the book of practical techniques as a form of management text that others could use for ready reference in the workplace. However, the book as I had first envisioned it proved to be too ambitious and my initial structure proved to be cumbersome and an unsuccessful way of organising and accessing the information. Learning from this experience, I developed the second prototype in September 2003, as a smaller book, one which I personally trialled in the workplace and during many analysis activities and training workshops conducted throughout late 2003 and early 2004.
Reflection, learning and experience now gave me greater insight into what I actually wanted and I decided to focus on meeting my own needs rather writing the book as a general management text. What I needed, I decided, was a journeyman’s toolkit, one that could include aspects and practical applications of social ecology, ecopsychology, systems thinking, complexity and chaos theory, socio-technical systems design and organisations as complex adaptive systems. I also adopted a form for the book modelled on the structure of an anthology of poetry, with various techniques and approaches arranged around the most common activities in which I was often engaged in my professional practice and work. In this way between late April and early June 2004, I developed the third prototype as a journeyman’s toolkit, which I am now using in the workplace and from which I am planning to shape a final book for professional publication.

Revisiting the Literature

Let me briefly review these techniques and approaches in relation to some of the systems theory and complexity theory literature.

Drawing on Bertalanffy’s open systems theory and Morgan’s (1997) insights into organisations as open systems, the concept of work systems has its origins in Flood and Jackson’s (1991, p.6) visualisation of a system and in Churchman’s nine conditions of systems teleology (Flood 1999, p.63). I have designed the work system mapping technique to incorporate the many basic features of a system such as purpose, boundary, environment, inputs, outputs, sub-systems and feedback. I have also used a simple though significant enhancement to Flood and Jackson’s (1991) model by placing the sub-systems in dynamic interrelationships with one another, rather than the sequential linear relationships between sub-systems as suggested in Flood & Jackson’s model. My fundamental premise here is that all the sub-systems (that is, human activity systems) must logically be in dynamic interrelationship all the time. This is not to say that the activities are being undertaken within the organisation all the time, they are only operating when
required. However, by definition, the whole work system can only be fully effective when all the component elements and sub-systems are operating together for the benefit of the determined (that is, intentionally designed) and purposeful whole. In this regard, each sub-system is also an open system at its own level of resolution, drawing energy and resources from its contextual environment and delivering outcomes, outputs and feedback back into its environment. From the perspective of each sub-system, all the other dynamically interrelated sub-systems are external to it and therefore considered to be part of the sub-system’s external environment. Hence the whole system is an open system and the sub-systems are equally open systems, and the same can then be said of the relevant sub-sub-systems if any are present in a specific map. Each view of system, sub-system, sub-sub-system presents a different level of resolution and a slightly different environment.

The work systems are systems of transformation, that is, they are used not only to illustrate organisational capability and management practices, but also to illustrate aspects of organisational productivity by highlighting the relationship between inputs, transformation and outputs. The technique also goes further than Flood and Jackson’s (1991) model by enabling the illustration of the relationships between organisational intent, the purpose of the designed work system, inputs, the key elements in dynamic relationship, sub-systems as transformative activities, outputs and outcomes. As an analysis tool it can also be used to illustrate aspects of emergent properties and behaviours that are identified through the systemic analysis activity.

In practical terms, I differentiate between outputs and outcomes by describing outputs as the purposefully designed concrete tangible artefacts and products that result from the transformative process, while the outcomes are the behavioural practices and activities that can now occur through the use and application of the artefacts and products.

The work system mapping technique also incorporates and brings together aspects of Checkland’s (1990) soft systems and Stafford Beer’s (1985) viable systems. Work systems, defined as the purposeful and intentional combination of people, processes, resources, technologies, intellectual capital and place to achieve planned business outcomes, are soft systems. They are human activity systems and as such follow the
naming conventions proposed by Wilson (1990, p.27) where a work system is described in the present tense and uses the grammatical rule of a verb being the first word in the name. The format for the name is then simply “verb”, expressed in present tense, qualified by a noun or phrase. This grammatical discipline, together a knowledge of the basic features of a system and an understanding of the direct relationship between system purpose and designed outcome, plus the application of Brookfield’s (1987, pp.7-9) four key features of critical thinking, provides an accessible and understandable framework of intellectual and critical rigour that managers can readily use in the workplace.

The power of the work system technique is that in addition to incorporating soft systems concepts, the technique can also draw on the six systems in Beer’s viable systems model. By designing and naming a work system as “leading and managing the XXX capability” (for example, a work system entitled “leading and managing the intelligence and risk analysis capability”), I can then also design sub-systems that address issues of identity, policy, intelligence, management and control, coordination, operations, and internal communication audits. In this way the work systems mapping technique can be applied to the mapping of existing organisational capabilities (including key meaning-making and decision-making capabilities) and also to the proposed designs of potential enhancements to organisational and management capabilities.

Further, when the work systems mapping technique is combined with the interface analysis technique, to produce a model of an organisation and its work systems in dynamic relationship with the community and environment, I can also demonstrate the notion of Ashby’s Law of Requisite Variety (Flood & Jackson 1991, p.90) across the organisation/community interface.

As well as enabling the visualisation of Beer’s viable systems as human activity systems, this combination of work system and interface technique readily facilities the visual modelling of Hames & Oka’s (1997) strategic navigation concepts and principles (for example, niche, ambition, intent, contextual environment, internal capability, alternate futures), as well as the visual representation of corporate strategy and strategic intervention by the organisation into its external environment. For
example, the technique can be used to illustrate an organisation’s Statement of Strategic Intent (or equivalent, for example, mission statement, vision) as a means of delineating and defining the interface as a boundary between the organisation and its contextual environment, its market and/ or its broader contextual community. Similarly, the technique can be used to illustrate the intended impact of a policy or strategy designed to modify existing compliance behaviours, market share, and/ or consumer behaviour, in the external environment. By drawing separate interface diagrams at different levels of focus and resolution (for example, organisation, division, section, team levels) managers can then also explore and demonstrate Beer’s (1995) notions of recursion (the whole is in the part) in their analysis and design of work systems and organisational capabilities.

The combination of work system and interface techniques also enables the mapping of organisations as complex adaptive systems. Essential features of Beer’s (1995) cybernetic insights and concerns about organisations as viable systems, Hames and Callanan’s (1997) organisations as appreciative ecologies, Merry’s (1995) exploration of social systems as complex adaptive systems, Morgan’s (1997) organisations as open systems, and Hames and Oka’s (1997) principles of strategic navigation can be readily illustrated across the interface. Thus, abstract concepts can be readily visualised by managers in the workplace and the work systems and interface diagrams can then be used to facilitate and stimulate well-informed strategic conversations.

The mapping of organisation/ community interfaces as straight lines is not meant to imply a rigid, fixed boundary with an inherent logic that considers all items to be either inside the organisation or outside the organisation in the environment. In addition to a formal logic of ‘either/ or’, work systems mapping and interface analysis readily accommodate the application of fuzzy logic. Woog et al (1998, p.108) propose that:

“One of the major contributing strengths of a fuzzy logic approach to social inquiry is its ability to cope with multiple constructions of reality….Fuzzy logic allows social realities to be what they are: pluralistic, dynamic and ambiguous”.

276
The application of fuzzy logic in the setting of system boundaries allows for fuzzy, permeable boundaries to be considered for both work systems and the organisational/community interface. Across the fuzzy interface can then be diagrammatically demonstrated some of the many features of complex adaptive systems including non-linear dynamic interrelationships, feedback loops, co-adaption, co-evolution, sensitivity to initial conditions, self organisation, and aspects of organisational autopoeisis (Merry 1995; Stacey 1996). These fuzzy boundaries can also be used to illustrate fuzzy information sets and relationships, which is extremely useful in modelling issues of inclusion and exclusion, and those truly contentious and problematic organisational issues when, for purposes of gaining shared understanding and moving on, any item, activity, person etc can be considered, through the application of fuzzy logic, to be simultaneously included and excluded from the information set.

Such organisation/community interface models can also be used to show aspects of complex problem domains and the presence and location, on both sides of the interface, of paradox, ambiguity, contradiction, uncertainty, and emergence. In terms of practical application, the combined work systems mapping and interface analysis technique readily enables the analysis and diagrammatic exploration and modelling of Stacey’s (1996, p.47) notions of legitimate and shadow sub-systems, while the many systems, sub-systems and their dynamic co-evolving relationships and non-linear feedback networks can be mapped across the interface to create an enhanced understanding of the organisation and its environment forming “a highly complex whole” (ibid, p.47).

The further combination of an enhanced development (see “Technique 6.1: Rich Contextual Pictures” in this thesis Appendix C, pp. C-69 to C-78) of Checkland’s rich picture technique with work systems maps and interface analysis techniques provides a practical artistic canvas and modelling technique capable of mapping organisations and their environments as complex adaptive systems. The act of using such techniques creates a learning environment where fuzzy logic and creativity can be used to explore social systems and a process of enquiry engaged in that is

The 6-Step, Many Step Analysis Approach and the 5-Step, Many Step Design Approach both incorporate heuristic enquiry and encourage holistic explorations of complex problem domains and the design of systemic interventions.

Embodying a spirit of plurality and inclusion the analysis and design approaches provide managers with the option of using them in a linear process fashion and a more creative non-linear way. By modelling the analysis and design approaches as work systems with sub-systems that are numbered and that can be followed sequentially I have been able to build in aspects of both intellectual rigour and creativity, while the non-linear dynamic interrelationships between all the sub-systems means that a manager using these approaches can move freely between all the analysis or design phases without being restricted to having to follow a strictly linear sequence. It is a matter of choice, personal preference and contextual need. I believe that this overcomes some of the difficulties people have experienced in using Checkland’s soft systems method which in essence is represented as a linear process (Checkland and Scholes 1990, p.27) and other traditional socio-technical work design approaches which require the analysis phase to be completed before commencing the design phase.

This explicit heuristic design also encourages an effective adult learning environment with features such as reflective practices, experiential and double-loop learning, as well as the opportunity for emergent understanding and the collaborative making of meaning about complex issues. The systemic appreciation and emergent understanding and shared meaning can then be captured in a range of artefacts and documents that in turn contribute to ongoing organisational learning and knowledge management.

Similarly to the soft systems and viable systems methods, these analysis and design approaches enable the user to grapple with the messiness of design and the incompleteness of systemic analysis, while at the same time using the explicit
heuristic action research method to develop a profound understanding of both the analysis and design situations through the iterative exploration of visual analysis techniques, design prototypes, and collaborative design conversations.

The work system design of the 6-Step, Many Step Analysis Approach and the 5-Step, Many Step Design Approach also incorporates Midgley’s Critical Systems Thinking phases of Contextual Awareness, Methodological Pluralism and Implementation (Bawden, McKenzie and Packham 1998), and to a large extent the spirit of Flood & Jackson’s (1991) Total Systems Intervention approach with their three phases of Creativity, Choice and Implementation.

Further, the focussing questions and practical deliverables that I have included in each sub-system and sub-sub-system, particularly in the 5-Step, Many Step Design Approach, draw on Ulrich’s 12 Questions relating to ethical considerations and critical judgement about boundaries, inclusion, exclusion, purpose, intent, ownership etc. (Midgley 2000, p.141), as well as Brookfield’s (1987) critical thinking techniques, and other questions informed by Hames and Oka’s (1997) Strategic Navigation.

Overall, the 6-Step, Many Step Analysis Approach and the 5-Step, Many Step Design Approach are the result of my attempts to synthesise knowledge from the literature as a means of finding practical approaches for encouraging social ecology enquiry and systems thinking in an otherwise predominantly positivist and reductionist thinking public sector work environment.

The significance of all these techniques is that, while drawing on open systems theory, complexity and chaos theory, and various systems thinking techniques (particularly soft systems methodology, viable systems method and critical systems thinking), as well as other organisational, management and adult learning theory, they were specifically designed as practical holistic and systemic approaches for the analysis of complex work systems and the design of effective organisational, management and work systems in complex environments.
The techniques themselves are informed by theory, written in accessible and understandable language, and supported by practical systemic, creative and innovative approaches as well as step-by-step process for those who prefer a more systematic approach. In addition, the techniques can be used as readily by an individual as by a group and the visual nature of the resultant recognisable diagrams enables others to be introduced to complex ideas and information sets and to then engage in meaningful and well-informed discussion about the changing nature of work and proposed changes to the current organisation and management of work.

Collectively, the Namadgi Technique is my attempt to bring these many ideas, insights and theories together in a practical way for the benefit of managers and staff in large public sector organisations. The 6-Step, Many Step Analysis Approach and the 5-Step, Many Step Design Approach provide practical and understandable frameworks in which managers and staff can then apply the various visual mapping and analysis techniques such as work systems, interface analysis, rich contextual pictures, as well as a range of other linear and non-linear analysis techniques.

The Namadgi Technique is by no means perfect nor is it a complete recipe for addressing and understanding complex problem domains. In terms of the broad ongoing discourse about systems thinking and organisations as complex adaptive systems I have deliberately shaped these techniques and approaches to move well away from Flood and Jackson’s (1991) notions of a system of systems methodologies and their pursuit of systems thinking as a management science. Rather, I have positioned my work closer to qualitative social research and social ecology enquiry, within a constructivist paradigm and contextual relativist ontology.

Drawing firmly on Bawden’s (1998) critical learning system, I have intentionally designed and positioned the Namadgi Technique away from a form of objective systems science and closer to the liberal and visual arts of creative writing, theatre and stagecraft, poetry, drawing, poster design, illustration, photography and collage, as a deliberate attempt to encourage people using the techniques to be creative and to explore not just the organisational problem domains, but also their own sense of self and their own learning needs. Emerging from heuristic enquiry and action research, the technique has drawn on both academic theory and contextual practice in pursuit
of encouraging creative and systemic approaches to problem solving and productivity improvement. In this regard the Namadgi Technique is very much influenced by my background in social ecology as a multi-disciplined form of enquiry and by a personal desire to create practical techniques and learning environments in the workplace where, in using these techniques and approaches, people are also encouraged to grow and develop, to “learn within the unknowable” (Flood 1999, p.83), and to explore joy and wonder in their everyday lives.

Further Ideas and Opportunities for Ongoing Research and Exploration

As I have mentioned in Chapter 7 Summary of Key Findings and Outcomes, there are a number of emergent ideas and proposals for further research and exploration, which have bubbled up through my reflection and writing towards the end of my research. These include:

- Undertaking PhD research and studies to more fully explore and document the theoretical frameworks underpinning the Namadgi Technique and to explore the potential integration of the Namadgi Technique with emerging theories of leadership and management in complex adaptive organisations.

- Developing the prototype booklet into a more substantial and commercially publishable book of the application of these systemic approaches and practical techniques in five key management and decision-making areas:
  - The analysis, design, development and evaluation of public policy in health, education, welfare, ecology, environment and natural resource management, and rural and urban development;
  - Organisation design and management practices;
  - The analysis, design, development, testing and implementation of Information Technology business systems applications;
- Conducting qualitative social research and social ecology enquiry;
- Enhancing individual and organisational strategic and business intelligence capabilities.

- In addition to a generic explanation of the Namadgi Technique, the book could address specific case studies and examples for each of the five key focus areas.

- The creative development of new visual software to support the use of work systems mapping and design by managers and business systems analysts in the workplace. Such software would not only considerably enhance the ease of developing systemic appreciations and designs, it would add aspects of rigour and critical thinking to the systems modelling activities as well as greatly encourage a computer-literate work force to use systemic and holistic approaches as part of their everyday normal suite of productivity improvement and problem solving tools and approaches.

- The development of a model(s) displaying an organisation and its business and social environment as a complex adaptive ecosystem. I believe that such a visual model would have many significant applications in organisational life, including scenario planning, environment scanning, intelligence recognition and analysis, risk identification, analysis, prioritisation and management, designing strategic research agendas, assessing, diagnosing and designing organisational capabilities, understanding client behaviours and relationships, cooperative co-design of effective and better targeted compliance strategies and performance measures, and in skilling middle and senior management in areas of systems thinking, understanding complexity and improved strategic management practices.

- A new series of laminated A3-sized desk guides illustrating a range of practical approaches and techniques for application and use by managers
and staff engaged in ATO compliance management, risk management and intelligence and analysis related activities.

- A range of ATO management research papers, demonstrating the practical application of these techniques to contemporary organisational, revenue performance, compliance and management issues.

- A new series of laminated A3-sized home and desk guides illustrating a range of useful ideas, practical approaches, and techniques for personal use by people interested in aspects of Social Ecology and Ecopsychology. Such a wide-ranging series could include guides for qualitative social research, critical heuristic research, personal development, and spiritual, physical, and well-being, sense of place and belonging, and for reminding busy men and women about taking the time and effort to “replenish at the well”.

- Further development of practical approaches to qualitative social research and critical heuristic research in large public sector organisations.

- Future papers at international conferences in 2006 and 2007 (which I am currently considering).

**In Conclusion**

Managers and staff in the public sector are experiencing increasing complexity in both the nature of the problems facing them and in making meaning from the vast flows of information churning through the dynamic and rapidly changing work and business environments. There is clearly a need to find ways to improve the analytical, critical and systemic thinking skills and capabilities of managers, so that they can more rapidly gain a greater depth of understanding of complex problem domains and issues and to make better informed decisions relating to strategic interventions and long-term effective and sustainable change.
I believe that the practical and visual techniques and approaches I have researched and developed during the last seven years in addressing my original research question can provide managers and staff with effective ways to learn about, access and readily apply open systems theory and systems thinking to some of the complex problem domains that confront them in the modern public sector work environment. I also believe that the practice of these techniques will also encourage greater creativity and the use of imagination as managers and staff begin to re-awaken different ways of seeing and knowing about the world in which they live and work.

The challenge facing the public sector, particularly its executive management, is to promote greater acceptance of such creative, visual and systemic ways of thinking and expression in the workplace, and to enhance the acceptance of notions of pluralism, inclusion and complementarianism within the existing organisational hierarchies and traditional management cultures.

As a direct consequence of my research and effort managers and staff working in the Australian Taxation Office in areas of strategic intelligence, knowledge management, and compliance risk management are now encouraged to use these techniques where it is appropriate to do so. In this way, my research has contributed to a small positive change in the ATO. Managers and staff can now approach the analysis of complex issues and the design of effective strategic interventions with a set of systems thinking techniques that I believe are accessible, readily useable and practical for aspects of the sort of work required of them in the ATO.

I want to conclude this thesis narrative by saying simply that the techniques I have developed are neither necessarily universal nor useful in all situations, but they do complement and enhance the current suites of professional analytical, decision-making and problem solving tools expected to be used by managers in tackling the many complex issues facing them in the modern work environment of the Australian Public Service. These techniques are now in use in the ATO and have proved particularly effective in the ongoing development of evolving strategic intelligence and knowledge management capabilities. Whether managers and staff will continue to use these techniques in the long-term remains to be seen and is definitely outside the scope of this thesis. From my personal perspective however, I am extremely
proud of the critical heuristic research that I have conducted over the last seven years, and of the leading role I have played in the creative and innovative development of new theoretical models within the field of systems thinking and in the design, development and application of new and enhanced practical techniques to support critical, analytical and systemic thinking in the workplace. I am also professionally confident that these techniques, if applied intelligently and wisely, will provide people with real opportunities for greater understanding of complex situations and problem domains and for the identification and design of strategic interventions for effective productivity improvement.

