UNIVERSITY
Of
WESTERN SYDNEY
NEPEAN

COURSE 10082
Doctor of Business Administration

Thesis topic:
Learning Organisations in High Technology Industries

Submitted:
2001

STUDENT
Ronald Charles Beckett
No: 97087843

CHAIR SUPERVISOR
Dr Robert-Leigh Compton
Director of Students/Corporate Programs
Sydney Graduate School of Management
SUMMARY

This portfolio describes an action research program, primarily within one company pursuing learning organisation concepts. The research was in integral part of the implementation process, not involving case studies carried out after the event, or analysis prior to it, but an iterative mixture of both.

The notion of a "learning organisation" that acquires and acts on new knowledge quickly, and adopts new operating paradigms readily is represented in various ways in the literature. The literature is also concerned with managing new or pre-existing knowledge to support the competitive positioning of an enterprise. In the research presented here, aspects of organisation structure, learning integrated with work, balancing competitive paradigms relevant to a learning organisation, and identifying and sharing critical knowledge are explored.

Both the literature and case studies of various aspects of the operations of an Australian Aerospace company are used to help identify some particular practices that support organisational learning. A range of issues arising from the research are also discussed. A multi-faceted systems model of corporate memory is developed, and possible ways of obtaining leverage from that memory are discussed.

Whilst an organisation may retain knowledge in computer systems, documents and informal routines implicitly accepted as the norm, it is individuals that must first accept the validity and relevance of new knowledge, and then act on it to introduce change. In these respects: evaluation and change, it is suggested that organisations and the people in them behave the same way. Faced with a learning opportunity, outcomes may be that no learning occurs, or that proficiency in a current skill is enhanced, or that a change in position or behaviour is stimulated. Examples of such behaviour are given.

The research presented here identifies a significant number of competencies, processes and practices that need to be in place for organisational learning and knowledge management to be effective. It is suggested that a particular organisation may take many years to establish this portfolio of capabilities to the extent that they become the operating norm.
It is observed that obtaining a better understanding of an organisation's knowledge attributes and knowledge flows offers an insight into its operations that complements conventional information and product flow views. It is also observed that tools to help acquire such understanding are still developing.
ACKNOWLEDGMENTS

This research started, not as a logically planned part of a broader program, nor with a burning desire to pursue a higher degree, but as a result of a serendipitous meeting early in 1997. The candidate and Professor Alex Kouzmin from UWS Nepean had been discussing prospective post-graduate course modules that might be suitable for delivery within the candidates' company. The kinds of aspirations and initiatives being pursued by the company were discussed to provide context for the modules being sought. As an aside, Professor Kouzmin suggested professional doctorate studies by some company executives as a mechanism for more rigorously exploring some of the initiatives that were only framed in broad conceptual terms at that time.

The idea did not have immediate appeal due to concerns about time availability and the ability of the executives to quickly translate theory into practice. Applying the effort to other initiatives could possibly provide beneficial outcomes faster. Over the next few months however, two factors made the idea more appealing for the candidate: having a different group to exchange ideas with, and an iterative, action centred research approach.

On balance, I must thank Professor Kouzmin for his original suggestion and for his support during the period of candidature. Some of the original concerns about time and integration were well founded, but because of the iterative nature of the research approach and Professor Kouzmin's willingness to meet at unusual hours, these concerns were made manageable. In addition access to professor Kouzmins broadly based management knowledge, access to his considerable personal library, and his very direct approach helped to maintain focus while exploring past research relevant to, but not always directly associated with learning organisation concepts. In that regard, I would also like to acknowledge the contributions made by my fellow doctoral candidates at internal research seminars organised by Professor Kouzmin, and ably run in his absence by Bob Levesley. I would particularly like to thank fellow doctoral candidate John Waters for discussions related to innovation processes.