Finally, I want to simply say that I have greatly enjoyed my learning journey over the last seven years, just as I have equally enjoyed the inspiration, spirit, practice and wonder of social ecology enquiry, and that I now finish my research not only with a pang of regret and sadness, but also with an enormous sense of privilege and good fortune at having been able to undertake post-graduate research with the University of Western Sydney, School of Social Ecology and Life Long Learning.

My thanks to all those who came on the various parts of the journey with me.

This is where I stop. My narrative is finished and this particular journey concluded. A new journey is already beginning…
Bibliography


Australian Public Service Act 1999.

Australian Taxation Office Agency Agreement 2004 to 2006. Australian Taxation Office, Canberra


Bruce-Smith, D., (2000). *Methodological Pluralism in practice: the practical application of various systems methods and techniques in the analysis and design of


Woog, Robert, Dr., Presentation on Complexity Theory for the Australian Taxation Office, April 1999. Centre for Systemic Development, University of Western Sydney, Hawkesbury.


www.uws.edu.au/csd/credo.shtml (15/04/02)

www.uws.edu.au.csd/paradigm.shtml (14/04/02)

www.uws.edu.au/serg/researchdomian.htm (29/01/02)
APPENDICES FOR
“EXPLORING AND DESIGNING PRACTICAL
TECHNIQUES FOR THE ANALYSIS AND DESIGN OF
COMPLEX WORK SYSTEMS:
A JOURNEYMAN’S STORY”

by

David A. Bruce-Smith

APPENDIX A:

EXTRACT FROM “DAVID’S BOOK OF LIVING
AND BEING”.

APPENDIX B:

AN INTRODUCTION TO SYSTEMS MAPPING

APPENDIX C:

EXTRACT FROM THE NAMADGI TECHNIQUE:
A JOURNEYMAN’S TOOLKIT”

© David Bruce-Smith, 2005.
APPENDICES FOR
“EXPLORING AND DESIGNING PRACTICAL
TECHNIQUES FOR THE ANALYSIS AND DESIGN OF
COMPLEX WORK SYSTEMS:
A JOURNEYMAN’S STORY”

by

David A. Bruce-Smith

APPENDIX A:

EXTRACT FROM “DAVID’S BOOK OF LIVING
AND BEING”.

©David Bruce-Smith, 2005.
DAVID’S BOOK OF LIVING AND BEING

A Guide to moving across the landscapes of my life.

David Bruce-Smith
August, 1999.
This book has been designed as a form of personal journal that is part record of where I have been, and part guide on my journey through life…

I have designed it to be:
A book of living and being,
Of richness and wonder and learning,
Of thinking and creativity and inspiration, of dealing with demons and shadows and ghosts,
Of health and well-being and healing.
About this book…

During June and July of 1998, I set out to collect notes and ideas for a personal book that I wanted to put together as a sort of “self-help” reference that could help me cope with the pressures and stresses of work and my work environment. I also wanted to find space in my busy life to adequately cope with the many roles I found myself performing. Husband, father, friend, manager, designer of work systems, public servant, social ecologist, business systems analyst, researcher, individual… well, anyway you get the idea. I wanted something that was useful and practical and that actually worked for me as I muddled my way towards middle age and through the last eighteen months of the twentieth century.

I had done some initial work in this area when I was studying for a Graduate Diploma of Social Ecology at the University of Western Sydney, Hawkesbury during 1993 and 1994. Part of my then area of focus was to research practical techniques for dealing with stress and for helping me cope with a busy working life. These initial techniques proved very successful and I still use a range of them today. However, as time went on, I began to seek something more than just stress management techniques.

By mid-1998, I found myself caught up both in a world of seemingly ever-increasing complexity and in an inner turmoil where I struggled in my soul to find meaning. I looked around and saw others going through similar struggles and confusion, and I initially thought that this whole domain would be worth exploring with others as a collaborative action research program. Others, I knew, were interested. Yet, as I began to think through the domain of where some of my inquiries might take me, I quickly realised that this was not a learning journey I actually wanted to embark upon with others. My search was going to be too personal.

I chose instead to take just one person into my confidence. That person, my good and close friend A., has been an extremely important part of research and my learning journey.
At that time, I was very clear about what I wanted out of my research. I wanted to explore and develop sets of practical ways to help me cope with the complexity of modern life. I thought that if I could find my own ways of coping with the sort of organisational madness in which I found myself working, then, at a later stage, I could also work with others to find common techniques for coping and making meaning. In addition to addressing complexity in the work environment, I also wanted to find practical ways to cope with the extraordinary demands of trying to juggle family, work, travel, university studies, and of finding time for a personal life. I thought that if I could successfully tackle this area of my life then perhaps I could maintain some control in my life. Perhaps also, I could and begin to find meaning and enjoyment beyond simply surviving and being an actor in someone else’s script and timetable.

In a series of rich and increasingly deeply personal conversations with A. I began to explore those aspects of life that were meaningful to me, and that made sense to somebody in my circumstances. I quickly discovered that my search was not just about coping, it was more about living and thriving in the world and rejoicing in the wonder of life. At about the same time, during August and September 1998, mainly through the pressures of work and my own inattention to my health I became ill and run-down and unable to cope effectively. Later, when I looked back at the time, I realised that I was probably physically and emotionally and intellectually exhausted. It was a difficult time for me, yet even then, I knew that it was no longer just a matter of coping it was now also one of healing and recovery.

I began to reflect on the nature of healing, and on processes for healing and for living in a state of well-being. In doing so, the nature of my research was beginning to broaden and to become enriched by my own experiences and growing awareness and needs. I was beginning to really understand the true nature of my personal inquiry and some of the many paths I would need to explore, if I was to come terms with who was and with how being who I was contributed to my ability to cope.

I have been thinking about and writing parts of this book since November 1998. It is the sort of book that will never be finished; it will always change just as the seasons change and just as I change. So I designed the book as a sort of journal and reference that I could use to help guide me across the landscape of the rest of my life.
The things you may find in this version of the journal and guide:

- Excerpts of other people’s works and ideas
- Songs and poems
- Sketches
- Photographs
- Musing and daydreams and idle thoughts
- Reflections
- Learning footprints and signposts
- Ways of making meaning
- Dreams and goals
- Aspects of personal sensuality and sexuality
- Ways of healing
- Ways of curiosity and exploring
- Ways of dealing with demons and shadows and ghosts
- Ways of thinking and creativity
- Ways of living and being…

David Bruce-Smith,
Weetangera, A.C.T.
August 1999.
Beneath the darkened window of winter’s night,
Unheard and unseen,
A cat stalks in the undergrowth.

Distant whispers, riding a thin wind,
Bespeak of silent ruins on ancient plains,
And through it all I hear the groan
Of wood on wood and rusted hinges.

Empty boughs on empty trees sway
In secret songs;
In my dreams I reach for visions
And wait quietly
For the cat to shut the gate.

David Bruce-Smith
Shepperton, Surrey, U.K.

**Ptolemy Penguin offers some gentle advice...**

- A stitch in time saves nine;
- Count your blessings;
- Make hay while the sun shines;
- Seize the day!
- From little things big things grow;
- Life is not a dress rehearsal.
Misty the Cat reflecting on Harry’s words of wisdom…

Weetangera. 1999
Harry the Cat’s Reflections on the nature of the cosmos:

- The cat’s pyjamas
- The ant’s pants
- The eel’s elbows
- The snake’s eyebrows
- The bee’s knees

- A journey of ten thousand miles begins with the first step...

- Nobody on their deathbed has ever said, “I wish I had spent more time at work!”.

- There is a saying that I have heard whispered occasionally down long dark corridors that goes something like this:

  A definition of madness is to do the same things in the same way as you have always done and to expect different outcomes!

  “Quite a three-pipe problem, Watson!” - Sherlock Holmes

  “Abandon ship!” - DBS

  “The living system learns, adapts, and evolves by re-organising itself” - Joanna Macy
Namadgi landscapes,
1999.
The search for meaning and the making of meaning involves:

- Understanding who and what I am today
- Understanding the world around me
- Learning
- Being creative
- Reflecting and day-dreaming
- Establishing and maintaining relationships
- Listening to the silence and the wind
- Being systemic
- Wrestling with demons, and dealing with shadows and ghosts
- Different perspectives
- Creating meaning for the future
- Intuition, irrationality, rationality, madness, insight, babble, lucidity, logic, deep breaths and reflection
- Finding other ways of seeing and knowing
- Balance
What might be some principles of my social ecology?

- That people have and need a sense of place, and that a sense of place and belonging is an extension and a part of their identity and selves.

- That there can be the “tyranny of a good idea”.

- That people can learn, and that there are different learning styles, conditions, environments, techniques, circumstances, degrees, depths and time frames.

- That collaborative action research provides great insight for sustainable change.

- That there can be propositional, experiential, technical, and inspirational learning.

- That people seek fresh food, clean water, good earth, and peaceful communities.

- That all human beings are capable of love and hate, fear and anger, joy and wonder…

- That people dream…

- That people’s sense of reality and truth is a constantly changing mix of fact, fiction, observation, dreams, myth, memory, community norms, wishful projections…

- That all human beings are sexual.

- That people are spiritual.

- That people are creative and can learn through play and drama and humour and song and music…

- That theory can inform action and that action can inform theory.

- That there is a relationship between people and their communities and their environments.
enguage. 

That all people struggle to make meaning from complexity.

That people have a right to be able to determine their own destinies.

That you use your unique talents and sets of skills to create things that you can leave behind for others to use.

That critical thinking requires the suspension of belief.

That drama and theatre requires the suspension of disbelief.
“Come into the garden with me. Don’t worry about not knowing the way: Your heart remembers, even if your head has forgotten. When you were small and first had time to create your dreams, you were at one with the earth you played in and with each leaf, bird and cloud you saw. This is the garden to which I invite you to return”.

Marilyn Barrett, Ph.D.
Creating Eden: The Garden as a Healing Space
(1992) Harper San Francisco. USA
Other ways of knowing and seeing....

Avebury stone circle & Stonehenge, Wiltshire, U.K.

1991
Other ways of seeing....

U.K. 1995
Views of Billy Billy Rocks, Tidbinbilla:

A landscape for dreaming. 1999
MY DREAMS

Dreams…

Dreams and daydreams and idle thoughts…

Dreams and interests and goals are all part of the rich tapestry and interweaving melodies of my life. The pursuit of many of these dreams has been thematic throughout my life, and I have been engaged in both the pursuit and the realisation of many of these dreams for a long time. Many of these dreams I am continuing to pursue with a passion. Some of these dreams are old friends; some are tantalisingly new and are still forming and taking shape. Together, they form part of me and help bring meaning and richness to my life.

There are other dreams for which, while a truly focused pursuit has yet to begin, I still enjoy even the gentle art of idly planning to undertake some day. These dreams hold the promise of things to come, of wonderful adventures and experiences that will become possible when present times and circumstances change. And unless I change my dreams, they will happen at some time in the future.

Then there are the dreams that are just nice to have without ever really wanting to or having to do anything about them. The pursuit of these dreams has no sense of urgency or great endeavour attached to them. These are simply the ones that inhabit the realm of fantasy and escape, vague daydreams that drift gently through my mind about worlds and people and events that might have been or could be still. I may never do anything about these dreams, except, of course, to say that I try to live a small part of them in some way every day of my life.

I have thrown this list of my current and known dreams together in a fairly hotpotch way, with no sense of order or of priority, reflecting in a way the many competing demands in life, and my own mind’s tendency to dance randomly from one interest and focus to another. All these dreams are a part of who I have been, and who I am, and who I may become...

Dreams and ambitions and yearnings…

Dreams…
Dreams:

♦ To develop a personal journey guide on living and being and coping and healing
♦ To write a novel
♦ To write letters to friends
♦ To write a book on work mapping and interface design
♦ To live a creative life
♦ To learn to draw
♦ To listen to music, particularly soundtracks and jazz
♦ To develop an appreciation of classical music
♦ To take great and interesting photos
♦ To take photos that are meaningful to others
♦ To write regularly in a journal
♦ To live in a house without clutter and to overcome my natural inclination to hoard
♦ To be free of the slavery of keeping many bits of paper
♦ To trust my own judgment and counsel, and to pursue my own creative endeavours
♦ To develop an interest and curiosity in life
♦ To eat a healthy diet and to exercise regularly
♦ To reduce my consumption of alcohol
♦ To travel to Europe and Great Britain
♦ To go on a journey of great wonder and learning
♦ To learn to type
♦ To be a good husband and father
♦ To enjoy the Australian landscape and natural environment
♦ To understand my children and to help them grow into healthy adults
♦ To read good books and to watch interesting and engaging and inspiring movies
♦ To have a healthy and rich life
♦ To have a healthy sex life
♦ To enjoy life and to value what I have
♦ To love and to be loved
♦ To learn to garden and to grow flowers in the spring
♦ To have an effective system for maintaining household information and a budget etc.
♦ To be financially secure when I retire
♦ To manage household finances effectively
♦ To overcome my personal demons and to find balance with my shadow side
♦ To find a rhythm in life and be at peace with the world
♦ To cope with organisational madness
♦ To develop sound critical thinking and systemic analytical and design skills
♦ To have sense of place in my house and community
♦ To learn the words of poems and songs and to learn to sing
♦ To learn to dance
♦ To live with who I am
♦ To come to terms with my romantic, sentimental side (to harness it to my benefit)
♦ To go bushwalking with a friend / friends in Tidbinbilla and Namadgi
♦ To daydream and watch the clouds drift by
♦ To live a long life with Sally
♦ To write letters to friends as part of healing and coping, and to receive responses from friends
♦ To dream dreams that I have not yet dreamt…

Scotland, 1995
Georgie on the veranda, Summer 1999.

Sam at the Quay, Sydney. 1999
Sally & Jamie the dog, Pinnacle Nature Reserve, Weetangera, A.C.T. 1999
A SUMMER NIGHT

(While waiting at home for Chinese food, with no TV and a cat lying awake on the floor).

Here I am! In person!
In black and white!
In transition from photograph to image!
In shadow and in twilight.
In gentle whisper of daydream
and faint hint of late summer storm
brewing on distant greying horizons.

Here I am. In quiet reflection.
Drifting in colourful flowerbeds and in bright sunshine,
the air a-buzz with bees, with vibrant petals in waft and sway,
with bright-eyed colourful conversation and
king island brie and chardonnay,
and kids eating twisties and
drinking fanta and dancing childhood
dreams in the sizzling summer sunlight,
full of promise and hope and
healthy smiles, as time and butterflies float by
in cloudless skies and currawongs call
the growing twilight of evening song.

The world is a-rhythm, the stars
are a-drift, we float and
dream and are lost and are
found among the eons and the
galaxies and the mysterious wonder
of a single raindrop.
Somewhere are frogs,
and are crickets, and dragons, and birdsong,
and hot evening air. 31 degrees Celsius
at 10 pm, cat panting on floor,
Georgie and Sam on
possum watch out in the
warm dark by the grevillea.

Here I am. Winding down
from a hot summer and
a long day, playing with
words and photographs and
images, and reaching out
to touch a leaf in the
shadows of a summer evening.

I smile at the moon
and speak to the cat in silhouette,
and smell the summer night breeze and
go inside to say goodnight to my children.

David Bruce-Smith
Weetangera. ACT.

Tuesday 10/2/98.
Rievaulx Abbey, Yorkshire, U.K. 1995

Helmsley, U.K. 1995
What is the song of the eucalypt forest?

The screech of the cockatoo?
The melody of the currawong?
The chirp and chatter of the rosella?
The laugh of the kookaburra?
The chorale of the magpie?
The fall of bark from the ribbon gums?
The snap of a branch?
The rustle of the wind in the canopy overhead?
The murmur of the trees in the soft gentle breeze?
The hum of the insects?
The annoying buzz of the blowfly?
The rustle of the skinks among the leaves and the bracken?
The rush and burble of the steep mountain creeks?
The repertoire of the lyrebird?
The harsh cry of the wattlebird and the honey-eater?
The tinkle of the tiny green and yellow finch?
The thump of the wallaby in the undergrowth?
The quiet stillness of the summer afternoon?
The whisper of the soft autumn rain falling on the undergrowth?
The bitter bluster and howl of the winter wind?
The ripple of life and renewal unfolding in the morning light of spring?

As I climb the ridge among the ribbon gums
I hear the rhythm of my footfall on the forest path,
I feel the filtered sun on my face and the joy in my heart
And I sense the movement of my thinking and listening
Responding to the symphony conducted by the forest elders.
In unseen harmony these majestic gums
Orchestrates wind and sky, birdsong and insect hum,
Rustle and whisper and the flutter of wings,
With tree and limb and undergrowth,
And I know that I am hearing
The journey of my soul and my being
While living the song of the eucalypt forest.

David Bruce-Smith
Tidbinbilla horizons, 1999
DAVID’S SELF-HELP BOOK

Dear David,

This is David writing.

On the occasion of your 46th birthday, 1st September 1999, I have put together some simple words of wisdom in the form of your very own self-help book to help you get through the next 46 years! Unlike most of the “pop” psychology books (i.e. “psycho-babble”) you can buy in the bookshops, this book is unique: it has been designed by you, for use by you. It is a living document to which you can keep adding future learning and insights for living and being as your circumstances and stages in life change.

Most of the wisdom comes down to a simple sentence:

In all things, David, take advice from others as you will, but trust in your own judgement!

Keep searching and wondering and writing.

Take care of yourself and your family, and dance in the moonlight whenever you get the chance.

As ever,
David.

12 August 1999.
DAVID’S SELF-HELP BOOK

Fundamental insights:

1. I like myself!

2. I am the person responsible for making improvements in my life!

3. Remember to breathe and maintain balance and focus.

David’s Guide to material possessions:

4. I have more than enough!

5. I do not need to buy lots of material things.

I am learning about what it is to be a husband and a father and a man:

6. Sam is teaching me patience.

7. Georgie is teaching me charity and generosity.

8. Sally is teaching me love.

9. My family is teaching me loyalty, trust, respect, laughter, tolerance and understanding.

10. My children are teaching me about being a father.

11. I am learning from myself and others, and I am exploring and learning for myself those qualities that are important in being a man and in being me!
Notes from the Lighthouse:

12. When all else fails, abandon ship!

13. Follow your dreams.

Gentle reflections from Solomon Tortoise, the Last Earl of Driftwood:

14. There are some things that can never be fully understood or explained; there are some things that just are; and there are some things that will never be.
Invaluable insight and wisdom from A:

15. My dreams and fantasies are O.K. They’re part of being human. (Everybody has his or her own dreams and fantasies).

David, at 45, musing on dealing with demons and shadows and ghosts:

16. Don’t worry too much about your demons, deal with them as best you can. In the broad scheme of life they are not too bad; acknowledge them, understand them if you can, but keep them in perspective. When you need to, be firm, stick to your strategies and give yourself positive feedback. Note that sometimes you will successfully overcome your demons, and sometimes they will get the better of you. Remember: they wouldn’t be demons if they were easy to get rid off. Get on with living and relax.