Many of my workplace colleagues were also very supportive of my research, particularly those who were undertaking some form of post-graduate studies.
themselves. Whenever they saw a book, journal article or conference paper potentially of interest, they would send me a copy. This enabled me to consider a diversity of views with minimal time in the University Library. Thanks to Tony Wilkinson, Michael Beecroft and Frank Anderson. Thanks to Anna Ray for typing notes from review of that literature, and for typing some of the papers produced as a result of this research. Thanks to John Polites for discussions on research methods, and to Ross Penfold for his contributions to discussion and debate on ways to structure corporate knowledge. Thanks to Fred Swainston, company Training Manager, who shared his extensive knowledge of adult education, and introduced me to a model of adult learning (Jarvis, 1987) not commonly referenced in management literature, but which I found very helpful.

One outcome of the research was a model of corporate memory that evolved from company experiences as some long serving employees retired. A focus group approach was used to collect views on this matter, and I would like to thank Fred Swainston, John Polites, John Gale and Richard Marsh for both participating in these groups and for their active subsequent debate of the corporate memory model that evolved. I would also like to thank Dr Laszlo Nemes from the CSIRO Division of Manufacturing Technology for his review and discussion of corporate memory and enterprise modelling aspects of the research.

I would like to especially thank my CEO during the period of the research, Tony Carolan, for his support of the notion of using DBA research as a mechanism for company innovation. His willingness to support some degree of experimentation using ideas from the research, his belief in it during this period of extreme turbulence within the company, and his personal support made this research practical.

To complete the doctoral research process however, all of this interesting stuff has to be rationally organised, and challenged, and assessed. I remain indebted to Paul Hyland, one of my Supervisors (also sometimes co-author of published papers), for his support in that regard. I would also like to record special thanks to my Chair Supervisor, Dr Rob Compton for helping me to complete the process after my initial Supervisor, Professor Alex Kouzmin, left UWS Nepean.

Blending research and work is advantageous from the viewpoint of quickly establishing the practical relevance of ideas, but disadvantageous in terms of time.
availability. This meant that literature review, concept development and authoring activities were primarily undertaken outside normal working hours. This would not have been feasible without the enduring support of my wife, Cheryl, and I wish to take this opportunity to publicly thank her for that support.

Non Sum Qualis Eram

Ronald C Beckett
March 2001
STATEMENT OF ORIGINALITY

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the dissertation itself.

Ronald Charles Beckett
DBA PORTFOLIO OVERVIEW

PURPOSE OF THE RESEARCH

The research was undertaken to help search for better ways for the researcher's organisation to compete in a demanding International marketplace.

At the time the research was initiated, the Executive Management (which included the researcher) of this Australian Aerospace company had considered that being competitive at a particular point in time is not sufficient. Continuous innovation was needed to remain competitive. It was noted that some companies, such as Motorola, had found that their rate of development was controlled by the rate at which they could learn new things, and by the rate at which they could master new technologies. The Aerospace Company had decided to try and adopt new technologies earlier in their life cycle, and saw this as a concern, being outside of traditional norms.

The Aerospace Company had around 1000 employees, and it had been decided to structure operations as a large representation of a small business rather than a small representation of a large business (which had been the previous approach). The objective was to establish flat, flexible structures. But how would people in the organisation learn new things when the traditional in-house training structures had been disbanded, and there was little capacity to have people off-line for conventional training. The perceived answer was to somehow integrate learning and work. Although learning on the job was a cultural norm in the organisation, due to a long-standing Apprenticeship scheme, it was unclear how learning about things outside the current experience of the workforce would be achieved.

Notions of the "Learning Organisation" that were appearing frequently in the management literature at the time seemed appropriate to the circumstances. But whilst the idea had some appeal, the characterisations were kind of fuzzy, and there was some indication that the application in high technology industries might be different than in some others. And how could it be established if the Aerospace company was already an effective "learning Organisation" or not. Perhaps it was one already. Certainly, normal Industry contracting assumed significant learning
curves could be achieved over the life of a project. But no diagnostic tools were evident at the time.

The approach of undertaking some interactive program with a University using the DBA structure to guide research was one of the initiatives agreed. Observations from the literature were to be tested against reality as represented by the circumstances of the Aerospace Company. Initiatives trialed in the Aerospace Company were to reconcile with theory, so their foundation could be understood, and they could be implemented more effectively.