17. The same with your shadows – treat them as old friends. Understand that they are a part of who you are, and that you are probably the only one who ever sees them. Without these shadows you wouldn’t be you. Acknowledge them, understand them if you can, keep them in perspective. When you need to, be firm, stick to your strategies and give yourself positive feedback. Relax.

18. Let your ghosts gently rest; they are simply part of your rich personal history and unique life story.
Songs of a kookaburra in the Tidbinbilla morning light:

19. Express your feelings

20. Daydream

21. Play

22. Love

23. Laugh

24. Sing
DAVID’S SELF-HELP BOOK

David’s Notes for the Journey:

25. Keep practicing your crafts: photography, writing, writing letters, bush walking, following ideas and creating interesting things. Learn to draw.

26. Don’t worry too much about coping; you are doing better than most. Let others cope as they will. Instead, use your imagination and think counter-intuitively about coping – add to the madness! Let go sometimes: forget the mainstream corporate world, and dance down the alleyways! Recast the characters in a musical comedy, daydream your way into a Louis Armstrong song, write poetry with inter-galactic adventurers, tap dance on mountain tops, invite a tiger or two to tea…

27. Develop your craft in analysis and design techniques. Keep mapping ideas and shaping concepts, and helping others to make meaning.

28. It is O.K. to like and love other people – this is part of the wonder of being human and being alive.

29. Use your talents and gifts to help yourself, your family and others.

30. Social ecology gives you a unique perspective – use this insight and your knowledge and principles to help others.

31. Stop sometimes to look around at the world, feel the sun on your face and the wind in your hair, sniff the breeze and rejoice in the moment.

32. Embrace your sensuality and sexuality – they are some of the great joys and wonders of being alive.
High on a peak in the Tidbinbilla range, the Powerful Owl muses:

33. Life, circumstances, and seasons change. Enjoy the moment, reflect, learn, move on. All things will pass.

34. Always keep your sense of wonder.
Eucalypt forests, Tidbinbilla. 1999.
A SENSE OF PLACE

HOME

Home is a loving, caring and healthy environment in which we can all grow, learn, be happy, share, feel safe, and, at the same time, understand what is happening in the world; a place from which we can venture into the world (at different times) with a sense of wonder, curiosity and yearning for adventure; a place to which we can return from the world and find compassion, love, friendship and healing; a place in which we can all follow our respective creative and recreational pursuits; a place in which we can feel at home.

WORK

Work is a place (perhaps even a state of mind) in which I can pursue an interesting and rewarding career; in which I can learn and grow, and make meaningful contributions to organisational outcomes. Work is also a place where I need to think for myself and to demonstrate leadership in an environment of ambiguity and uncertainty. While I work amongst a community of others I find that there are very few whom I can trust or upon whom I can depend. A great deal of my sense of place at work is associated with my sense of self and my trust in my own judgement, creative ability and self-reliance. (Note the different language for the different sense of place).

A SENSE OF SELF AND PLACE

I carry my own sense of place around inside me. It involves knowing who I am and understanding my contextual relationships with, and to, the world. By having a deep sense of self I believe that I am able to create a sense of place and belonging wherever I choose and wherever I go. While I am still exploring this notion, I find that it helps me greatly to deal with the silence and the emptiness and the void.
Tidbinbilla landscapes, 1999.
(A poem of healing and learning and finding meaning and moving on…)

Journals
and poems
and letters to friends

photographs
and films
and galleries on
Saturday afternoons

mountain landscapes and walking tracks
and Tidbinbilla forests
in soft autumn light

sitting beside you
in quiet reflection,
loving and longing
in silence

David Bruce-Smith
Weetangera. A.C.T.

04 March 1998
Sam in the landscape,

Tidbinbilla, 1999
Some Perspectives on Creativity:

Max Dupain (1986):

“Life today is manipulated by the photographer behind his camera. Magazines, newspapers, advertisements, junk mail, television, coffee table books, posters, - all affect our subconscious with directions to do this, buy that or think something different. But there is another kind of photography, proportionately minuscule, which induces delight, spiritual harmony, an abundance of emotional excitement and intellectual wonder.”

P.G.Wodehouse:

“I believe there are two ways of writing novels. One is mine, making a sort of musical comedy without music and ignoring real life all together; the other is going right deep down into life and not caring a damn…”

APPENDICES FOR
“EXPLORING AND DESIGNING PRACTICAL
TECHNIQUES FOR THE ANALYSIS AND DESIGN OF
COMPLEX WORK SYSTEMS:
A JOURNEYMAN’S STORY”
by
David A. Bruce-Smith

APPENDIX B:
AN INTRODUCTION TO SYSTEMS MAPPING

©David Bruce-Smith, 2005.
Occasional Paper No.1 of 2004
(Version 2.5)

Aspects of Applied Systems Thinking:
An Introduction to Work Systems Mapping

Purpose:
Business Logic:
Transformation:
Outcomes:

Elements:
- People
- Processes
- Resources
- Technologies
- Intellectual Capital
- Place

David Bruce-Smith
GDSE; MAappSc (Social Ecology)
April 2004.
Table of Contents

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>3</td>
</tr>
<tr>
<td>Background</td>
<td>3</td>
</tr>
<tr>
<td>Qualitative Social Research and Design</td>
<td>4</td>
</tr>
<tr>
<td>A System</td>
<td>5</td>
</tr>
<tr>
<td>An Open System</td>
<td>5</td>
</tr>
<tr>
<td>Features and Characteristics of a System</td>
<td>5</td>
</tr>
<tr>
<td>Visualising a System</td>
<td>5</td>
</tr>
<tr>
<td>A Basic Logic of Transformation</td>
<td>6</td>
</tr>
<tr>
<td>A Work System</td>
<td>7</td>
</tr>
<tr>
<td>Work Systems as Internal Capability</td>
<td>8</td>
</tr>
<tr>
<td>Key Work System Elements</td>
<td>9</td>
</tr>
<tr>
<td>Work System Component Diagram</td>
<td>10</td>
</tr>
<tr>
<td>Work Systems and Sub-Systems Maps</td>
<td>11</td>
</tr>
<tr>
<td>Organisation/Community Interface</td>
<td>12</td>
</tr>
<tr>
<td>Requisite Variety</td>
<td>13</td>
</tr>
<tr>
<td>Two Approaches to Requisite Variety</td>
<td>13</td>
</tr>
<tr>
<td>Strategic and Operational Level Interfaces</td>
<td>14</td>
</tr>
<tr>
<td>Workspace Diagrams</td>
<td>15</td>
</tr>
<tr>
<td>Application to Organisation and Work Design</td>
<td>16</td>
</tr>
<tr>
<td>Application to Strategic Compliance Planning</td>
<td>17</td>
</tr>
<tr>
<td>Compliance Strategy Across the Organisation/Community Interface</td>
<td>18</td>
</tr>
<tr>
<td>Strategic Planning Technique</td>
<td>19</td>
</tr>
<tr>
<td>Demonstrating Recursion</td>
<td>20</td>
</tr>
<tr>
<td>An Australian Taxation Office Example of Recursion</td>
<td>21</td>
</tr>
<tr>
<td>Summary of Four Key, Yet Different, Systems Mapping Concepts</td>
<td>23</td>
</tr>
<tr>
<td>Some Other Useful Concepts: Yin and Yang</td>
<td>24</td>
</tr>
<tr>
<td>Some Other Useful Concepts: Cybernetics</td>
<td>24</td>
</tr>
<tr>
<td>Summary Diagram: Complex Adaptive System</td>
<td>25</td>
</tr>
<tr>
<td>Selected Bibliography and Further Reading</td>
<td>26</td>
</tr>
</tbody>
</table>
Aspects of Applied Systems Thinking:  
An Introduction to Work Systems Mapping

Purpose

The purpose of this Occasional Paper is to briefly present the logic and visual argument underpinning my application of general systems theory and open systems theory to the analysis and design of work systems and to the design of effective strategic planning and systems of compliance.

I have written it primarily as a ready reference guide to support managers and staff in the workplace who have already completed the LB&I Strategic & Business Intelligence Training Program “Introduction to the Analysis and Design of Compliance Systems and Other Complex Work Systems”. This training program was conducted for approximately 180 managers and staff in the Australian Taxation Office by my small research team and myself between December 2000 and April 2004.

Background

There are many systems approaches to understanding complex problems, and there are many different systems mapping techniques.

Some of these include;

➢ Soft Systems Methodology (Checkland 1981; Checkland & Scholes 1990)
➢ Viable Systems Method (Stafford Beer 1985)
➢ Critical Systems Thinking (Churchman 1979; Midgley 2000)
➢ Systems Dynamics and Causal Loop Analysis (Forrester 1969; Senge 1994)
➢ Strategic Navigation (Hames 1994; Hames & Oka 1997)

In academia there has been extensive debate about which technique to use in which circumstances, the benefits of one technique over another, and, of course, the short comings of each technique in not being universally applicable in all circumstances and situations.

Equally, in the world of systems thinking practitioners and applied systems thinking, people select and apply techniques that are useful in finding understanding and making meaning from the contextual complexity facing them. To the horror of the purists among academics, practitioners mix and match aspects of techniques to suit the specific context and the problem situation in which they are working. The difficulty with this approach is that systemic techniques can end up being insufficiently understood and poorly applied in a reductionist way, thus limiting understanding and defeating the point of systemic enquiry and design. To my horror, I often see managers enthusiastically drawing bubbles and arrows on whiteboards in the mistaken belief that such diagrams and an accompanying list of nouns represent either rigorous analytical, critical or systemic thinking.

The work systems mapping technique has its origins in both worlds, that of academia and that of practical application. I have been researching, developing, applying and re-shaping this technique extensively over the last five years, both as part of my
professional work in the Australian Public Service and as the primary focus of my post-graduate research in Social Ecology at the Centre for Systemic Development, University of Western Sydney, Hawkesbury.

I have developed this work system mapping technique in response to what I believe is a gap in the literature of systems thinking and organisational design and a corresponding lack of specific effective technique for gaining a holistic and systemic understanding of the complex nature of work in public sector administration. I have also developed it because, from my background in socio-technical systems design, I believe that there is an urgent need for practical visual techniques that are informed by theory and that can be readily and usefully applied with rigour and confidence by managers in the workplace, particularly those involved in strategic planning, risk management, compliance management, organisational design, work design, human resource management, information technology application development, resource management, performance management and policy development.

In fact, I believe that aspects of this visual technique can be usefully applied in many areas of complex problem solving that confront managers everyday in their diverse fields of business planning, organisational management, the provision of services and the administration of public policy.

**Qualitative Social Research and Design**

The work systems mapping technique illustrated in this paper was developed over a five year period between 2000 and 2004 using a qualitative social research and design approach that brought together a transdisciplinary theoretical framework with a critical learning heuristic research and design technique.

In presenting the logic and argument for work systems mapping I draw principally, though not exclusively, on a theoretical framework that includes systems theory, social ecology, complexity and chaos theory, organisational theory, socio-technical systems design, management theory, strategic planning and management, public sector policy development and management, compliance management theory, and the notion of organisations as complex adaptive systems.

A selected bibliography is included at the end of this paper.

David Bruce-Smith.
Weetangera, ACT.

A System

A system is an entity with a purpose, which maintains its existence and functions as a whole through the interaction of its parts. (O'Connor and McDermott 1997: 2)

An Open System

An open system is a system that interacts with its environment, gaining resources across the boundary.

All living systems are open systems.

Features and Characteristics of Systems

Features and characteristics of a system include:

- A purpose
- A boundary
- Sub-systems
- Dynamic non-linear relationships
- Inputs
- Outputs & outcomes
- Transformative processes
- Levels of resolution
- Levels of recursion
- Emergence and emergent properties
- An environment
- Feedback
- Homeostasis
- Entropy
- Elements and/or components
- Nested systems

Visualising a System

A system and some of its characteristics can be represented visually as:
A Basic Logic of Transformation

From open systems theory I can take the basic features and characteristics of a system and represent them diagrammatically as a system map.

I can also draw this system as having a basic underlying logic of input - transformation - output.

That is, I can think of a system as being transformative in nature. The elements within the system combine in dynamic relationships to transform inputs and appropriate stimuli from the external environment into purposefully and intentionally designed outputs.
Aspects of Applied Systems Thinking:
An Introduction to Work Systems Mapping

A Work System

Applying this systems theory into an organisational design context, I can introduce the notion of work systems, where a work system is defined as:

A work system is the purposeful and intentional combination of people, processes, resources, technologies, intellectual capital and place to achieve a planned business outcome.

This can be visualised and represented diagrammatically as:

![Diagram of a work system](image)

This is useful because I can now say that if an organisation wants to achieve a specific planned business outcome then it will need an effective work system to deliver that business outcome.

That is, if an organisation wants to achieve a specific planned business outcome then it will need to purposefully and intentionally design the internal capability so that it can effectively do so.
Work System as Internal Capability

Thus, the work system can be seen as the purposeful and intentional combination of an organisation's internal capabilities to achieve planned business outcomes.

This can be represented in a systems diagram as:

The internal capability can also be expressed as the organisation's capacity and potential to achieve its strategic purpose through the deliberate and intentional management and activation of dynamic interrelationships and interactions between the key internal capability elements of people, processes, resources, technologies, intellectual capital and place.
I can diagrammatically represent these six key work system elements using the following types of symbols, words and diagrams:

<table>
<thead>
<tr>
<th>Key Work System Element</th>
<th>Diagram&amp; Text</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>People</strong></td>
<td><strong>INDIVIDUAL</strong></td>
</tr>
<tr>
<td><strong>Processes</strong></td>
<td><strong>RECEIVE REQUEST</strong></td>
</tr>
<tr>
<td></td>
<td><strong>SEQUENTIAL, VALUE-ADDDING STEPS / ACTIVITIES IN A PROCESS</strong></td>
</tr>
<tr>
<td><strong>Resources</strong></td>
<td><strong>E.G.:</strong></td>
</tr>
<tr>
<td></td>
<td><strong>CONSUMMABLE STATIONERY ETC</strong></td>
</tr>
<tr>
<td><strong>Technologies</strong></td>
<td><strong>COMPUTERS</strong></td>
</tr>
<tr>
<td><strong>Intellectual Capital</strong></td>
<td><strong>BOOKS</strong></td>
</tr>
<tr>
<td><strong>Place</strong></td>
<td><strong>AN OFFICE BUILDING</strong></td>
</tr>
</tbody>
</table>
Work Systems Components Diagram

I can use now these visual representations of the work system elements to illustrate the key contextual elements in a specific work system. This representation is known as a Work Systems Component diagram and can be shown as:

**Key Elements:**
- **People:** Director, Team Members, Lawyer
- **Processes:** Key Process 1 (to produce Output 1), Key Process 2 (to produce Output 2)
- **Resources:** Finances, Time & Timeframes, Management Information (as an input), Management Information and Knowledge
- **Technologies:** Networked Computers, Computer Business System Application, Microsoft Office Suite, Writing
- **Intellectual Capital:** ITAA 1936, 1997, ATO Policy and Procedures, Corporate Planning Documents
- **Place:** National Office; Open Planned Office with Work Stations and Networked Computers

Work system component diagrams can be very useful when working with others to visualise the interconnectedness of system elements and to gain a shared understanding of the required relationships between the various elements that comprise a specific work system.
Work Systems and Sub-Systems Maps

Work systems have sub-systems and can have sub-sub-systems. Systems, sub-systems and sub-sub-systems represent different levels of information, with the level and amount of detail and information growing as you move from system to sub-systems to sub-sub-system and so on. This effect is known as **Levels of Resolution**.

The notion of sub-sub-systems within sub-systems within systems is also known as "nested systems".

Systems, sub-systems and sub-sub-systems can be represented on visual maps as:
Organisation/ Community Interface

Another way of viewing a work system is by thinking of it as a logical and/or conceptual representation of the desired organisational capability in relationship to the external environment across the organisational/community interface.

That is, you can use the notion of a work system to describe the optimum combination and configuration of people, processes, resources, technologies, intellectual capital and place that you believe are actually required to achieve the planned business outcomes.

Interface diagrams are very powerful ways of representing strategic relationships, information flows, key processes, client interactions and desired behaviours required to effectively support the achievement of planned business outcomes.

---

**Key Information Flows**

- E.g. Intelligence, Law, Strategic Data Sets.
Aspects of Applied Systems Thinking:
An Introduction to Work Systems Mapping

Requisite Variety

Ashby’s Law of Requisite Variety states that in a viable system the variety of the controller must be equal to or greater than that which is being controlled (Flood & Jackson 1991: 90).

This means that an effective, responsive and viable organisation needs the intentionally designed capability to deal with all the challenges from the external environment and the business events that occur across the organisation/community interface.

Two Approaches to Requisite Variety

Stafford Beer (1975), the creator of the Viable Systems Method, suggests two approaches to achieving requisite variety:

- Increase the variety of the controller until it matches the variety of the situation to be controlled.
- Take action to drastically reduce the variety to be controlled.

The notion of requisite variety can be illustrated using an interface diagram:
Strategic and Operational Level Interfaces

There are two key levels of interface that are useful in both analysis and design of compliance strategies and work systems. These are the strategic level and the operational level.

The strategic level enables you to explore the critical strategic relationships, desired behaviours, and high-level information flows between your organisation and the community.

The operational level enables you to explore the detailed nature of the processes, information flows, client relationships, customer service, management practices etc that are required on a day-to-day basis to ensure the smooth operation and effective performance of your organisation and/or specific work areas.
Workspace Diagrams

Work actually takes place in a physical environment, which means that work design needs to consider both the conceptual and logical nature of work as well as the requirements and characteristics of the physical environment in which the work will need to be performed.

A workspace diagram e.g. a floor plan, a layout diagram, a site plan, a 3-dimensional illustration of the proposed office environment, can be used to illustrate the requisite physical features and characteristics for a healthy sustainable workplace and the relationships between the proposed design of the work system and the physical space in which to perform the work. By focusing on the physical environment and the way that people may need to work and move through the office landscape, you can challenge and test many assumptions as well as generate many new ideas about the detailed aspects of the proposed work design, e.g. the type of processes, access to intellectual capital, applied technologies, required skill sets, type of office layout, furniture, special equipment and office features etc. This is of vital importance in designing work systems related to intelligence, risk identification and analysis, knowledge management and collaborative and creative working environments.
Application to Organisation and Work Design

By combining these techniques and using heuristic design and prototyping approaches you can simultaneously design at the systems view (conceptual), the strategic and operational interface views (logical) and workplace/workspace views (physical), all the while testing and challenging your assumptions and exercising both your imagination and your critical thinking abilities.
Application to Strategic Compliance Planning

A compliance strategy can be represented systemically and visually as:

In this system model the following key features of strategic compliance management and planning can be clearly seen:

- A compliance strategy is designed to initiate, modify, and/or maintain specific desired compliance behaviours and relationships i.e. planned business outcomes;

- A compliance strategy, to be successful, must have a specifically designed work system capable of delivering the compliance strategy and achieving the planned business outcomes;

- The work system must also be capable of measuring the actual compliance behaviour resulting from the strategy and gaining intelligence, information and feedback about both the compliance performance and the work system performance.
Compliance Strategy across the Organisation/Community Interface

Compliance strategy can also be demonstrated by combining a work system diagram and an interface diagram.