Throughout the period of the research however, the operating environment of the Aerospace Company was very turbulent, and not all of the concepts emerging from the research were fully trialed. Through the period, the volume of production doubled, then started to fall. Parallel initiatives, eg. on the Industrial Relations front, were also changing the way the company operated. And there was a change of ownership that also influenced the management style of the business. It is suggested that the high rate of change the research was intended to support made some aspects of the research difficult. The approach taken was to study aspects of the topic as a series of facets. From this perspective, it is suggested that the DBA approach is more suitable than a PhD perspective where a focus area would studied in some depth. This was also the perspective of some colleagues undertaking PhD studies. They found that trying to conduct an organisation-wide survey difficult because the responses would change as the organisation changed, and trying to implement their grand idea was difficult when the target was moving.

CENTRAL THEMES

Initial work focussed on people as the agents of organisational learning, however the literature survey and comparison with various operational experiences also highlighted a range of other issues. Utilising structured processes, finding a balance between refining today's best practices and creating entirely new ones for tomorrow, and the influence of structure on knowledge transfer were all explored.

During the early days of the research there was a lot of management literature focus on knowledge management, and an exploration of the relationship between this and learning organisation concepts was undertaken. The view was formed
that the learning organisation proponents had a people-centred approach to knowledge creation and transfer primarily associated with problem solving, and that the knowledge management proponents had a system-centred approach to knowledge codification and re-use. In subsequent work it was considered that these views needed to be merged. As an aside, it was observed that the researchers' management colleges had different reactions to these two themes. Some found the learning organisation idea a bit soft and fuzzy, but the Human Resources people liked it. Others found the notion of managing knowledge that is in peoples' heads a bit difficult, but the Operations and Project Management types liked the idea of managing something. This reinforced the need for an all-embracing view.

In the initial literature survey, a number of definitions of the learning organisation were found. A definition adopted for the purposes of this research was: an organisation that has created a learning environment that provides a source of competitive advantage. This allows concurrent focus on short term and long term initiatives that ultimately yield a customer benefit. Learning to compete through knowledge transfer arrangements that lead to innovative action became an outcome focus for the company.

Throughout the research various barriers to organisational learning and knowledge management arising from the complexity of the underlying processes were noted. The approach to coping with complexity was through the use of "maps" and diagnostic tools.

The way elements of the program link together is shown in the diagram below.
IMPLEMENTING A LEARNING ORGANISATION IN A HIGH TECHNOLOGY INDUSTRY

COMPONENTS OF THE PORTFOLIO

Consistent with the requirements of the University of Western Sydney Doctor in Business Administration program, the portfolio contains a literature survey component, a research study component presented in the form of a major report, and four published (or publishable) papers. In this overview document, some broad comments are made about each of these components.
The literature survey was presented as a business report within the authors' organisation, and considered the current organisational training arrangements in the context of a learning organisation. One thing that the initial study suggested was that the organisations traditional training focus should be altered. The traditional norm was focussed on a “single loop” learning paradigm, where training was delivered Just-In-Time to support efficiency in current operations. But for the organisation to be able compete through innovation, a “double loop” learning paradigm had to be adopted, to provide exposure to new ideas ahead of their adaptation into unique, best practice organisational processes. This change ran in parallel with the research program.

The major research paper is presented from the perspective of converting knowledge into action, and its flow broadly reflects the time-line progression of the research. It also draws on extensions of the initial literature survey (reflected in a bibliography section of the major paper) and on the work behind the various presentations and publications identified below, and gives them some context.

Whilst a number of papers were produced during the progression of the DBA research, four have been selected as representing the outcome of the study. A short background to each one is given below, with the same designation as in the figure above.

**Paper A: “The process of Mentoring as an Aid to Transformational Learning”**

To be published in “Deciphering Knowledge Management” Springer-Verlag LNIA1859

This started with evidence of the value of Mentoring within the authors, organisation, and regular reference to the practice in some way in the business press. How widely the practice was being implemented was explored, and compared with some models arising from current or past research. It is considered important in the current context as an effective way of mobilising the tacit part of corporate memory.

**Paper B: “Accessing Corporate Memory: Some Knowledge Structure Concepts”**
Proceedings of the 8th International Conference on the Design of Information Infrastructure for Manufacturing (DIISM 2000), Melbourne, 15 – 17 November 2000 (This was also a keynote paper)

This paper flowed from research into corporate memory, and considers how to best access and get value out of that memory. Where that memory lies as organisations outsource functions and pursue network relationships is briefly discussed. Using this research, techniques for rapidly and simply enunciating what the authors’ organisation “knows” are being trialed.