A work system to deliver compliance strategy and to achieve planned business outcomes

Feedback

Desired compliance behaviours and planned business outcomes

Compliance strategy

World

Organisation
Strategic Planning Technique

This provides a very sophisticated strategic planning technique for designing compliance strategies at the same time as visualising desired compliance behaviours and business outcomes, as well as understanding the effective internal capabilities required to deliver the strategy, achieve business outcomes and measure overall system performance and effectiveness.

Thus, this strategic planning technique draws on a combination of work systems mapping, interface design, rich picture techniques to visually explore and document ideas and assumptions about the ideal world.

This can now be represented as:
Demonstrating Recursion

In systems theory, the term “recursion” refers to an extraordinary quality of some systems where the pattern of the whole system may also be replicated in the component parts of the system. This is a particularly useful feature when using Stafford Beer’s Viable Systems Model (VSM) as a means of diagnosing the viability and sustainability of current organisational and management capability.

This notion of recursion, of patterns of the whole being repeated in the parts, is also extremely useful when using work systems techniques to design compliance strategies and organisational capability. Levels of recursion can be demonstrated by exploring the complex adaptive system across the organisational and community interface.
An Australian Taxation Office example

In the case of the Australian Taxation Office, an example of this characteristic of recursion can be demonstrated by looking at the different levels of organisational management:

At the next level of recursion, across the LB&I ATO interface, you will see the same systemic pattern:
Aspects of Applied Systems Thinking:
An Introduction to Work Systems Mapping

This will also be repeated at the next level of recursion, that of the LB&I Segment/LB&I interface:

This concept of recursion is particularly important for understanding that at whatever level of focus you have in an organisation, whether it is strategic, operational, tactical or individual, you need to think, plan and act systemically, and you need to have the actual capability to achieve your intent.
Summary of Four Key Similar, Yet Different, Systems Thinking Concepts

Resolution

The different levels of focus or magnification eg. Supra or meta-system, system, sub-system, sub-sub-systems.

This is a useful concept for maintaining an appropriate level of focus in analysis and design and, by doing so, avoiding being too conceptual (high-levelled) or detailed (low-levelled). Choosing the appropriate level of resolution will depend upon your personal judgement and your understanding of the context.

Recursion

“The whole is in the parts”; (Flood & Jackson 1991: 89) i.e. patterns of the whole are replicated in the part.

Particularly useful in diagnosing and designing organisational capabilities, communication and information flows, and management practices.

Fractals, Fractality.

Self-similar patterns that are repeated at all levels of resolution and magnification. From chaos and complexity theory.

Repeating, though slightly different patterns in nature and the universe, eg patterns found in nature such as ferns, leaves, trees. Also see Mandelbrot’s observation of patterns in the English coastline that repeat at different levels of magnification. (Bullock & Trombley 1999).

Requisite Variety

In a viable system, the variety of the controller must be equal to or greater than that which is being controlled. (Flood & Jackson 1991: 90)

Particularly important when analysing and/ or designing internal capabilities and in understanding the nature of complex adaptive systems across the organisational-community interface.
Some Other Useful Concepts

Yin & Yang:

Two complimentary opposites. Yin represents feminine qualities and perspectives, while yang represents masculine qualities and perspectives. Nothing is ever absolutely yin or yang; that is why there is a white dot (yang) within the yin, and a black dot (yin) within the yang. (Source: www.self-healing.com.au/MACRO/yinyang.html (23 November 2003)).

Very useful in coping with the unpredictable nature of aspects of complex adaptive systems and in understanding organisational paradox, contradictions and the spontaneous diversity and endless variety of human behaviour in an organisational context. I believe the notion of yin and yang is a wonderful practical way of introducing ideas of compassion, tolerance, humour, humanity, spirituality and alternate world views into what is often otherwise an ideologically-driven and deterministic economic rationalist view of organisations and organisational behaviour.

Cybernetics:

The science of effective organisation.

Particularly concerned with notions of control, communication and effective information flows in organisations. Often uses metaphors drawn from living beings, particularly the human body eg heart, brain, circulation, the nervous system etc. (For further information see Stafford Beer’s Viable Systems Method).
A Summary Diagram Illustrating the Ebb and Flow Patterns and the Co-Evolving and Adaptive Nature of a Regulatory Organisation in Dynamic, Non-linear Relationship with its Contextual Environment.
Selected Bibliography and Further Reading


Aspects of Applied Systems Thinking:
An Introduction to Work Systems Mapping


Aspects of Applied Systems Thinking: 
An Introduction to Work Systems Mapping


John Wiley & Sons Ltd. England

Great Britain: John Wiley & Sons Ltd.
Aspects of Applied Systems Thinking: 
An Introduction to Work Systems Mapping


Aspects of Applied Systems Thinking:
An Introduction to Work Systems Mapping


Applied Systems Thinking: 30
An Introduction to Work Systems Mapping  6/05/2004
David Bruce-Smith
Aspects of Applied Systems Thinking:
An Introduction to Work Systems Mapping


APPENDICES FOR
“EXPLORING AND DESIGNING PRACTICAL
TECHNIQUES FOR THE ANALYSIS AND DESIGN OF
COMPLEX WORK SYSTEMS:
A JOURNEYMAN’S STORY”

by

David A. Bruce-Smith

APPENDIX C:
EXTRACT FROM “THE NAMADGI TECHNIQUE:
A JOURNEYMAN’S TOOLKIT”

© David Bruce-Smith, 2005.
Appendix C

Extracts from

The Namadgi Technique:

A Journeyman’s Toolkit of Practical Approaches and Techniques for use in the Analysis and Design of Complex Work Systems

Table of Contents

<table>
<thead>
<tr>
<th>Technique/ Tutorial/ Diagram</th>
<th>Title</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagram 6.1</td>
<td>The four key components of the Namadgi Technique.</td>
<td>C-3</td>
</tr>
<tr>
<td>Diagram 6.2</td>
<td>The “6-step, many step” process for systemic analysis, illustrated as a work system.</td>
<td>C-4</td>
</tr>
<tr>
<td>Diagram 6.3</td>
<td>The “5-step, many step” process for systemic and holistic design, illustrated as a work system.</td>
<td>C-5</td>
</tr>
<tr>
<td>Work System 1</td>
<td>Analysis as a work system</td>
<td>C-8</td>
</tr>
<tr>
<td>Work System 2</td>
<td>Design as a work system</td>
<td>C-12</td>
</tr>
<tr>
<td>Tutorial 1</td>
<td>Drawing a Work System – the basics of drawing and naming a work system.</td>
<td>C-24</td>
</tr>
<tr>
<td>Tutorial 2</td>
<td>Designing a Work System – to begin to design your own work system.</td>
<td>C-32</td>
</tr>
<tr>
<td>Tutorial 3</td>
<td>Developing a Systemic Appreciation of Your Work.</td>
<td>C-52</td>
</tr>
<tr>
<td>Tutorial 4</td>
<td>Designing a Work System to Support a Strategic Intervention.</td>
<td>C-56</td>
</tr>
<tr>
<td>Diagram 6.5</td>
<td>The Iceberg Analysis Technique.</td>
<td>C-61</td>
</tr>
<tr>
<td>Diagram 6.6</td>
<td>Deconstructing the Iceberg Analysis Technique.</td>
<td>C-62</td>
</tr>
<tr>
<td>Diagram 6.7</td>
<td>A summary diagram of techniques for visualising complex adaptive systems across the organisation/community interface.</td>
<td>C-67</td>
</tr>
<tr>
<td>Technique 6.1</td>
<td>Rich Contextual Pictures.</td>
<td>C-68</td>
</tr>
<tr>
<td>Technique 6.2</td>
<td>24 useful Ideas.</td>
<td>C-83</td>
</tr>
<tr>
<td>Table of Contents of</td>
<td>Complete Table of Contents from the current version of A Journeyman’s Toolkit (2004)</td>
<td></td>
</tr>
<tr>
<td>Contents</td>
<td>Table of Contents: Summary</td>
<td>C-86</td>
</tr>
<tr>
<td></td>
<td>Detailed</td>
<td>C-87</td>
</tr>
</tbody>
</table>
The Namadgi Technique

A Journeyman’s Toolkit
of
Practical Approaches and Techniques for
Use in the Analysis and Design of Complex
Work Systems.

David Bruce-Smith
GDSE, MAppSc(Social Ecology).
May 2004

A Prototype Booklet
A LEARNING JOURNEY

You in a dynamic environment

Leadership

Critical thinking

Analysis and Design Techniques

A wiser you

A SOCIAL ECOLOGY ENQUIRY

Individual

Methodological Pluralism

Critical awareness

A Social Ecology Enquiry

Contextual Environment

Improvement

Communities, organisations, social groups

Environment

A model of the Namadgi Technique
Author: David Bruce-Smith
Date: January 2003

SIX STEPS TO UNDERSTANDING AND ANALYSIS

1. Establish self-awareness and group identity
2. Identify the problem domain or area of concern
3. Map the current human, social, business and organisational work systems
4. Identify and understand the contextual deep systemic drivers of current behaviours and practices
5. Identify strategic leverage and points of strategic intervention for transformation
6. Take action and undertake critical evaluation

A system for the analysis of human, social, business and organisational environment

Contextual, social, business and organisational environment

Analysis as a process and as a system of enquiry

“DESIGN AS DANCE” – THE 5 STEP, MANY STEP

1. Self-awareness and clarity of purpose
2. Identify the purpose and outcomes of the proposed work system
3. Develop a prototype/model of the work system with several levels of resolution
4. Develop a detailed design, including work maps and interface models
5. In collaboration with others, take action to test and conduct critical evaluation

A system for the design of human, social, business and organisational work systems

Q: When to use one or the other?
A: A matter of focus and intent.

Document your assumptions and issues

Environment

Q: When to use one or the other?
A: A matter of focus and intent.

Appendix C

C-4

Extract from Namadgi Technique

Diagram 6.1 The four key components of the Namadgi Technique
Diagram 6.2: The 6-step, many step analysis work system model
“DESIGN AS DANCE” – THE 5-STEP, MANY-STEP

A system for the design of human, social, business and organisational work systems

1. Self-awareness and clarity of purpose
2. Identify the purpose and outcomes of the proposed work system
3. Develop a prototype/model of the work system with several levels of resolution
4. Develop a detailed design, including work maps and interface models
5. In collaboration with others, take action to test and conduct critical evaluation

Q: When to use one or the other?
A: A matter of focus and intent.

Diagram 6.3: The 5-step, many step; design as dance work system
A SOCIAL ECOLOGY ENQUIRY

- Seeking improvement that is ethically desirable and ecologically and environmentally sustainable.
- Exploring the relationships, interrelationships, coevolution and the emergence of patterns, complexity and possibilities within all systems.

A Social Ecology Enquiry expressed as a system map
A work system is a purposeful and intentional combination of people, processes, resources and technologies to achieve planned business.

**Sub-systems:**
- A work system may comprise a number of sub-systems that are in relationship with one another.
- Each sub-system is also a purposeful and intentional combination of people, resources, processes and technologies that produces planned product or outcome.
- All of the sub-systems are in a dynamic relationship with one another.
- All of the sub-systems are required to work in harmony with one another to achieve the system purpose and the...
The Namadgi Technique

Section

Analysis as a Work System
A Process for Analysis

Analysis is about exploring *what is, why it is, and what are the consequences* of the situation continuing as it is.

Six steps for exploring and understanding

1. Establish self-awareness and group identity
2. Identify the problem domain or area of concern
3. Map the current human, social, business and organisational work systems
4. Identify and understand the contextual deep systemic drivers of current behaviours and practices
5. Identify strategic leverage and points of strategic intervention for transformation
6. Take action and undertake critical evaluation

These six steps can be viewed as a *process*:

*Viewed as Process*

1. Establish self-awareness and group identity
2. Identify the problem domain or area of concern
3. Map the current human, social, business and organisational work systems
4. Identify and understand the contextual deep systemic drivers of current behaviours and practices
5. Identify strategic leverage and points of strategic intervention for transformation
6. Take action and undertake critical evaluation

- The output from each is the input to the next
- Orderly discrete processes
- A series of value-adding transformations

*But organisational and human activity doesn’t act that way.*
*Why? … … … … … … … … Because they are complex systems.*

The same process can be described as a *system* for analysis:
A System of Analysis

Because human systems are complex, an analysis process for enquiring into them needs to be systemic too.

The elements in a dynamic complex system are interrelated and incorporate feedback.

In a dynamic complex system, the elements are not only interacting in a linear sequence but are also interacting in a non-linear way. That is, these activities can happen in any sequence and the results will feed into the other steps to build general understanding of the problem domain and the developing solutions.
Analysis Process & Deliverables

1. Establish self-awareness and group identity
2. Identify the problem domain or area of concern
3. Map the current human, social, business and organisational work systems
4. Identify and understand the contextual deep systemic drivers of current behaviours and practices
5. Identify strategic leverage and points of strategic intervention for transformation
6. Take action and undertake critical evaluation

Deliverable:
Create a narrative to tell the flow of the story using a range of mapping techniques, including Rich Pictures to capture aspects of local cultures, communities, environments, paradigms and worldviews etc.

Rich Pictures
- include cultural artefacts

Organisation structures
- & decision making authorities

Historic perspective
- Time line - Evolution of issue

Laws/Norms
- Laws, rules, norms, policies, behaviours, that shape behaviour

Key Relationships
- Between relevant people, groups, areas etc.

System Map
- showing what you believe are the significant issues, and the systemic roots and drivers

Statement of Concern

Just how messy and complex do you think this issue might be?
Include some information about the size, scale, qualities and the nature of the problem.

Identify and intent

What is the issue or problem domain?
Initial boundary – people included/excluded

A statement of your identity and intent. Include the purpose of your analysis, timelines and expected outcomes

Engage others in coherent conversation

Begin the strategic design conversation

Feedback and new insights

Deliverable:

Яssemble your knowledge and understanding

Your analysis of the problem domain/issue

What are the emergent properties of the system
What is your emergent understanding of the problem domain? Do you need to change the boundaries of your enquiry?

思维！！！ - Reflection & Critical Analysis

Key Relationships
- Between relevant people, groups, areas etc.

A System Map
- showing what you believe are the significant issues, and the systemic roots and drivers

Proposals for strategic intervention

Deliverable:

Ideas

Deliverable:

Deliverable:

Appendix C

C-12

Extract from Namadji Technique
The Namadgi Technique

Section

Design as a Work System
A Process for Design

Design is about exploring what could be, what it might look like, and what conditions would be needed to support it.

The Five Step Design Process

➢ Establish self-awareness and clarity of thought and purpose.
➢ Identify the purpose and outcomes of the proposed new work system.
➢ Develop a prototype (eg sketch, model, diagram, draft paper etc).
➢ Develop a more detailed design.
➢ Take action and critical evaluation.

The five steps can be represented as a process, as shown below.
The Namadgi Technique

Alternatively, the five steps can form a system.

1. Establish self-awareness and clarity of thought and purpose
2. Identify the purpose and outcomes of the proposed work systems
3. Develop a prototype [eg. sketch, model, diagram, draft paper etc]
4. Develop a more detailed design
5. Take action and critical evaluation
The Namadgi Technique

What does this mean for designers?

There are a number of benefits associated with designing whole work systems rather than simply designing business processes:

- enables you to deal with complex problems and complex design issues
- enables you to focus on and design for outcomes rather than just outputs
- enables you to take a holistic and systematic approach
- enables you to bring together disparate organisational, community and broader environmental elements and explore relationships, boundaries and endless possibilities for change and for the future (an element can be part of many systems at the same time)
- enables better informed design and management decision-making
- enables you to design for purposeful outputs and outcomes and for emergent outcomes

and, in the ATO vernacular,

- enables you to “think outside of the box”, to explore diverse possibilities while “keeping your eye on the main game”, and to achieve practical and effective outcomes.
“DESIGN AS DANCE” – THE FIVE STEP, MANY STEP MODEL
A system for the design of human, social, business and organisational work systems

1. Establish self-awareness and clarity of thought and purpose
2. Identify the purpose and outcomes of the proposed work systems
3. Develop a prototype [eg. sketch, model, diagram, draft paper etc]
4. Develop a more detailed design
5. Take action and critical evaluation

State the problem domain and or the design situation
Document your assumptions and issues
The Namadgi Technique

How to design a work system: An exploration of the various sub-systems of the five step, many step model

Step 1: Establish Self-Awareness and Group Identity

Sub-System Name: Self-awareness and clarity of your purpose/group identity.
Step 2: Identify the purpose and outcomes of the proposed work system

Sub-System Name: Identify the purpose and outcomes of the proposed work system.
Step 3: Develop a prototype

Sub-System Name: Develop a prototype

3a. Identify the inputs, transformation(s) outputs and outcomes required.

3b. Identify the boundaries of work system. What is in / out / in and out? What implications will this have for your design process and for the organisation?

3c. Identify and describe the components, sub-systems, relationships and dynamics of the work system.

3d. Play with the ideas. Think about things. Talk to people. Dance around the whiteboard.

A proposed work system.

Prototypes and models and work systems.
Step 4: Detailed designs, including work maps and interface diagrams

Sub-System Name: Develop a detailed design, including work maps and interface models.

4a. Develop work maps and interface models to show detailed relationships between the work of the work area/organisation and external clients, stakeholders, community etc.

4b. Populate your model with key relevant organisational, environmental and human elements, especially people, business design, business logic, business processes, IT applications, policy, legislation, information flows, performance measures.

4c. Keep surfacing and testing your assumptions. Keep challenging both yourself and others about your design. Document issues and thinking relating to the nature of proposed change to existing work systems and organisational structures.

4d. Keep playing and thinking and talking to people and dancing around the whiteboards etc. If creative energy flags conduct community singing in the local workplaces.
Step 5: Take action and critical evaluation

**Sub-System Name:** Take action and conduct critical evaluation.
The Namadgi Technique

Use the design process illustrated.

**A Design Opportunity or Problem Domain**

**Fuzzy boundary**

**Deliverable:**
- Point of strategic leverage
- Rationale
- Design hypothesis

**Intent**

**Deliverable:**
- A statement of your identity and intent

1. **Self-awareness and clarity of purpose**

2. **Identify the purpose and outcomes of the proposed work system**

3. **Develop a prototype/model of the work system with several levels**

4. **Develop a detailed design, including work maps and interface models**

5. **In collaboration with others, take action to test and conduct critical evaluation**

**Deliverables:**
- High level work system [inputs, transformations, outputs, boundaries, purpose etc.]
- Business rules etc.

**Deliverables:**
- Detailed design,
- Business process/interface map,
- Workspace design

**Deliverables:**
- Work systems and sub-systems.
- Model of key components & relationships.

**Deliverables:**
- Implementation strategy
- Criteria for viability and sustainability
- List of key assumptions

**A rich picture**

- An understanding of the complex adaptive and evolving contextual environment

Appendix C C-22 Extract from Namadgi Technique
This is pretty nifty, but where do you start?

What do you actually do?

Use Tutorial 1 to learn the basics of drawing and naming a work system.

Use Tutorial 2 to begin to design your own work systems.
TUTORIAL 1:

HOW TO DRAW A WORK SYSTEM
How to Draw a Work System Model

Step 1: Draw a blank “system” shape.

This shape will represent the boundary of your work system. Inside the boundary will be the component parts of your work system. Anything outside the boundary is the broader contextual work environment. E.g.
Step 2: Name your work system.

The name should describe the broad activity required to achieve the planned business outcomes. This means that the system name needs to comprise at least a verb and a noun.

You will note from this example that the system name has two verbs: “identifying” and “managing” and a noun “risk” with a qualifying clause.

*Technique Hint: If you are not willing to name your system in terms of verbs and nouns (i.e. you just want to plonk a noun on the paper) then don’t bother going any further with this technique. The use of appropriate language is the basic way of ensuring intellectual rigour and analytical discipline in your design thinking and system modelling process. Without this rigour and discipline you are merely playing with “bubbles and arrows” rather than systemic models.*

Step 3: Describe the purpose of the work system.

The purpose of this work system is to…..

Eg The purpose of this work system is identify and manage risks to our business and to the achievement of our planned business outcomes.
Step 4: Describe the planned (i.e. desired) outcomes of the effective work system.

Step 5: Describe the key inputs to the work system.
Step 6: Describe your work system in terms of transformation from inputs to outputs and outcomes.

Identify and describe the underlying business logic of this transformation and work system. In other words, by taking these inputs and applying this work system in the workplace we will achieve this desired business outcome. Step back and reflect on what you have written. Look at your stated work system purpose and the underlying business logic together. Does your logic make sense? What implicit and explicit assumptions are you making in your statements? Is this what you really want to do? Is this the best way of expressing your business logic in terms of a transformation from inputs into outcomes and outputs? Play with the wording of your purpose statement and your business logic until you feel they accurately reflect your intentions and your current thinking.

**Technique Hint:** Because you are using a prototyping approach to the development of this work system model, you don’t need to get too worried about getting it exactly right. You can always play “wordsmithing” later. As you engage both yourself and others in the ongoing design conversations you will come back to and review your purpose any number of times. This is a dynamic process. Your thinking will almost certainly change as you engage others in design conversations and as you begin to reflect on what you have designed to date. You will get fresh insights and ideas. The important issue is for you to document enough to convey your meaning and intentions and to keep moving forward by taking the next step.
Step 7: Identify the sub-systems that comprise your work system.

Draw the sub-systems and name each sub-system. The same naming rigour of verb and noun applies to sub-systems.

Step 8: Stand back and admire your design work so far!

You should now have a basic work system model that looks like this and includes the following features:
The Namadgi Technique

*Technique hint: There is no right level at which to design your work system. It can be as simple or as complex as you need it to be to address your business context and your understanding of your problem domain.*

*You may find that your system is really too big and trying to accomplish too many things. If so, break it into two or more work systems. Work systems should compliment one another and will always be in a dynamic relationship with one another.*

*Similarly, you may find that your area of focus is too small or simple, in which case you might consider including it as a sub-system of a broader more complex work system.*

Step 9: Reflect on what you are doing. Document any relevant assumptions that may be either implicit or explicit in your work and your work system model. Talk to others about your assumptions and what they may mean as you progress through your design and begin to think about implementation in the workplace. Are any of the assumptions likely to represent significant risk to the organisation or your design project?
Step 10: Document any insights, fresh thoughts, ideas and emergent learning that arisen during your design activities and your subsequent reflections. Think about how you might translate your insights and thinking so that it may be meaningful to others.

*Technique hint: Treat yourself as a learning system, give yourself feedback and take time for daydreaming and personal reflection. Nourish your intellect and your soul. Delight in your learning! Sing a song! Dance in the sunshine and the moonlight!*
TUTORIAL 2:

HOW TO DESIGN A WORK SYSTEM
TUTORIAL

HOW TO DESIGN A WORK SYSTEM

Purpose

The purpose of this tutorial is to introduce the reader to a practical approach to designing work systems in complex environments and to demonstrate a step by step process for developing work systems models in combination with interface diagrams and workspace diagrams. These techniques, when used in the spirit of action research and collaborative enquiry, provide a robust and rigorous way to conduct an holistic design of new work systems that is informed by both social ecology and by systems theory.

Tutorial Outline

- Key Practical Techniques
- Some Key Definitions:
  - Definition of A Work System
  - Other Definitions
- Why Use the Work Systems Mapping Technique?
- Benefits of Designing Whole Work Systems
- Some Background Theory and Other Useful Concepts:
  - Features of a Work System
  - Holistic Work Systems Diagram
  - Requisite Variety
  - Requisite Variety – Interface Diagram
  - Diagram – It’s About You
- The Process to Design a Work System
- Design as Dance – The 5 Step, Many Step Approach
- Summary of the 5 Step, Many Step Approach
- Designing a Work System – The 5 Key Deliverables
Key Practical Techniques

There a number of key processes associated with using the work system modeling technique. They include:

- A Process to Draw a Model of a Work System (see previous tutorial)
- A Process to Design a Work System
- A Process to Develop a Model of a Community/ Organisation Interface, including Business Process and Behaviour. (See Practical Analytical and Mapping Techniques).
- The use of rich contextual pictures, and work place/ work space diagrams. (See Practical Analytical and Mapping Techniques).

It is important to learn to use these techniques simultaneously when exploring design options and when developing prototypes of work systems.

(Australian native bees and banksias - a natural work system!)
Some Key Definitions

Definition of A Work System

I have defined a work system as the purposeful and intentional combination of people, processes, resources, technologies, intellectual capital and place required to achieve a planned business outcome.

Some examples of organisational work systems may include:

- An internal mail system for a business organisation;
- A performance management system to provide employees with feedback and to recognise and reward exceptional performance;
- A risk management system;
- An enquiry system;
- A compliance assurance system;
- A strategic management system.

Some key things to understand about the concept of a work system:

- A work system is not necessarily real. Rather it is an artificial construct to represent a reality.
- We can use the concept of work systems for the purposes of conducting collaborative enquiries and for focussing our critical thinking when designing organisational, behavioural and process changes.
- The concepts of work systems can be used to graphically illustrate organisational purpose, intentionality and relationships between activities and the achievement of planned business outcomes.
- We can use the models of work systems as artefacts in engaging people in conversations about the future and about potential changes to the workplace.

Other Definitions

What is work?

The Australian Concise Oxford Dictionary defines work as:

1. The application of mental or physical effort to a purpose; the use of energy.
2. a) A task to be undertaken.
   b) The materials for this.
   c) A task occupying (no more than) a specified time.
Why use the Work Systems Mapping Technique?

We design work systems and develop visual models of work systems and business process interface diagrams as a means of collaboratively exploring the complexity and the rich interconnectedness of our problem domain and the design environment in which we are working.

In doing so we:

- Work with others to make meaning, develop common understandings and engage people in coherent conversations about their future work environments.
- Reflect, support and achieve organisational purpose and intentionality.
- Pursue human-centred design.
- Acknowledge plurality and diversity.
- Design for viability and co-evolution.
- Design for requisite variety.
- Continue, in Robert Flood’s (1999) words “learning within the unknowable”.

Simply, the use of visual systems modelling techniques enhances people to work collaboratively and think critically.

Benefits of Designing Whole Work Systems

The benefits of designing whole work systems rather than simply designing business processes and/or information technology applications are:

- Designing work systems enables you to deal with complex problem domains and complex design issues. More linear and reductionist approaches such as business process design or information technology applications by definition cannot deal with complex and dynamic human work environments and problem domains.
- Designing work systems enables you to design for outcomes rather than just outputs.
- It enables you to take an holistic and systemic approach, which can only increase your chances of achieving successful design outcomes.
- It enables you to bring together disparate organisational, community and broader environmental elements and to explore relationships, boundaries and endless possibilities for change and the future.
- It enables you to apply fuzzy logic to complex design issues and to acknowledge that an element can be part of many systems at the time. This eliminates the design traps of black and white thinking and “either/or” boundary decisions that tie you into inappropriate and limiting design decisions and solutions.
- It enables a much better informed design and ultimately, management decision-making.
The Namadgi Technique

- It enables you to design for purposeful outputs and outcomes, and for emergent outcomes.

- Designing work systems using prototyping, action research and collaborative enquiry approaches enables you rapidly engage in strategic and coherent conversations, to test hypotheses, to explore potential design solutions, to realize potential design mistakes and to rapidly abandon inappropriate design solutions and ideas and to just as rapidly developing new hypotheses and design proposals.

- And, in the current ATO vernacular, it enables you to “think outside of the box”, to explore diverse possibilities while “keeping your eye on the main game”, and to achieve practical and effective outcomes.

Some Background Theory and Other Useful Concepts

Features of a work system

- It has a purpose.
- It has inputs, transformations, outputs, outcomes.
- It has sub-systems (in relationship to one another).
- It has a boundary.
- It is located in an external environment (i.e. the broader organisation and community).
- It will have emergent properties and give rise to emergent organisational, group and individual behaviours.
- It also had a designer (An intelligent, informed human being who made conscious and deliberate choices about the original purpose, elements, components and interactions of the system).

The many elements of a work system may include:

- People
- Business processes
- Organisation structures and reporting arrangements
- Information technology
- Consumable resources
- Facilities and equipment
- Unimaginable horror and complexity
- You
- The physical workplace
- Management and work practices
- Leadership
- High employee morale and job satisfaction
- Local culture, rituals and ceremonies
One way of illustrating the many elements and components that designers may need to consider when designing a work system can be seen in the following diagram:

An effective, productive and healthy workplace that encourages individual well-being and a sense of community, including a sense of place and belonging.
The Namadgi Technique

Other Key Concepts and Features used in Systemic Analysis and Design

- Logical and physical models
- Recursion
- Resolution
- Self-organisation
- Fuzzy Logic
- Limits of design
- We are only human
- Collaborative action research
- Prototyping
- Visual techniques
- Mind mapping, rich pictures and linking ideas

Requisite variety

Ashby’s Law of Requisite Variety states that in a viable system the variety of the controller must be equal to or greater than that which is being controlled (Flood & Jackson 1991).

This means that an effective, responsive and viable organisation needs the intentionally designed capability to deal with all the challenges from the external environment and the business events that occur across the organisation/community interface.

Two Approaches to Requisite Variety

Stafford Beer (1975), the creator of the Viable Systems Method, suggests two approaches to achieving requisite variety:

- Increase the variety of the controller until it matches the variety of the situation to be controlled.
- Take action to drastically reduce the variety to be controlled.
The notion of requisite variety can be illustrated using an interface diagram:

<table>
<thead>
<tr>
<th>World / Community</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential impacts from external factors and events</td>
<td>• The need for requisite variety to maintain viability and to meet expectations and demands from changing environment.</td>
</tr>
<tr>
<td>Requests/demands for products and services</td>
<td>• Requisite variety may be in the form of:</td>
</tr>
<tr>
<td>Performance feedback from world and community</td>
<td>o People with appropriate knowledge, expertise, skills, experience, aptitude, character etc</td>
</tr>
<tr>
<td>External scrutiny from regulatory authorities</td>
<td>o Business processes that can respond to many business events</td>
</tr>
<tr>
<td>Risks / threats / opportunities intelligence</td>
<td>o Information technologies (computer hardware, software, business applications, etc)</td>
</tr>
<tr>
<td>Invitations to contribute to external communities and organisations</td>
<td>o Communication technologies (eg. call centres, mobile phones)</td>
</tr>
<tr>
<td></td>
<td>o Responsive and readily adaptable strategic navigation and management etc</td>
</tr>
</tbody>
</table>
The Namadgi Technique

Other Useful concepts

➢ Designing simultaneously or national work systems and for local workplace needs and conditions.

➢ Social ecology (relationships between the individual, communities and the environment)

➢ Start with the basics: purpose, intentionality, desired outcomes

➢ As researchers and designers we become part of the complexity and the problem domain.

➢ When it all seems to be an impossibly big task, remember the old Chinese proverb that a journey of 10,000 miles begins with first step. You are on a long learning journey into the future so go on, take the first step.

➢ Other aspects of designing work systems: it’s about you! It is also about who you are becoming.

Other Aspects of Designing Work Systems:

It’s About You.

Knowledge and ways of knowing

Life experience

Ways of Learning

Career

Creativity and ways of expression

Inner self

It is also about who you are becoming
The Namadgi Technique

The Process to Design a Work System

Warning: This is described as a linear process for instructional purposes only.
Follow it slavishly at your own risk!

The Meta Process

At a high level the process to design a work system comprises five key dynamic and interrelated activities. These are:

- Establishing self awareness and group identity
- Identifying the purpose and outcomes of the proposed work system
- Developing a prototype
- Developing a detailed design
- Taking action and conducting critical evaluation

These activities can be viewed as both a process of design and as a work system for design. Diagrammatically, it can be illustrated as:

“DESIGN AS DANCE” – THE FIVE STEP, MANY STEP MODEL

A system for the design of human, social, business and organisational work systems

Appendix C

C-42

Extract from Namadgi Technique
I call this the “Design as dance: the 5-step, many step process”. I do so because learning to use this model is like learning to dance. You start learning one step at a time and the sequence in which to use the steps. As you learn your confidence grows and you start making up your own variations and sequences. You can do because this understand the basic steps and the relationships of the steps to one another, and because you also understand that with different dancing partners, different music, rhythm and beats you will need to vary your dance. So it is with design. Once you understand the basic steps and the interrelationships between the steps you can vary the approach and timing and scope of your design activities to suit your context and style and needs.

You begin with the five key activities, which form the basic steps. Understanding and using each of the five steps ensures a rigour and discipline to design activities, and will produce a far more robust design outcome. But a dance does not consist of just one sequence of five steps. You may perform the sequence many times or the variations of the sequence many times. So too in design. You initially conduct the five key activities, but then you may also conduct them many times, taking many, many steps as you become engaged in the swirl of creativity and design.

Don’t take the metaphor of dance too seriously though; the real issue is for you to be flexible, adaptable, intelligent and systemic in your approach to design.

(Don’t take the metaphor too seriously though!)
Design as dance: the 5-step, many step model.

Step 1: Establishing self awareness and group identity

Question: where to start?
Answer: with some self-awareness and clarity of thought.

You begin with an initial understanding of the problem domain and/or the design situation you are expecting to address. With this in mind you need to do three things:

1a. Articulate the outcomes you seek. Think about your purpose and intentionality and write an initial statement along the lines of “I intend to design a work system that enables the organisation to successfully achieve the outcome of...”.

1b. Ask yourself “What is it that you are really trying to do?” Review your purpose statement and make sure that it actually states what it is that you are really trying to do. Test your assumptions and ask yourself whether you and your group/team have the capability and capacity to do what you really want to do. Write a brief statement about your assessment of your capability to undertake the design you are after (your intended design).

1c. Reflection. Think about you are doing. Refine your statement of intention and purpose as required. Discuss them within your group and with others if necessary until you reach a common understanding of your role, motivations, purpose, intent, approach and expectations. (These points are not interchangeable; by discussing each of them you will gain a shared understanding of what is that you are going to do and how you may work together on your design).

Sub-System Name: Self-awareness and clarity of your purpose/group identity.
Step 2: Identify the purpose and the outcomes of the proposed work system

Now that you are informed by a common understanding of your role, motivations, purpose, intent, approach and expectations, you can begin the design of your proposed work system. There are four key activities you need to do in this step:

2a. Explore the problem domain and/or the design situation to gain a creative and contextual understanding. Use analytical and critical thinking techniques, including the levels of conversation, in your exploration of the design environment.

2b. Identify and define the required work system(s) in terms of system purpose and desired outcomes that will address the problem domain. Draw your initial high-level work system model. This model should show the work system in relation to the host organisation in terms of environment, the organisation (in terms of purpose, niche, strategic business outcomes), the broad business design and business logic of the organisation, and the work system (in relationship to the business logic and the business design). Broadly describe the underlying business logic and the transformation process that the work system represents.

2c. Explore the characteristics of the environment in which this proposed system will be interacting. Identify an initial set of stakeholders and interdependencies with other work systems and work areas.

2d. Engage people in collaborative approaches, including action research. Document your research and design thinking.

As a deliverable from this Step 2, you should now have a model of a proposed work system with a defined purpose and outcomes.

Sub-System Name: Identify the purpose and outcomes of the proposed work system.
Step 3: Develop a prototype of the work system.

3a. Identify the inputs, transformation(s), outputs and outcomes required.

3b. Identify the boundaries of the work system. What is in? What is not in? What maybe both in and not in? (Use some fuzzy logic here when considering the dynamic nature of your work system and the boundaries). What implications will this have for your design process and for the organisation?

3c. Identify and describe the components, sub-systems, relationships and dynamics of the work system.

3d. Play with the ideas. Think about things. Talk to people. Dance around the whiteboard.

You should now have the prototype of a work system that describes:

- The work system inputs, transformations, outputs, outcomes.
- Relationships with other work systems.
- Sub-systems, each with a name, purpose, transformations, outputs, outcomes.
- The relationships and interdependencies between the sub-systems.
- Where appropriate, Sub-sub-systems, each with a name, purpose, inputs, transformations, outputs, outcomes.

Sub-System Name: Develop a prototype
Step 4: Develop detailed designs, including work maps and interface diagrams.

4a. Develop work maps and interface models to show detailed relationships between the work of the work-area/organisation and the external clients, stakeholders, community etc.

4b. Develop detailed design and/or interface design diagrams that illustrate the relationships between the many elements of the work system. Populate your model with key relevant organisational and human elements, especially
- people,
- business events,
- business design,
- business logic,
- business processes,
- information technologies and computer applications,
- policy,
- legislation,
- information flows,
- work flows,
- performance measures,
- organisation and management structures,
- management and work practices,
- clients,
- products and services,
- resources,
- procedures,
- human resource management policy and practices,
- remuneration classification levels,
- desired organisational behaviours,
- desired client and community behaviours,
- organisational artefacts,
- cultural symbols and rituals,
- feedback and improvement loops,
- controls,
- physical workspace e.g. proposed layout, fitout, equipment, aesthetics etc.

4c. Keep surfacing and testing your assumptions. Keep challenging both yourself and others about your design. Document issues and thinking relating to the nature of proposed changes to existing work systems and organisational structures etc.