**Paper C: “A Diagnostic Tool for Identifying Barriers to Organisational Learning”**

Proceedings of the Eighth Asia Pacific Researchers in Organisational Studies Colloquium on “Organising Knowledge Economies and Societies” (APROS 2000), 14 – 17 December, 2000

The research undertaken showed that a repertoire of competencies, processes and knowledge management practices were required to become a comprehensive learning organisation. But what if some elements were missing? Taking this line, a diagnostic approach to progressive organisational learning is presented.

**Paper D: “Sources of Failure in the “Corporate Memory””**

To be published in “Deciphering Knowledge Management” Springer-Verlag LNIA1859

The model of corporate memory as a knowledge system developed through this research has eight underlying processes and fourteen knowledge flows between them. There are tacit and explicit knowledge components associated with the processes and the flows. The number of opportunities for system failure, particularly in times of operational turbulence, is quite large. The model is examined from this perspective to help understand what happens in organisations that become dysfunctional following some kind of change.

Whilst other published and unpublished papers are integrated within the research report, through the research period, there was much interest in the topic, some arising from presentations at research colloquia, and some arising from contact with Industry colleagues. This resulted in other relevant presentations and papers, which are referred to in support of the main research study document, are also listed below.
Research Colloquium presentations and associated papers were:

- Semester 2, 1997: Searching for organisational forms best suited to a learning organisation. Associated paper: "Corporate Decay or Corporate Stupidity: Auditing loss of Distinctive Capacity after Restructure"
- Semester 1, 1998: Learning by Auditing – a Process perspective. Associated paper of the same name
- Semester 1, 1999; What to Learn in Time. Associated paper: "Organisational Learning processes and the management of multiple time horizons"
- Semester 1, 2000: A Diagnostic Tool for identifying barriers to organisational learning. A presentation was prepared but no research colloquia were available at UWS Nepean in calendar year 2000, due to various organisational changes.

Refereed publications are:


• Ronald C Beckett "A Characterisation of Corporate Memory as a Knowledge System" KNOW 99, University of Technology, Sydney, 26-27 November 1999

• Ronald C Beckett and Peter Murray "Learning by Auditing: a Knowledge Creation Approach" TQM Vol 12, Issue 2, April 2000, pp 125 - 136


• Ronald C Beckett and Paul W.B Hyland "Learning to Compete: the value of internal benchmarking" ANZAM Conference " Leaping Ahead: Managing for the new Millenium", Macquarie University, Sydney, 3-6 December 2000

• Ronald C Beckett “A Diagnostic Tool for Identifying Barriers to Organisational Learning” 8th APROS International Colloquium on Organising Knowledge Economies and Societies, University of Technology, Sydney, 13-16 December 2000


Ronald C Beckett "The Sources of Failure in Corporate Memory" in Deciphering Knowledge Management, Springer-Verlag LNAI 1859 (to be published)

Ronald C Beckett "The Process of Mentoring as an Aid to Transformational Learning" in Deciphering Knowledge Management, Springer-Verlag LNAI 1859 (to be published)

Other presentations:

- "Maximising Opportunities for Industrial Interactions" presented to the 8th Professors and Heads of Department Chemistry Conference, Canberra January 1999
- "Encouraging Innovation – What to learn in time" Presented at an Australian Institute of Management Greater West meeting, 14th July 1999
- "Supply Chains as a Change Agent in Organisation Structure and Business Process Redesign" Supply Chain Management Workshop, Newcastle University, November 17, 1999
- "Some Contingency Considerations in Inter-Enterprise Supply Chain Management", presented at the 2nd GLOBEMEN Conference, Chiba, Japan, 11 – 16 June, 2000
- "Issues of trust in a Virtual Organisation" presented at the 3rd GLOBEMEN Conference, Melbourne, Australia, 18 – 22 November, 2000
Evidence of Professional Leadership