4d. Keep playing with ideas and thinking and talking to people and dancing around the whiteboard etc. If your creative energy flags conduct community singing in the local workplaces.

You should now have prototypes of detailed work systems models, interface diagrams and workspace diagrams.
**Sub-System Name:** Develop a detailed design, including work maps and interface models.

**Step 5: Take action and conduct critical evaluation.**

**5a.** Take action by using the models to inform:

- coherent conversations
- further design and/or redesign
- specifications
- development and testing
- marketing and communication
- education
- implementation and planning
- implementation
- workspace and workplace design
- evaluation and learning
- action research and iterative development
- improvement to problem situations.

Develop an action plan that takes you from design to implementation. Include in your action plan who is going to do what and by when.

**5b.** Surface and test your assumptions. Challenge your own and others ideas. Test your hypotheses. Document your outcomes and findings.

**5c.** Document your and others learning. Share the learning and the intellectual capital.
5d. Reflection and critical evaluation. Ask yourself some critical questions?

- Have you achieved what you set out to do?
- Do you need to change your design hypothesis and begin again?
- Does your design make sense?
- Does the design add value to the broader organisational design conversations?
- What conditions need to exist to support your design and to implement a sustainable and ethically desirable change in the organisation?

**Sub-System Name: Take action and conduct critical evaluation.**

- Detailed models and designs of work systems.
- Take action for implementation/improvement.
- 5a. Take action. Use models to inform:
  - coherent conversations
  - further design/redesign
  - specifications
  - development and testing
  - marketing and communication
  - education
  - implementation and planning
  - implementation
  - workspace and workplace design
  - evaluation and learning
  - action research and iterative development
  - improvement to problem situations
- 5b. Surface and test assumptions. Challenge your own and others ideas. Test your hypothesis, document outcomes and findings.
- 5c. Document and share learning and intellectual capital.
- 5d. Reflection and critical evaluation.
Summary

In summary, the 5 step, many step model for designing a work system involves:

- Developing self-awareness and clarity of purpose.
- Stating the problem domain and/or design situation, then designing an initial work system with a defined purpose and outcome.
- Developing a prototype model of the work system with several levels of resolution (i.e., sub-systems).
- Developing a detailed design, including work maps and interface diagrams. Documenting your design assumptions and issues.
- In collaboration with others, taking action to test ideas and use the models to inform further design, redesign, specifications, development, implementation, change, learning and evaluation processes.

This systemic approach to designing a work system can be illustrated with the following model:

**HOW TO DESIGN A WORK SYSTEM: IN SUMMARY**
DESIGNING A WORK SYSTEM
The 5 Key Deliverables

1. Start with a statement describing the:
   a. Name of the work system
   b. Purpose of the work system
   c. Intended outcomes

2. Then develop a high level model of the host organisation
   a. The environment
   b. The organisation (in terms of purpose, niche, strategic business outcomes)
   c. The broad business design and business logic
   d. The work system (in relationship to the business design and business logic)

3. Develop a prototype of the work system
   a. The work system inputs, transformations, outputs, outcomes
   b. Relationships with other work systems
   c. Sub-systems (each with a name, purpose, inputs, transformations, outputs, outcomes)
   d. The relationships and interdependencies between the sub-systems
   e. Sub-sub-systems (same as for sub-systems)

4. Develop detailed design and/or interface design diagrams
   a. Detailed design and/or interface diagrams that illustrate the relationships between the many elements of the work system. This should include people, business events, business processes, information flows, organisation and management structures, policy, management and work practices, clients, products and services, feedback and improvement loops, controls, physical workspace etc

5. Develop an action plan that takes you from design to implementation
   a. Include who is going to do what and by when
Tutorial 3:
Focusing Questions and Techniques for
A Systemic Appreciation of Your Own Work Environment

Your Focus:

Explain aspects of your work and the work of your area and/or team to a colleague who will be taking over your job when you soon move on.

You can develop this systemic appreciation by using a range of systems mapping and analysis techniques.

As you develop the individual visual analytical models you can begin to arrange them on a wall or other display area to create an holistic collage of analytical insights and perspectives of your work.

<table>
<thead>
<tr>
<th>Mind Mapping Technique</th>
<th>Knowledge Mapping Technique</th>
<th>Relationship Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask questions about my work, like:</td>
<td>What are the essential information sources/ sets/ flows that I need to do my work?</td>
<td>Who are my external and/or internal clients?</td>
</tr>
<tr>
<td>What do I do?</td>
<td>What are the key corporate documents that inform my work?</td>
<td>Who are the key people with whom I interact in doing my work?</td>
</tr>
<tr>
<td>What should I do?</td>
<td>What is the key legislation that influences the work and the management of this work and/or work area?</td>
<td>Who are the key clients of this work and work area?</td>
</tr>
<tr>
<td>Why does this work need to be done?</td>
<td>What is the key intellectual capital required to effectively do this work?</td>
<td>What is the nature of these relationships?</td>
</tr>
<tr>
<td>How does the work get done?</td>
<td>Where is it physically and/or electronically located?</td>
<td>Are there any formal and/or informal networks? Forums? Committees?</td>
</tr>
<tr>
<td>What does and doesn’t actually get done?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## The Namadgi Technique

<table>
<thead>
<tr>
<th><strong>Interface Analysis Technique</strong></th>
<th><strong>Business Processes Mapping</strong></th>
<th><strong>Rich Contextual Picture Technique</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the key interface between my work/work area and the clients to whom I/we provide services/products/information/relationships? What are the current behaviours, relationships, information flows across the interface?</td>
<td>What are the key business processes I use in my work? What is the value add/transformative nature of these processes? How effective are these processes?</td>
<td>Develop a rich picture that captures the essence of your work and you feel and relate to the work and the organisation. What is the key narrative and other stories you wish to tell about your work and workplace and organisation?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Work Systems Mapping and Analysis Technique</strong></th>
<th><strong>Workspace and Workplace Diagrams</strong></th>
<th><strong>Changing Landscape and Changing Nature of Work</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the main work system in which you are engaged? What are the secondary work systems in which you are involved?</td>
<td>Where does this work physically take place? Is there more than one physical work space or workplace involved? Does some of the work take place in virtual workspace? Is the work dependent upon a specific workspace, workplace or geographical relationships?</td>
<td>Are there any changes currently impacting on the work/workplace? Is the design of the current work systems in a state of transition? What other key influences and/or imminent changes are likely to impact on this work and workspace in the near future?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Social and Cultural Analysis</strong></th>
<th><strong>Organisational Structure</strong></th>
<th><strong>Information Technology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there a sense of community in this organisation/work area? Do people come together apart from work in social activities? Are there any significant ceremonies, rituals, icons, mythologies, metaphors, beliefs, shared values, shared meanings, patterns of behaviour, sense of place and belonging? What is important to people in the workplace?</td>
<td>What is the organisational structure of your work area? To whom do you report? Who reports to you? Where are they located? What is the organisational structure of the larger Team/Segment/Project/Committee/ATO/Market/BSL/Cross BSL/Inter-Departmental organisation(s) in which your work and you are located?</td>
<td>What are the key IT applications and/software used in this work? How effective are they? What do they do? How do they support strategic &amp; operational management, decision-making, risk management, resource management, intelligence gathering and analysis, information dissemination, knowledge management, statutory record keeping?</td>
</tr>
</tbody>
</table>

---

**Appendix C**

C-53 Extract from Namadgi Technique
Systemic Appreciation Techniques

<table>
<thead>
<tr>
<th>Mind Mapping Technique</th>
<th>Knowledge Mapping Technique</th>
<th>Relationship Diagrams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface Analysis Technique</td>
<td>Business Process Mapping</td>
<td>Rich Contextual Picture Technique</td>
</tr>
<tr>
<td>Work Systems Mapping and Analysis Technique</td>
<td>Workspace and Workplace Diagrams</td>
<td>Changing Landscape and Changing Nature of Work</td>
</tr>
<tr>
<td>Social and Cultural Analysis</td>
<td>Organisational Structure</td>
<td>Information Technology</td>
</tr>
<tr>
<td>Time &amp; Timing</td>
<td>Management &amp; Financial Information</td>
<td></td>
</tr>
</tbody>
</table>

Aspects of Time and Timing

As you put the holistic collage together also consider aspects of time and timing:

Annual cycle, monthly, weekly, daily, periodic, intermittent, predictable, non-predictable, lag, delay…
Management and Financial Information

You will also need to consider appropriate contextual Management and Financial Information, including:

- Budgets, income, cash flow
- Financial position and projections
- Numbers of staff
- Technical knowledge
- Management information and reporting
- Costs
- Productivity and performance measures
- Requisite skills and experience
- Workforce planning
- Contextual opportunity and risk assessments
- Strategic business plans
- Scenario planning; possible and probable futures
- Current productivity improvement initiatives
- Work plans
- Progress and status against business plans and planned business outcomes
- Problems and issues
- Strategic navigation
- Niche
- Aspirations
- Strategic intent
- Business logic
- Intelligence capability

This type of information can be presented in graphs, tables, text, reports, etc and included in your holistic collage.
The Namadgi Technique

Introduction to the Analysis and Design of Compliance Systems and Other Complex Work Systems

Tutorial 4: Designing a Work System to Support a Strategic Intervention.

Outline

The case study comprises four stages:

1. Systemic analysis.
2. The design of a work system.
3. Presentation of your analysis and design.
4. Reflection.

Systemic Analysis:

1. Define your focusing question:
   - What is the focusing question that is driving your systemic enquiry? What do you want to know? What do you want to find out?

2. Develop a mind map to explore your current understanding of the situation and other factors and considerations, as well as aspects of the landscape through which you may travel on your journey of enquiry and design.

3. Develop a high-level interface diagram locating the problem domain and the nature of the problem situation.


5. Create a rich contextual picture that captures the essence of your story and your understanding of the complex forces, influences and drivers that are shaping the problem domain.

6. Develop a statement of strategic intervention, e.g.:
   - “I/ we believe that a key point of leverage to improve this problem situation is............”
   - “I/ we propose that an effective point of strategic invention is............”
The Design of a Work System

7. Write a clear statement of individual/group identity and intent.

8. Draw a strategic interface diagram demonstrating the proposed strategic intervention, and showing how the proposed work system relates to the external environment.

9. Develop a high-level work system diagram, showing the work system name, purpose, outcomes, business logic and transformation.

10. Create a prototype of the proposed work system, including:
   - Sub-systems;
   - Sub-sub-systems for at least one sub-system;
   - Key contextual work system elements and the major relationships and dependencies between the key elements.

11. Further develop the detailed design including all aspects of the work systems and the component elements that you believe are relevant.

12. Draw an operational interface diagram showing the delivery of appropriate products and services, key process and information flows, and client relationships and expectations across the interface. Also show the requisite conditions required in both the external environment and the organisational environment for the proposed strategy to succeed and for your organisation to effectively achieve the planned business outcomes.

13. Create a workspace/workplace diagram, showing the requisite conditions and the key features of the designed physical environment that are essential for contributing to an effective, supportive, healthy and productive workplace where the work will actually be performed.

14. Identify criteria for viability and sustainability, including requisite conditions in both the external and internal environments.

15. Develop a list of key assumptions embedded in your design and which are fundamental to the success of your proposed design.

16. Use your design to develop a table of interrogative questions that can be used to conduct a diagnostic of the existing capabilities.

17. Develop an initial action plan to engage others in conversations about the design, and to further test the prototype, the ideas and the assumptions. How will you progress from this work to an appropriate strategic decision making point? What do you believe needs to happen after that to see your design taking shape in the real world and being implemented?

Presentation of your analysis and design

18. Present a summary of your diagrams, work maps, research findings, thinking, learning and design rationale.
Reflection

19. Reflect on the experience and document your thoughts and learning as well as the feedback you received and any emergent ideas that arose through your presentation.
The Namadgi Technique

Section

The Iceberg Model and other Techniques for Research and Analysis in an Intelligence Environment
The Iceberg metaphor has been used by many authors and management consultants to discuss the need to seek beyond surface of events and problems. It is particularly useful when introducing people to systemic analysis and the notion of exploring systemic roots, drivers and influences contributing to complex problem domains and situations.

In developing the iceberg concept into a practical visual tool I need to acknowledge the key influences of Argyris (1993), Hames (1994), Hames and Oka (1997). I also want to acknowledge the ongoing design conversations between myself and my colleague, Stephen Jovanovich, as a source of many emergent ideas, including the shaping over time of this particular form of Iceberg analysis.
Intelligence Analysis Techniques

Used in:
- Epidemiology
- Research
- Issue Resolution
- Problem solving
- Systemic Analysis
- Creative Design

Am I seeing what I expect to see? Or am I seeing something different?

1st Order
- Pre-event
- Proactive

2nd Order
- Event
- Surprise

3rd Order
- Post-event
- Reactive

The Iceberg Metaphor

- Patterns and Trends
- Systemic Structures and Dynamics
- Complex Adaptive Systems
- Worldviews and beliefs

Take Action

Evaluate

1st Order
- Analysis

2nd Order
- Synthesis and Design

3rd Order
- Systems mapping techniques for analysis & design
Am I seeing what I expect to see? Or am I seeing something different?

Pre-event
- Pre-event
- Reactive

Event
- Reflective
- Surprise

Post-event
- Proactive

Intelligence Analysis Techniques
- Used in
  - Epidemiology
  - Research
  - Issue Resolution
  - Problem solving
  - Systemic Analysis
  - Creative Design

Deconstructing the Iceberg Metaphor

Economics
- Social
- Economic
- Political
- Technology
- Environmental
- Tax technical
- Tonal

Systems of compliance
- Business
- Industry
- Sociology
- Technology
- Psychology

The nature of events, recognition and response

1st Order
- Analysis
- Synthesis
- Design
- Take Action
- Evaluate

2nd Order
- Patterns and Trends
- Systemic Structures and Dynamics
- Complex Adaptive Systems
- Worldviews and beliefs

3rd Order
- The Five Whys

The DCASAL model & process
- Macro Environmental Analysis: What do these mean? How do you do this analysis?
- Broader contextual environment
- The Iceberg Metaphor
- The nature of events, recognition and response
- Different levels of analysis
- Some practical techniques
- Systems mapping techniques for analysis & design
- The Five Whys
- The nature of events, recognition and response

Appendix C C-62 Extract from Namadgi Technique
Initial Notes for

1\textsuperscript{st}, 2\textsuperscript{nd} & 3\textsuperscript{rd} Order Analysis

to accompany the Iceberg Analysis model.

Author: David Bruce-Smith.

1\textsuperscript{st} order analysis would be the simple assessment of saying "Does what I am seeing/ hearing/ perceiving/ sensing/ feeling make sense? What does this mean? What might this mean in my immediate context?" i.e. without any further research or analysis. Given what I currently know of the business world, the ATO, the ATO compliance plan and my own work "what might this information mean:

- to my work?
- to the work of my team?
- Segment?
- BSL?
- Market?
- ATO?

In some circumstances this question of "What might this mean?" will be equally applied to such categories of:
We should be able to provide people with a reasonable set of categories to support their identification and initial analysis of information that may contribute to current intelligence. Similarly we should be able to provide a number of practical tools and techniques for assisting in this recognition and 1st order analysis of possible implications.
2\textsuperscript{nd} order analysis should be the asking and investigation of other strategic questions such as:

- Is this an isolated event or part of some pattern and trend?
- How long has this been happening? Is it a new pattern or trend or has it been forming and operating for a length of time?
- Have we seen similar occurrences in the past? Has this a history? What do we already know about such situations and phenomena? Do I need to establish a tracking and monitoring process to gain further understanding/ evidence of this over time?
- Is this also part of other patterns and trends that the ATO is monitoring/ researching/ investigating etc?
- What are the origins of the behaviour that I am seeing?
- What are the systemic shifts, systemic roots, systemic drivers in the environment that that encouraging and/or causing this behaviour to emerge now?
- Is the behaviour deliberate/ intentional or is it an emergent property of other intentions and structural features in the current global and/or local economy, culture, society, political and ecological environment?
- What are the implications of such behaviour?
- How might I record such behaviour and keep an eye on this emerging behaviour/ occurrence?
- How might we intervene in the system to address this situation and reduce the identified the risk?
- Is my analysis/ interpretation of this correct? Do I really understand what I am seeing/ sensing/ finding etc?
- Are the other ways of thinking about this?
- Are there other contexts in which I could frame this information to gain an entirely different meaning and understanding?
- How do I research and substantiate and model aspects of this information that I am coming across?
- Do I need to collaborate with other people and/or organisations on this?
The Namadgi Technique

- Do I need to do further analysis and research? If not me, then whom? Who needs to be informed/appraised of this situation and to commission further analysis and research?
- Do I need to escalate this information?

**3rd order analysis** would apply a range of methodologies and techniques and address such questions as:

- What are the short and long-term risks, implications, consequences and possible/probable futures if the situation highlighted by the intelligence is not addressed?
- Do other government agencies/organisations/research areas need to be involved in discussing this/making meaning of this/further researching and designing systemic interventions? Will this greater strategic focus and thinking change how we currently assess and interpret this information/situation?
- What are the strategic and/or policy decisions that need to be taken to address this situation?

@@@@@@@@@@@@@

Appendix C C-66 Extract from Namadgi Technique
Aspects of Applied Systems Thinking:
An Introduction to Work Systems Mapping

The Namadgi Technique

Appendix C  C-67  Extract from Namadgi Technique
Technique 6.1:
Rich Contextual Pictures
and Wall Mapping Techniques

Introduction

The Australian Public Sector is facing an environment of increasingly difficult and complex interrelated social, economic, technological, ethical, cultural, political, organisational, international and ecological issues in which it is expected to administer legislation and government policy. Many senior and middle managers struggle in the face of this complexity to make meaning and to find effective ways to individually and collaboratively explore the systemic nature of many of the issues that they are expected to address.

Working as a social ecologist in the Australian Taxation Office over the last ten years I have been researching, designing and using a range of creative visual techniques to assist senior and middle managers in exploring and understanding complex problem domains and in identifying appropriate strategic, and systemic interventions required to address the problem domain. These visual techniques include the collaborative development of rich pictures (Checkland and Scholes 1990), mind maps, knowledge maps, relationship diagrams and a creative mix of linear and systemic visual modelling techniques, combined with photographs, text, narrative, representations of corporate artefacts (eg key organisational documentation, legislation, strategic statements, public booklets etc), workspace and workplace diagrams, sketches, drawings, collage, symbols and even representations of key people engaged in dialogue.

Rich Contextual Pictures

The notion of rich pictures formed an integral component of Peter Checkland’s Soft Systems Methodology (1981) as a means of capturing essential cultural, political and behavioural aspects of the human experience of organisations and work systems.
The Namadgi Technique

These were the soft systems, an exploration and understanding of which were just as important in management and organisation design as the analysis of the hard systems (e.g. information technology applications, data flows, business processes).

Over the last seven years I have played with and further developed this notion of rich pictures of a problem domain by combining it with narrative and story-telling techniques, the understanding of large organisations as complex adaptive systems, fuzzy logic, and a qualitative social research approach in the form of a social ecology enquiry that encourages the exploration of dynamic relationships between individuals, communities and the broader contextual environment.