It is stated in the Australian Vice-Chancellors guidelines relating to higher degrees (refer UWS Nepean Post-graduate Research Handbook) that an objective of Professional Doctorate study is to support leadership in the professions. The following provides some evidence of that outcome:

- invited keynote presenter at three international conferences –
  - ACUN-2 International Composites meeting: Composites in the transportation industry, 14-18 February, 2000, Sydney
  - ICME 2000 the eighth international conference on manufacturing engineering, 27 – 30 August, Sydney

- Organised two National Professional Group Conferences:
  - Australian Industrial Research Group, Sydney, February 21-23, 1999

- Professional Associations:
  - Fellow of the Australian Institute of Management
  - Fellow of the Institution of Engineers, Australia
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>PAGE NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXECUTIVE SUMMARY</td>
<td>3</td>
</tr>
<tr>
<td>1. INITIAL LITERATURE SURVEY AND CASE STUDY</td>
<td>9</td>
</tr>
<tr>
<td>1.1 Literature survey</td>
<td></td>
</tr>
<tr>
<td>1.2 Some learning organisation attributes</td>
<td></td>
</tr>
<tr>
<td>1.3 Case study</td>
<td></td>
</tr>
<tr>
<td>1.4 The way forward</td>
<td></td>
</tr>
<tr>
<td>2. FLOW-ON LITERATURE SURVEY AND CASE STUDIES</td>
<td>15</td>
</tr>
<tr>
<td>2.1 Research approach</td>
<td></td>
</tr>
<tr>
<td>2.2 Flow-on literature survey</td>
<td></td>
</tr>
<tr>
<td>3. PEOPLE AS AGENTS OF ORGANISATIONAL LEARNING</td>
<td>17</td>
</tr>
<tr>
<td>3.1 Overview</td>
<td></td>
</tr>
<tr>
<td>3.2 People in learning organisations</td>
<td></td>
</tr>
<tr>
<td>3.3 Some learning organisation concepts</td>
<td></td>
</tr>
<tr>
<td>3.4 Ways that people think and act</td>
<td></td>
</tr>
<tr>
<td>3.5 Team learning</td>
<td></td>
</tr>
<tr>
<td>3.6 Learning process models</td>
<td></td>
</tr>
<tr>
<td>3.7 Some barriers</td>
<td></td>
</tr>
<tr>
<td>3.8 Discussion</td>
<td></td>
</tr>
<tr>
<td>4. INTEGRATION OF LEARNING AND BUSINESS ACTIVITIES</td>
<td>38</td>
</tr>
<tr>
<td>4.1 Overview</td>
<td></td>
</tr>
<tr>
<td>4.2 Learning by auditing</td>
<td></td>
</tr>
<tr>
<td>4.3 Internal benchmarking</td>
<td></td>
</tr>
<tr>
<td>4.4 Testing the vision</td>
<td></td>
</tr>
<tr>
<td>4.5 An &quot;internal University&quot;</td>
<td></td>
</tr>
<tr>
<td>4.6 Discussion</td>
<td></td>
</tr>
<tr>
<td>5. ISSUES OF BALANCE</td>
<td>58</td>
</tr>
<tr>
<td>5.1 Overview</td>
<td></td>
</tr>
<tr>
<td>5.2 The time factor</td>
<td></td>
</tr>
<tr>
<td>5.3 Learning organisation operational conflicts</td>
<td></td>
</tr>
<tr>
<td>5.4 Learning processes and competencies</td>
<td></td>
</tr>
<tr>
<td>5.5 A multiple cycle model</td>
<td></td>
</tr>
<tr>
<td>5.6 Application to start-up companies</td>
<td></td>
</tr>
<tr>
<td>5.7 Balancing internal and external initiatives</td>
<td></td>
</tr>
<tr>
<td>5.8 Discussion</td>
<td></td>
</tr>
<tr>
<td>6. ISSUES OF STRUCTURE</td>
<td>73</td>
</tr>
<tr>
<td>6.1 Overview</td>
<td></td>
</tr>
<tr>
<td>6.2 In search of &quot;better&quot; forms of organisation</td>
<td></td>
</tr>
<tr>
<td>6.3 The potential downsides of structural change</td>
<td></td>
</tr>
<tr>
<td>6.4 Some attributes of different organisational forms</td>
<td></td>
</tr>
<tr>
<td>6.5 Drivers of organisational Structure</td>
<td></td>
</tr>
<tr>
<td>6.6 Creating (or destroying) distinctive capacity</td>
<td></td>
</tr>
</tbody>
</table>
6.7 Auditing structural performance
6.8 Discussion