Essential elements of this enhanced rich picture technique include:

- The encouragement of personal and group creativity,
- The use of story-telling and narrative techniques,
- The use of illustrations, diagrams, text, collage and photographs,
- The use of semiotics (i.e. symbols and recurring images that create resonance in the viewer),
- Inclusion of multiple perspectives and worldviews,
- Personal, experiential and systemic understanding of the world,
- Inclusion of paradox, ambiguity and the non-rational,
- Subjective and qualitative analysis and interpretation, as well as
- The more traditional forms of management and organisation analysis (e.g. business processes, information flows, decision-making forums, organisational structures).

Features of a Rich Contextual Picture:

- A rich contextual picture is a creative diagram representing the essential elements of the problem domain or area of focus that you are exploring and analysing,
- It can comprise many different elements and ideas,
The Namadgi Technique

- It can be a creative interpretation, however it must communicate the essence of
  the issue to others,
- It can be done by an individual or a group,
- It can be developed over time as your understanding grows,
- It can be a story of your journey exploring and analysing the particular issue,
- It can combine a number of different techniques,
- It reveals meaningful information about the situation in focus.

A Rich Contextual Picture:

- Can make use of many visual techniques and characteristics,
- Tells a story,
- Is creative,
- Can contain diagrams, words, arrows, symbols, icons,
- Key elements and components of the story,
- Demonstrates dynamic relationships,
- Highlights issues and questions,
- Can use visual signposts,
- Illustrates information flows, sets, stores, sources,
- Illustrates feedback loops and dynamic elements.

Rich contextual pictures can many aspects and perspectives of life and existence including:

<table>
<thead>
<tr>
<th>Landscape</th>
<th>Past, present, future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicality and the physical world</td>
<td>Cultural features and behaviours</td>
</tr>
<tr>
<td>Logic and logical argument</td>
<td>Emotions</td>
</tr>
<tr>
<td>Intellectual ideas</td>
<td>Spirituality</td>
</tr>
<tr>
<td>Society and social behaviours</td>
<td>Environment</td>
</tr>
<tr>
<td>Politics</td>
<td>Ecology</td>
</tr>
<tr>
<td>Philosophy</td>
<td>Dreams</td>
</tr>
<tr>
<td>Economics</td>
<td>Aspirations</td>
</tr>
</tbody>
</table>
Alternative forms of creating and expressing rich contextual pictures:

- Mind maps
- Contextual sketches
- Photographs
- Collage
- Digital Video

Two different forms of rich contextual pictures on the next two pages.

Diagram 1 represents a rich contextual picture quickly sketched by the author to explore the relationships between visual techniques and theoretical frameworks. (11 August 2003).

Diagram 2 is a rich contextual picture exploring aspects of current management and organisational capability.
Diagram 1: a rich contextual picture quickly sketched by the author to explore the relationships between visual techniques and theoretical frameworks. (11 August 2003).
The Namadgi Technique

Appendix C C-73 Extract from Namadgi Technique
A Simple Technique for Creating a Rich Contextual Picture

The idea and task of developing a rich contextual picture can be extremely daunting to many adults in the workplace, especially those that are predominantly linear thinkers and the many, many adults who may not have drawn or expressed themselves creatively in many years.

A rich contextual picture can be developed in stages by using some of other basic analysis and mapping techniques and then cunningly arranging and displaying these diagrams physically together on a wall and/ or a large sheet of paper.

<table>
<thead>
<tr>
<th>Technique</th>
<th>Type of Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge map</td>
<td>Information sources, information flows, information repositories and destinations; and transformations.</td>
</tr>
<tr>
<td>Processes</td>
<td>Analysis of value-adding sequences and activities; transformations; step-by-step processes in research; investigation; problem solving; and decision-making.</td>
</tr>
<tr>
<td>Mind maps</td>
<td>Exploration of ideas, issues, themes, topics, etc. Connected elements of a story, information &amp; logic trees &amp; branches, symbols, illustrations etc.</td>
</tr>
<tr>
<td>Organisation charts</td>
<td>Hierarchy, teams, people, individuals &amp; groups, committees, organisational responsibilities &amp; reporting structures, and decision-making.</td>
</tr>
<tr>
<td>Technique</td>
<td>Type of Information</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Relationship and influence diagrams</td>
<td>Formal and informal networks; interdependencies; and emergent qualities &amp; properties.</td>
</tr>
<tr>
<td>Fuzzy logic and fuzzy boundaries</td>
<td>Inclusion, exclusion, ambiguities, paradox, non-defined areas, entities, groups, changing compositions of groups &amp; entities.</td>
</tr>
<tr>
<td>Narrative</td>
<td>Major points in a story; commentary by the designer of the rich contextual picture; and the perspectives of the analyst.</td>
</tr>
<tr>
<td>Information flows and feedback loops</td>
<td>Information sets, information flows, and feedback loops.</td>
</tr>
<tr>
<td>Illustrations and diagrams</td>
<td>Cultural aspects and artefacts, rituals, ceremonies, rites of passage, rhythms in the organisational life environment.</td>
</tr>
<tr>
<td>Work systems maps</td>
<td>Capability expressed in terms of work systems, sub-systems, etc.</td>
</tr>
<tr>
<td>System maps</td>
<td>Features of environment and area of focus expressed in terms of systems properties, features &amp; components.</td>
</tr>
</tbody>
</table>
## The Namadgi Technique

<table>
<thead>
<tr>
<th>Technique</th>
<th>Type of Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface diagrams</td>
<td>Key relationships, information flows, processes, behaviours, products &amp; services, clients etc.</td>
</tr>
<tr>
<td>Work space and work place diagrams</td>
<td>Physical layout of current and/or future work space &amp; work place.</td>
</tr>
</tbody>
</table>

### Deconstructing a Rich Contextual Picture

The diagram on the following page (Diagram 3) is of a “deconstructed” rich contextual picture, illustrating how these different modelling techniques can be used in the development of a rich contextual picture.
The Namadgi Technique

The Use of Wall Maps

While each of the three techniques discussed so far are powerful creative and visual analytical approaches in themselves, it is when the techniques are used in combination that they really become extremely powerful tools for exploring complex problem domains and for identifying potential areas for strategic intervention.

It is this combination of these techniques that I refer to as “wall mapping”, simply because I use large sheets of paper pinned to the wall of office meeting rooms and on which I develop rich diagrammatic analyses of complex problem domains. On these large sheets I begin to use information from all the other analytical techniques to begin creating a narrative about our emerging understanding of the complex problem domain.

To capture all this information I use large sheets of clean white drawing paper (eg 1.6 metres in height by 3 to 5 metres in length) that I tape or pin to office and meeting room walls (even corridors) and then over time and in conversation with others I develop complex visual explorations and analyses of the relevant problem domain.

I find that the use of coloured felt-tip pens and images of corporate artefacts, combined with my own creative imagination and visual design abilities as well as the more traditional visual information techniques in these large information displays greatly enhances people’s intuitive understanding of aspects of the complexity and provides them with a non-threatening visual exploration of complex situations. The non-threatening quality of these large “office art” wall maps is extremely important as it enables and encourages time-pressed senior and middle managers to see, rather than having to remember, many different aspects of the problem domain at the same time. It also enables people to view and discuss the evolving wall map over a number of weeks or even months, once again reducing the pressure on an individual to remember the many details and relationships, and in doing so encouraging a far more inclusive and collaborative exploration of the problem domain. Similarly, other people’s ideas and suggestions and evolving understanding can also be incorporated into the use of these large diagrams through the use of coloured felt-tipped pen, annotated post-it stickers, new photographs and images, even A4 sheets and sticky tape etc.
The Namadgi Technique

Using these techniques people were individually and collectively making new meaning and developing a greater shared understanding of the complex issues facing them and the complex environment in which they were operating.

Some of the information I capture on these wall maps includes focussed, eclectic, creative and relevant combinations of processes, information flows, people, technologies, client interfaces and relationships, organisational structures and hierarchies, management practices and actual behaviours, guiding principles, policies, laws, contextual language and vocabulary, workplace culture, thinking patterns, worldviews, values and many other elements normally considered in systemic and holistic exploration and analysis. Sometimes I use the unfolding diagram to let the narrative of the social ecology enquiry emerge; other times I use the initial exploratory story and narrative to inform my development of the diagram and illustrations. Often I do both. This of course is a highly subjective and creative approach to analysis, and one with which I have had considerable success and enjoyment in the last few years.

The key features of the technique are:

- It enables me to creatively synthesise my current thinking at the same time as continuing to analyse a complex and dynamic situation (i.e. it allows me to simultaneously conduct an analysis and to design the meta-narrative of the analysis).

- As a person with a strong visual learning preference, it enables me to create new meaning and understanding as I progress. In this way, my iterative development of the rich contextual picture wall map gives me immediate visual feedback and enables a double loop learning and reflection process that in turn sparks other ideas and considerations for inclusion. I can also approach the creation of the rich contextual picture in much the same way as an artist works with a large canvas, working on some areas in great detail and then
standing back to reflect on the design and visual balance and impact of the overall big picture.

➢ It immediately attracts and commands an audience’s attention, and can be used to quickly focus people’s attention and discussion in any particular area of the map;

➢ It enables me to present complex systemic appreciations and stories about organisational, business and environmental issues to others and to engage others in contributing to the emerging broader narrative and the development of shared understanding and meaning.

➢ It allows people in a meeting or other forum to have a very visual and readily viewed reminder and initial analysis of the many issues, perspectives and aspects of a dynamic, complex adaptive problem domain. I have found that people readily respond to this form of rich, informative, dynamic, imaginative and creative information display and use the narratives represented on the wall maps in front of them to conduct comprehensive, coherent and strategic analysis and design conversations.

➢ As a facilitator, the use of the wall maps enable me to readily focus discussion and to direct the conversation to the appropriate level of detail, sometimes strategic, sometimes operational, sometimes both, depending on the context and the purpose of the discussion. One example of this is that I can readily add definitions to the wall map during a discussion to address ambiguities that we have surfaced or to help people avoid talking at cross purposes. Similarly, I can quickly point out red-herrings, set fuzzy boundaries, identify areas for further research, and at times, surface, identify and challenge, albeit gently, deeply held assumptions and worldviews by the individual participants in the meeting.

➢ On a personal note, for me as social ecologist and as an analyst and creative designer, the act of creating these wall maps it is wonderfully stimulating, therapeutic, satisfying and relaxing.
Through the use of this wall mapping technique I have been able to engage time-pressed senior managers in strategic analytical and design conversations that have significantly enhanced our collective abilities to make timely decisions about highly complex issues and systemic problems.

In designing these rich contextual pictures I can readily use a wide range of systems mapping and social ecology narrative techniques including the use of mind maps, relationship diagrams, interface diagrams, process maps, work systems maps, work systems component diagrams, causal loop analysis, viable systems diagnostic, strategic navigation analysis (Hames & Oka 1997), conversation mapping, cognitive systems mapping, the identification of emerging ambiguity, assumptions and paradox etc.

It also enables me to present visual and verbal systemic and holistic appreciations of complex issues to others and to then engage others in participative discourse in a way that I simply do not believe is possible through the use of linear and reductionist reports, written as they are in sentences and paragraph form and presented electronically in linear formatted PowerPoint presentations, as single overheads and/or on A4 printed pages.

The wall maps can be readily updated with different coloured pens directly onto the paper. They can also be updated by documenting comments, observations, suggestions, etc onto an accompanying whiteboard, through the use of written comments on post-it stickers, and/or drawing and writing on other sheets of A4 sized paper that can be attached by sticky tape to the existing wall map. The great advantage of this is that when I am engaging others in conversations people can see that their contributions to the unfolding narrative are being immediately included and considered. This in turn, creates trust, and confidence and a willingness to contribute greater insights and to share deeper sets of personal and often tacit knowledge.

I can also readily change areas of the large wall maps, crossing out aspects of the story as I find a better word, tone, nuance, image, symbol, connection,
The Namadgi Technique

information flow, relationship etc. If it really gets too messy then I can synthesise and transcribe the evolving iteration of the narrative onto another large sheet of paper.

- I can iteratively develop these wall maps over a number of sessions and days, sometimes even weeks. This process of systems mapping over a prolonged period also enables greater time for reflection and personal learning, as well as critical thinking and being able to take time out to conduct appropriate research into other associated ideas and/or emerging topics and issues.

The wall mapping technique however, does have a major drawback in that these large complex rich contextual pictures are not readily transcribed onto an electronic file format, and therefore, in our current electronic office environment, cannot be readily stored, accessed, reproduced or transferred to others. This is where digital photography and technology such as scanners become important in this form of systemic analysis.
The Namadgi Technique

Section

24 Useful Ideas and Concepts to Think About When You Design
24 Useful Ideas and Concepts

**BASIC THEORY**
1. Features of a system
2. Features of a work system,
3. Logical and physical models
4. Recursion
5. Resolution
6. Requisite variety

**COMPLEXITY THEORY**
7. Self-organisation
8. Sensitivity to initial conditions and nudging
9. Co-evolution
10. Organisations as complex adaptive systems
11. Autopoiesis
12. Fractals and fractality

**LIMITATIONS**
13. There are limits to design
14. We are all only human
15. Time (time in which to be effective and to influence)

**APPROACHES**
16. Collaborative action research and iterative design
17. Individual action research and action design
18. Creativity and creative design

**POLITICS**
19. Design can be a dangerous activity

**WORLDVIEWS**
20. Designing for national work systems and local workplace needs and conditions
21. Social ecology (relationships between the individual, communities and environment)

**MOST IMPORTANTLY**
22. No matter how big the task may seem, start with the basics: purpose; intentionality; and desired outcomes

**AND REMEMBER…**
23. As researchers and designers we become part of the complexity and problem domain

**YOU**
24. Take care of yourself
The Namadgi Technique

A Journeyman’s Toolkit

Summary

Table of Contents

1 Title Page & Publication Details 1-1
2 Introduction: A Journeyman’s Toolkit 2-1
3 A brief overview of the theoretical framework for the development of the Namadgi Technique. 3-1
4 Journeys Across My Landscape 4-1
5 Introduction to Work Systems Mapping 5-1
6 The Difference Between Analysis and Design 6-1
7 Some Basic Analysis Symbols and Visual Techniques 7-1
8 Practical Analysis and Mapping Techniques 8-1
9 Interrogative Techniques 9-1
10 Analysis as a Work System Process plus deliverables diagram. 10-1
11 Design as a Work System Process plus deliverables diagram 11-1
12 Examples of Work System Designs 12-1
13 The Iceberg Model and Other Techniques for Exploring Complexity 13-1
14 Understanding and Mapping Complex Environments 14-1
15 Conducting a Systemic Enquiry: Approaches to the Analysis of Ecological Systems and Complex Human Environments. 15-1
16 Experiential Training Activities and Other Exercises 16-1
17 24 Useful Ideas and Concepts to Think About When You Design. 17-1
18 Some Notes & Quotes on Systems Thinking 18-1
19 Selected Bibliography 19-1

Appendix C C-86 Extract from Namadgi Technique
# The Namadgi Technique

## A Journeyman’s Toolkit

### Detailed Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Title Page</td>
<td>1-1</td>
</tr>
<tr>
<td></td>
<td>‣ Publication Details</td>
<td>1-1</td>
</tr>
<tr>
<td></td>
<td>‣ About this Booklet</td>
<td>1-2</td>
</tr>
<tr>
<td></td>
<td>‣ Acknowledgement and Disclaimer</td>
<td>1-2</td>
</tr>
<tr>
<td></td>
<td>‣ Summary Table of Contents</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>‣ Detailed Table of Contents</td>
<td>1-5</td>
</tr>
<tr>
<td>2</td>
<td>Introduction: A Journeyman’s Toolkit</td>
<td>2-1</td>
</tr>
<tr>
<td>3.</td>
<td>A brief overview of the theoretical framework for the development of the Namadgi Technique.</td>
<td>3-1</td>
</tr>
<tr>
<td>4</td>
<td>Journeys Across My Landscape: “When I Design”</td>
<td>4-3</td>
</tr>
<tr>
<td></td>
<td>‣ The Song of the Eucalypt Forest</td>
<td>4-6</td>
</tr>
<tr>
<td></td>
<td>‣ Diagram: Thinking Simultaneously…</td>
<td>4-10</td>
</tr>
<tr>
<td></td>
<td>‣ Diagram: The Thinking Rainbow</td>
<td>4-11</td>
</tr>
<tr>
<td></td>
<td>‣ Principles of My Social Ecology.</td>
<td>4-12</td>
</tr>
<tr>
<td></td>
<td>‣ Life Planning.</td>
<td>4-15</td>
</tr>
<tr>
<td></td>
<td>‣ Thoughts on a Sense of Place.</td>
<td>4-19</td>
</tr>
<tr>
<td></td>
<td>‣ Some of the things that matter…</td>
<td>4-22</td>
</tr>
<tr>
<td></td>
<td>‣ Poem: “A Summer night”, 1998.</td>
<td>4-25</td>
</tr>
<tr>
<td>5</td>
<td>Introduction to Work Systems Mapping</td>
<td>5-1</td>
</tr>
<tr>
<td>6</td>
<td>The Difference Between Analysis and Design</td>
<td>6-1</td>
</tr>
<tr>
<td>7</td>
<td>Some Basic Analysis Symbols and Visual Techniques</td>
<td>7-1</td>
</tr>
<tr>
<td>8</td>
<td>Practical Analysis and Mapping Techniques</td>
<td>8-1</td>
</tr>
<tr>
<td></td>
<td>‣ Storytelling and Narrative.</td>
<td>8-3</td>
</tr>
<tr>
<td></td>
<td>‣ Linear Techniques</td>
<td>8-11</td>
</tr>
<tr>
<td></td>
<td>‣ Organisation Charts</td>
<td>8-13</td>
</tr>
<tr>
<td></td>
<td>‣ Lists</td>
<td>8-14</td>
</tr>
<tr>
<td></td>
<td>‣ Lists and categories.</td>
<td>8-14</td>
</tr>
<tr>
<td></td>
<td>‣ Flow charts.</td>
<td>8-14</td>
</tr>
<tr>
<td></td>
<td>‣ Process maps.</td>
<td>8-14</td>
</tr>
<tr>
<td></td>
<td>‣ Business processes.</td>
<td>8-15</td>
</tr>
<tr>
<td></td>
<td>‣ Design of a business process.</td>
<td>8-18</td>
</tr>
<tr>
<td></td>
<td>‣ Pictorial Techniques</td>
<td>8-27</td>
</tr>
<tr>
<td></td>
<td>‣ Mind maps</td>
<td>8-28</td>
</tr>
<tr>
<td></td>
<td>‣ Rich contextual pictures.</td>
<td>8-30</td>
</tr>
</tbody>
</table>