7. IDENTIFYING AND SHARING CRITICAL KNOWLEDGE
7.1 Overview
7.2 Critical knowledge
7.3 Knowledge creation
7.4 Knowledge transfer
7.5 Knowledge utilisation
7.6 Leverage from "Corporate Memory"
7.7 Discussion

8. BARRIERS TO LEARNING AND KNOWLEDGE TRANSFER
8.1 Overview
8.2 The notion of a missing link
8.3 Knowledge flow barriers
8.4 Social context: is learning valued
8.5 Keeping up the momentum
8.6 Discussion

9. CONCLUDING REMARKS
9.1 High technology industry factors
9.2 Issues of turbulence
9.3 Learning progression
9.4 Levels of learning
9.5 Individual and organisational learning
9.6 Moving forward
9.7 Maintaining perspective
9.8 Some case study company outcomes
9.9 Measuring progress
9.10 Taking a knowledge view of an organisation

BIBLIOGRAPHY

ATTACHMENT 1: CASE STUDIES
Case study 1: Company training 1
Case study 2: Prerequisites to learning 10
Case study 3: Auditing and learning 15
Case study 4: Progression towards a vision 21
Case study 5: Internal Benchmarking 26
Case study 6: An internal University 34
Case study 7: Long and short term issues 39
Case study 8: Structural change 43
Case study 9: Supply chain issues 49
Case study 10: Application of networks 52
Case study 11: What is corporate memory 58
Case study 12: Fast-track R&D 60

ATTACHMENT 2: REFERENCE PAPERS
EXECUTIVE SUMMARY

The Aim
This research has been carried out in support of the intended implementation of learning organisation concepts within an Australian Aerospace Company. Implementation and research were to progress in parallel. The research approach adopted was to blend literature survey and case study work to observe how theory was enacted in the company, and how case study observations might be aligned with some new theory or model. Consistent with the DBA approach, a number of aspects of the topic were explored, as compared with the PhD approach of exploring some aspect in considerable depth. Research on each aspect was taken to the point where a useful tool or future direction was identified.

The Process
The logic behind the learning organisation strategy was that people in the organisation were highly skilled compared with some lower cost competitors, and finding unique ways to leverage that attribute might be a source of competitive advantage. If this is the case, action needs to be taken immediately, not after some years of research. For such an advantage to be sustained however, just leveraging today's knowledge would be necessary, but not sufficient. New things would also have to be learned.

An initial literature survey provided a variety of definitions of a learning organisation and its attributes. A definition adopted for the purposes of this study was: An organisation that has created a learning environment that provides a source of competitive advantage.

As well as sharing knowledge to improve the efficiency of current operations (designated "single loop" learning in the literature), there was a need to introduce new/different/better ways of doing things (designated "double loop" learning), and the latter, generally speaking, is the focus of the literature and this research. The logic seems simple. Single loop learning restores things to a current norm, and builds on the substantial investment people and organisations have made in these routines to deal with complexity. And as people come and go in the organisation, and as the operating environment changes, maintaining efficiency is critical to its short-term survival. However, whilst this is necessary, in the long run it is not sufficient. New
knowledge obtained must be acted on to both improve current practices, and evolve new ones that sustain competitiveness. This aspect of linking learning with significant change (double loop learning) has complexities in understanding something new, in disrupting current routines and long held beliefs, in possibly adopting new behaviours, and in embedding the change in the organisation somehow, not just in its current personnel.

The initial literature survey presented a variety of views on these issues. Pieces of a jigsaw puzzle, but not necessarily the whole puzzle. Arising from this survey, a case study of company training (case study 1), and from the intent of parallel research and action, four broad outcomes were sought:

- Enhancement of individual learning within an updated employee development system that sought to integrate work and learning
- Identifying structured problem solving processes that become a way of life
- Enhancing processes to share and utilise current organisational knowledge and access new knowledge
- Understanding what to change and how to change it

Introduction to Knowledge Management

Issues of knowledge management arose early in the research, and the volume of literature on that subject continues to increase. Was this an alternative view of organisational learning, or something unique? From a subsequent review of literature, and some outcomes of this research, it is argued that:

- the “learning organisation” focus is on acquiring technical mastery in some particular competencies and on applying problem-solving, networking and knowledge sharing processes that lead to enduring beneficial change in the organisation.
- knowledge management is about the management of a resource that has an intangible element, but a significant codified element; and that certain competencies and infrastructure are needed to manage and utilise this resource to achieve beneficial change.
- Both need to be pursued in concert

It is observed that learning organisation proponents often find that knowledge needs to be codified to embed it in the organisation, and that knowledge management
proponents often find that people have to change something to utilise codified knowledge.

People, and Learning Organisation Attributes
From the view that people are the agents of organisational learning, it was found that a particular model of adult learning (Jarvis, 1987) was very helpful in rationalising the findings of various learning organisation researchers (especially where there was some failure to learn) and understanding what might drive different kinds of learning outcomes. A range of competencies and some pre-requisite knowledge needed to obtain benefit from a learning organisation strategy were identified; some being helpful in discovering knowledge new to the participants, some being helpful in selecting the best opportunities to progress, and some being helpful in introducing change. In addition, it was found that some kinds of structured processes and knowledge management practices were needed to facilitate the organisational learning cycle. In total seventeen kinds of capability were noted in an attribute matrix (reference paper C). Being competent in any one of them is a significant undertaking. Being competent in all seventeen requires a high level of organisational sophistication, and multi-discipline teamwork.

Some practices supporting double loop learning that were found particularly useful within the aerospace company were forms of mentoring (reference paper A) and of internal auditing (Beckett and Murray, 2000) that compared current status with some desirable future position. These built on some traditional competencies, facilitated reasoning and reflection processes on matters outside the individuals current frame of reference, and supported beneficial change whilst minimising conflict.

Corporate Memory
Driven from the view that an organisation needs to be aware of what it "knows" and that it needs to leverage that knowledge, a model of "corporate memory" as a form of knowledge system was developed (reference paper D). This model, which is oriented towards where knowledge might be located in (or associated with) an organisation, has eight kinds of sub-tier systems (eg a data warehouse) with fourteen kinds of knowledge flows between them. Again, this indicates a high degree of complexity which may be difficult to master. Combined with a way of categorising what kind of domain knowledge an organisation has, an approach to capturing and representing organisational knowledge is suggested (reference paper B). In considering generic kinds of knowledge (tacit and explicit) and knowledge transfer mechanisms, the work
of Nonaka and Takeuchi (1995) on knowledge creating companies was found particularly useful.

**Barriers to Learning**

The attribute matrix and the model of corporate memory were used to explore the significance of failure in some of their elements as potential barriers to implementation (reference paper C). This generally dealt with internal process matters (although there are some external connections). There are also environmental factors that impact organisational learning. Is the company focus still consistent with its operating environment? Does the company structure influence its learning capability? How is learning linked with suppliers and customers? These questions were also explored.

**Maintaining Balance**

The learning processes and competencies needed for survival today, to support change for tomorrow, and to support the creation of options and positioning for the future were considered in relation to each time horizon. This has been observed by a number of researchers, but the work of Baghai, Coley and White (1996) from the McKinsey Company was found to provide a practical overview. Different competencies, measures of performance and learning processes were observed in relation to each time horizon, resulting in some paradoxes and potential conflicts to be balanced. A pictorial model reflecting the three time horizons, activities appropriate to each, and competencies needed was developed, and has proven helpful in taking a total business view. Prioritising efforts between these three time horizons, and other issues related to time (for example the typical product and process life cycles in a particular industry) influence what needs to be learned and when. A structured approach to assessing company progress towards its long term vision of the future was also explored. These exploration processes themselves provided valuable learning experiences at the strategic level.