---

Appendix C C-87 Extract from Namadgi Technique
A simple technique for creating a rich contextual picture. 8-32
Examples of a rich contextual picture: ‘Strategic & Business Intelligence’. 8-34
Examples of a rich contextual picture: Overview of Interpretative framework and some key outcomes from my thesis. 8-35
Examples of a rich contextual picture: as an analysis technique. 8-36
Examples of a rich contextual picture: ‘Thinking simultaneously about systems theory and chaos theory and…’. 8-37
Deconstructing a rich contextual picture. 8-38
Work mapping. 8-40
Developing a work map in stages. 8-41
Illustrations. 8-46
An illustration of organisations in communities as complex adaptive systems. 8-47
Knowledge maps. 8-48
An example of a combined knowledge map and rich contextual picture, from my thesis: interplay between the relevant influential literature, texts, authors, etc and my four action research phases. 8-49
Deconstructing a Knowledge Map 8-50
Systemic and Holistic Techniques 8-53
Relationship diagrams. 8-54
System maps. 8-55
Complex adaptive system map. 8-55
Work systems mapping. 8-56
An example of an analytical work systems map. 8-57
A work systems diagram (template). 8-58
Systems component diagram. 8-59
Work Systems Desk Guide 8-60
Interface analysis and mapping. 8-61
Features of an interface diagram. 8-62
Strategic level interface maps. 8-63
An ATO 1999 “Manage & Shape” Interface Map 8-64
Designing systems and processes across the organisational/community interface. 8-65
Tutorial: developing an interface analysis model. 8-66
Representations of Other Systems Methodologies and Applications of Systems Thinking. 8-71
Causal Loop Analysis (3 variations). 8-72
Viable Systems Model. 8-75
Soft Systems Methodology. 8-76
Strategic Assumption Surfacing and Testing. 8-77
Strategic Navigation. 8-78
Bawden’s Learning System Approach. 8-80
Bawden’s Critical Learning System (the lemniscate). 8-81

9 Interrogative Techniques 9.1
Critical Thinking and Critical Questioning Techniques: 9-1
Levels of conversation 9-2
5 Whys 9-3
The 5 fingers and hand of ancient man 9-4
The Namadgi Technique

- Brookfield’s components of critical thinking. 9-5
- An example of an applied critical and systems thinking analysis process to identify risk in the ATO. 9-6
- Ulrich’s 12 questions. 9-8
- The Iceberg analysis technique. 9-9
- A simple heuristic for strategic and critical questioning. 9-10

10 Analysis as a Work System Process plus deliverables diagram. 10-1

11 Design as a Work System 11-1

- Process plus deliverables diagram 11-2
- Tutorial 1: How to draw a work system. 11-16
- Tutorial 2: How to design a work system. 11-24

12 Examples of Work System Designs 12-1

13 The Iceberg Model and Other Techniques for Exploring Complexity 13-1

- The Iceberg model 13-3
- Intelligence analysis techniques: the Iceberg model and 1st, 2nd, and 3rd order analysis. 13-4
- Notes for 1st, 2nd, and 3rd order analysis. 13-5
- 3 different sets of questions for iceberg analysis: levels of conversation questions; Am I seeing what I should be seeing?
- The 5 Why’s applied. 13-8
- Deconstructing the iceberg metaphor diagram. 13-12
- Analysis process and deliverables. 13-13
- An interface model showing compliance management as an open system. 13-14
- Aspects of organisational design (06 July 2003). 13-15
- A diagram for action research. 13-16
- Brief notes on fuzzy logic. 13-17
- How to use the levels of conversation. 13-18

14 Understanding and Mapping Complex Environments 14-1

- An illustrated model of an organisation and related community as a complex adaptive systems model. 14-3
- A social ecology enquiry (as a system of enquiry). 14-5
- An organisation as a complex adaptive system (original diagram). 14-10
- An organisation as a complex adaptive system (Word file). 14-11
- Exploring organisations and communities as complex adaptive systems. 14-12
- A problem domain viewed as a complex adaptive system. 14-13
- An example of a diagnostic tool for intelligence and other capabilities. 14-14
- Diagram: Exploratory thoughts on the implications of recursion in viewing a business organisation through the lens of the viable systems diagnostic model. 14-15

Appendix C C-89 Extract from Namadgi Technique
The Namadgi Technique

- Diagram: Using a number of techniques simultaneously. 14-18
- A Fractal Pattern of Poor Management Practices 14-19
- Diagram: Designing systems and processes across the organisational/community interface 14-20
- Diagram: A taxonomy of work systems. 14-21
- How to use the Strategic Navigation “Trimtabs” to identify leverage 14-23
- How to conduct Coherent Conversations 14-25

15 Conducting a Systemic Enquiry: Approaches to the Analysis of Ecological Systems and Complex Human Environments. 15-1
- How do I make meaning in this complex environment? 15-2
- Diagram: the thinking rainbow. 15-3
- Exploring organisations & communities as complex adaptive systems. 15-4
- Activity: systemic appreciation – an analysis of a current complex adaptive system. 15-5
- Tutorial: Focussing questions and techniques for a systemic appreciation of your own work environment. 15-6
- Tutorial: Designing a work system to support a strategic intervention. 15-11

16 Experiential Training Activities and Other Exercises 16-1

17 24 Useful Ideas and Concepts to Think About When You Design. 17-1

18 Some Notes & Quotes on Systems Thinking 18-1

19 Selected Bibliography 19-1
APPENDICES FOR
“EXPLORING AND DESIGNING PRACTICAL TECHNIQUES FOR THE ANALYSIS AND DESIGN OF COMPLEX WORK SYSTEMS: A JOURNEYMAN’S STORY”

by

David A. Bruce-Smith

APPENDIX D:

SOME USEFUL NOTES AND QUOTES ABOUT SYSTEMS THINKING


**Appendix D:**

Examples of the range of ideas and applied knowledge about systems, systems thinking and systems mapping.

<table>
<thead>
<tr>
<th>Author, Background, Perspective, Context</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stuart Kaufman (1980)</strong> Academic</td>
<td>A system is a collection of parts that interact to function as a whole.</td>
</tr>
<tr>
<td><strong>Popular axiom</strong></td>
<td>The system/ the whole is greater than the sum of its parts.</td>
</tr>
<tr>
<td><strong>Richard Bawden (1995)</strong> Academic; Management consultant; Futurist; Systems thinker; Sustainable agricultural practices.</td>
<td>&quot;A system is a bounded whole entity which is different from the sum of its parts. This difference emerges as a property which results from the way the component parts interact with one another&quot;.</td>
</tr>
</tbody>
</table>
| **O'Connor & Mc Dermott (1997)** Academics; Management consultants; Systems practitioners. | "A system is an entity that maintains its existence and functions as a whole through the action of its parts."

"Systems thinking looks at the whole, and the parts, and the connections between the parts, studying the whole in order to understand the parts. It is the opposite to reductionism, the idea that something is simply the sum of its parts. A collection of parts that do not connect is not a system. It is a heap."

**Richard Hames (1994)** Academic; Strategic navigation & appreciative systems; Futurist; management consultant.

"A system is a coherent set of processes that work together to achieve the purpose required in order for the system to survive."

And goes onto describe systems thinking as:

“…the ability to appreciate the interrelated complexity of whole systems, especially as this concerns processes, feedback loops and relationships.”
### The new Fontana Dictionary of Modern Thought (1999)

The Fontana Dictionary has a lengthy definition of a system beginning with "A system is a group of related elements organised for a purpose" and going on to acknowledge other properties of a system, such as boundaries, environment, sub-systems and notions of recursion and sub-optimisation.

---

### Motloch (2001)

Academic; Landscape architecture and design; Systems practitioner.

Yet another perspective is provided by in his Introduction to Landscape Design where he explores landscape as a system and writes that: "Systems ("whole" consisting of entities and relationships) function through interrelatedness of parts, and exhibit existential properties independent of these parts".

---

### David Bruce-Smith (2001).

Social ecology; System practitioner; Organisational design; Post-graduate research.

"A work system is the intentional and purposeful combination of people, processes, resources, technologies, intellectual capital, and place to achieve planned business outcomes."

---

### Flood and Jackson (1991)

Academics; Management Science; Management Consultants

"A system consists of a number of elements and the relationship between the elements" (p.5)

"…the concept "system" (in systems thinking) is used not to refer to things in the world but to a particular way of organising our thoughts about the world". (p.2)

The authors consider the notion of a "system" as an organising concept; they then look at various metaphors that may be used as a basis for structuring thinking about organisations and problem situations. (p.2) "In systems thinking, a system is a complex and highly interlinked network of parts exhibiting synergistic properties - the whole is greater than the sum of the parts". (p.4)

The authors discuss 5 flavourings or filters with which to look at a problem situation:

- Machine metaphor, or "closed system" view;
- Organic metaphor, or "open systems" view;
- Neurocybernetic metaphor, or "viable system" view;
- Cultural metaphor;
- Political metaphor.

---

### Senge, Kleiner, Roberts, Ross, Smith (1994)

Academics (MIT); Management Consultants; Systems Dynamics.
"A system is a perceived whole whose elements "hang together" because they continually affect each other over time and operate toward a common purpose. The structure of a system includes the quality of perception with which you, the observer, cause it to stand together."

Systemic Structure (of an Organisation):
"In systems thinking, the structure in the pattern of interrelationships among key components of the system that might include the hierarchy and process flows, but it also includes attitudes and perceptions, the quality of products, the ways in which decisions are made, and hundreds of other factors."

Senge, Kleiner, Roberts, Ross, Roth & Smith (1999)
Academics (MIT)
Management Consultants;
Systems Dynamics

“A system (in this context) is anything that takes its integrity and form from the ongoing interaction of its parts. Companies, nations, families, biological niches, bodies, television sets, personalities, and atoms are all systems. Systems are defined by the fact that their elements have a common purpose and behave in common ways, precisely because they are interrelated toward that purpose”.

“There are probably many viable forms of systems thinking, each appropriate to different peoples' attitudes and learning styles. At least five are relevant to organisational change. These are:

1. Systems Dynamics;
2. Open systems: seeing the world through flows and constraints
3. Social Systems: seeing the world through human interaction
4. Process systems: seeing the world through information flow
5. Living systems: seeing the world through the interaction of its self-creating entities”.

Oxford Dictionary of Ecology

"System: a distinct entity that consists of a number of interacting parts such that the removal or failure of one part may incapacitate the entity as a whole."

“Ecosystem: A discrete unit that consists of living and non-living parts, interacting to form a stable system”.

“Ecosystem principles apply at all scales. Principles that apply to an ephemeral pond, for example, apply equally to a lake, an ocean, or the whole planet”.

“Ecology: The scientific study of the interrelationships among organisms and between organisms, and between them and all aspects, living and non-living, of their environment”.

David D. Kemp (1998)
The Environment Dictionary.

“System: An assemblage of interrelated objects organised as an integrated whole”.
“In environmental studies, systems are usually classified as open or closed. Open systems are those which allow an exchange or flow of energy and mass across the systems boundaries in the forms of inputs and outputs. Closed systems involve the input and output of energy, not mass”.

“The general concept of the systems is relatively simple, but its application to specific situations can be difficult. In the complex relationships that exist between the different elements of the environment, for example, delineating sub systems is particularly difficult because it is not always possible to identify clear boundaries between them”.

“Ecosystem: A community of interdependent organisms and the physical environment they inhabit. The individual organisms interact with each other and with their environment in a series of relationships made possible by the flow of matter and energy within and through the system. The relationships are dynamic and routinely respond to change, without altering the basic characteristics of the ecosystem”.

“Ecology is the study of the relationships that develop among living organisms and between these organisms and their environment”.

Professor of Management and the director of the Complexity and Management Centre at Business School of the University of Hertfordshire.  
Management Consultant.

*Complex Adaptive Systems:*

“A complex adaptive system consists of a number of agents interacting with each other according to schemas, that is, rules of behaviour and adjust their own in the light of the behaviour of others. In other words, complex adaptive systems learn and evolve, and they usually interact with other complex adaptive systems. They survive because they learn or evolve in an adaptive way”. (p.284)

“Human systems, that is, individuals, groups, organisations, and societies are all non-linear feedback networks that nest within each other to form a highly complex whole. Each of these systems consists of what we might think of as two sub-systems”.

“A legitimate sub-system in which behaviour engages current reality and is driven by a dominant schema that all the agents in the systems share, thus leading to conformity; A shadow sub-system in which behaviour is driven, not by current reality, but by recessive schemas, most of which are unique to individual agents, thus leading to diversity”.

“Human agents and systems all coevolve in interaction with each other, utilising both single - and double-loop learning processes through which they develop strategies for interacting with each other and so surviving”. (p.47)

**Checkland & Scholes** (1990)  
Creators of soft systems methodology; academics; management consultants; systems practitioners.
"...there are many definitions of the word system in the literature (Jordan 1965, pp.44-65 for example offers fifteen) all take as given the notion of a set of elements mutually related such that the set constitutes a whole having properties as an entity. Secondly comes the crucial idea that the whole may be able to survive in a changing environment by taking control action in response to the shocks from the environment". (p.4)

Richard Hames with Callanan (1997) *Burying the 20th Century*. Academic; Strategic navigation & appreciative systems; Futurist; management consultant.

In a later work Hames (1997) has a far more expansive definition of a system and also discusses the notions of appreciative systems, that is a "self-organising system that sustains a social ecology able to learn its way into preferred futures". Within this framework of evolving sophistication Hames proposes that system mapping is:

"A method for making non-linear patterns and relationships visible in order to perceive the essence of complex issues".

**Hitchins, Derek K.** (1992) Professor of Systems Science with the Royal Military College of Science at Shrivenham, UK. Systems engineering.

"A viable system is one which is able to maintain its separate existence within the environment. It can draw upon energy and resources from that environment, with which it can maintain itself. A non-viable system will not persist". (p. 77)

In his book, "*Putting Systems to Work*", Hitchins proposes a Unified Systems Hypothesis in which he presents "a set of system images, definitions and principles which are intended to provide a common basis for the perception, understanding, analysis, design and creation of all systems". (p. 70)

He also introduces as "Generic Reference Model (GRM) as a reference for any system such that features in the system can be seen against corresponding elements in the model. The GRM comprises 3 functions of mission, viability and resource management." (p. 75)

Hitchins defines a system as "a collection of interrelated entities such that both the collection and inter-relationships together reduce local entropy." (p. 56)

**C.West Churchman** (1979)
Academic; systems practitioner; major influence on critical systems thinking.

In "The Systems Approach and Its Enemies":

"On the broadest level, the systems approach belongs to a whole class of approaches to managing and planning our human affairs with the intent that we as a living species conduct ourselves properly in the world. Everyone adopts at least one such approach during his/ her life, even if he/ she is a recluse, an agnostic, a nihilist".
“The systems approach is, therefore, only one approach to the way in which humans should respond to reality; but it is a grand approach, by which I mean "large", "gigantic", or "comprehensive". It is one of the approaches based on the fundamental principle that all aspects of the human world should be tied together in one grand rational scheme, just as astronomers believe that the whole universe is tied together by a set of coherent "laws". Even so, this description hardly captures the richness of the systems approach". (p. 8)

Lewin & Regine (1999) *The Soul at Work*

“Certain biological metaphors have deeper cogency in business. We often heard from managers and consultants that biological metaphors made difficult problems more readily comprehensible. This is surprising because metaphors typically invoke something familiar in order to illuminate something unfamiliar, whereas in this case it’s the other way around. Images of biology, with which many business people are unfamiliar, are being invoked to illuminate something familiar, the world of business”. (p.36)

Lewin & Regine (1999) *The Soul at Work*

“The recognition that businesses are complex adaptive systems allows us to draw on what is known about such systems – in computer simulations and in nature – so that we can learn about the fundamental dynamics of businesses and the economic webs of which they are a part. Common to the dynamics within and among businesses is the emergence of (mostly) unpredictable patterns from the interactions that occur there, because of the connectedness of the systems. For those who have the courage – and it takes courage – complexity science offers a new way of doing and being in the workplace of the connected economy: in short a new management theory.” (p.46)


Environmental activist; Ecopsychologist.

“The living system learns, adapts and evolves by reorganising itself.” (p.255).

“Through the systemic currents of knowing that interweave our world, each of us can be the catalyst or tipping point by which new forms of behaviour can spread. There are many different ways of being responsive as there are different gifts we possess. For some of us it can be through study or conversation, for others theatre or public office, for still others civil disobedience and imprisonment. But the diversities of our gifts interweave richly when we recognize the larger web within which we act. We begin in this web and, at the same time, journey toward it. We are making it conscious.” (p.259)
APPENDICES FOR
“EXPLORING AND DESIGNING PRACTICAL TECHNIQUES FOR THE ANALYSIS AND DESIGN OF COMPLEX WORK SYSTEMS: A JOURNEYMAN’S STORY”

by

David A. Bruce-Smith

APPENDIX E:

INTERVIEW QUESTIONS, NOVEMBER 1999
Appendix E:

Interview Questions, November 1999.

Welcome

Contextual Background:

I am seeking an understanding of participant’s ongoing learning since November 1998 and aspects of their experiences in using the systems thinking techniques. This is part of our ongoing learning and research into the introduction of systems thinking in the workplace.

The Training Program.

1. During the “Leadership in the Design of Complex Work Systems” training program during 1998, you were introduced to a range of systems thinking approaches and techniques. Can you tell me what you remember of the program and what techniques we covered during the course?

2. The specific approaches and techniques we covered were:
   - Learning systems,
   - General systems theory,
   - Soft systems methodology,
   - Critical systems thinking,
   - Viable systems method.

Can you tell me what you learnt of each technique?

Application in the Workplace.

3. Have you and/ or your team/ colleagues used any of these techniques in the last twelve months?

4. Can you tell me why, when, where and how you used the technique(s)?

5. What was the problem domain you were exploring?

6. Did you use more than one technique in exploring the same complex problem domain?

7. Did you go back to the course notes and/ or other texts to assist in remembering and applying the technique (s)?
8. Of those that you used, did you find the technique(s):
   ➢ Useful?
   ➢ Practical?
   ➢ Easy to use?
   ➢ Readily accessible in terms of supporting documentation and practical notes?

9. How effective was the technique in helping you understand aspects of the complex problem domain and in informing your design?

10. Do you believe that a systems approach gave you greater insight than if you had simply used more traditional linear techniques?

11. Would you use these techniques again?

**Reflection on the Learning Experience.**

12. Do you believe the program last year with the University of Western Sydney, Centre for Systemic Development, was an effective way of introducing people to systems thinking?

13. Would you recommend this type of training program to others?

14. How else would you like to learn about systems thinking, chaos and complexity theories?

**Overall.**

15. Overall, what was your experience of using the techniques in the workplace?

16. Through the training program last year we were hoping to establish a community of practice of systems thinkers who could encourage and support one another. What is your assessment of the current community of practice?

17. If we continue to introduce people in these systems thinking techniques and approaches, what sought of support do you believe the organisation needs to provide to people?
Conclusion.

18. Are there any other insights, comments or suggestions you would like to contribute?

Thank you for your time and participation in this ongoing research.