Reviewing the advantages and disadvantages of particular organisational forms from a knowledge transfer standpoint suggested that:

- Functional hierarchy forms of organisation provide concepts of level and specialised purpose consistent with supporting different time horizons, focus on explicit knowledge, and generally involve sequential decision making.
• Network forms of organisation provide links across boundaries, focus on knowledge transfer and conversion, and support analysis of complex matters from a variety of perspectives.

• In team based forms of organisation, members participate in defining boundaries, there is a focus on tacit knowledge, and consensus decision making is common.

It was noted that whilst a particular form may best suit specific circumstances, all three exist (formally or informally) in every organisation. The point is that any given organisational form has some beneficial attributes and some downsides that have to be managed to minimise their impact. A form of audit process is presented to identify the issues to be managed in connection with changing an organisation’s structure.

Learning with others
For the aerospace company, the external environment had lead to a response of progressively expanding a number of network relationships in research and development, and with partners and suppliers. It has been observed that many of the competencies associated with a learning organisation also support this style of operation, and enables different kinds of capability to be offered to customers. In pursuing organisational learning, attention must also be given to these external aspects of company operations. For many companies today, materials and outsourced services cost significantly more than internal labour costs. So the strategic approach to supply chain management (including within the customers premises), and the strategic market positioning of a company will influence what the organisation must learn to compete.

Ongoing Learning
There is evidence that it's ability to sustain operational and technology competencies has supported the Aerospace Company in coping with considerable change over its seventy plus year history. There is evidence that acquiring learning organisation and knowledge management capabilities will help it compete in the future, but that it may take ten years or more for them to become transparently embedded in the organisation. During this period, top level management support needs to be sustained. It is further suggested here that whilst a particular company may focus on lean manufacturing, or supply chain management, or some other initiative as a primary focus, underlying learning organisation attributes will be needed to embed changes in the organisation in an enduring way. In selecting a particular change strategy, the contingency approach of Dunphy and Stace (1994) was found to fit well with the case study observations associated with this research.
Levels of Learning
Organisational learning was observed more as a cyclic, multi-level process than a linear process, with higher levels of learning requiring considerable sophistication. Three levels of learning were postulated: acquiring foundation language; exploration of learning opportunities and conversion into action; and creating new knowledge from the new perspectives now available. The case study aerospace company (and many others reported in the literature) is considered to be at the exploration level. It has made progress in each of the four areas targeted early in the research program. Finally, it was considered that taking a distinctive "knowledge view" of an organisation revealed new insights into its workings and into how competitive advantage might be created (reference paper B considers obtaining leverage from corporate memory), but that tools for this approach are still in development.

Making a Difference
Has the research made a difference in the case study aerospace company? It has certainly improved the candidates understanding in relation to organisation knowledge, and as a manager in the company, this is reflected in support for changed work practices. The company's learning organisation capabilities have improved over the period of the research, and this has supported the implementation of other, more targeted initiatives. But there is still a substantial opportunity for further learning. Progression can be seen to some extent from the case studies supporting this thesis. They are broadly in chronological order, starting with the understanding that different modes of learning were needed, and finishing with more sophisticated ways of working with others and developing new products.
1. INITIAL LITERATURE SURVEY AND CASE STUDY

1.1 Literature survey

An initial literature survey was carried out using a key word search to obtain more than one hundred and thirty abstracts, and then selected full papers were obtained. The references are included in the bibliography section of this report, along with others that were subsequently identified. The highlights from the survey were outlined in an internal company management report that also provided more detail of some Australian learning organisation studies (Dunphy, Turner and Crawford (1996), Field and Ford (1995), Rameau (1995). This approach was taken as there was some scepticism toward simply adopting overseas practices without adaptation.

Several definitions of and a diversity of views about the attributes of the learning organisation were noted. A definition adopted for the purposes of this research was: An organisation that has created a learning environment that provides a source of competitive advantage. This implied that there must be both an ability to defend an existing competitive position and an ability to create new ones as the company’s products and markets go through their natural life cycles.

1.2 Some learning organisation attributes

The following are, in much abbreviated form, some of the observations made from the initial literature survey.

Some environmental influences were noted. Some researchers observed that the competitive environment would require companies to acquire new technologies, new skills and new values to meet customer needs (Goldhar and Lei(1991), Marsick and Watkins (1994)). Others observed that the operational environment would require multidiscipline teams to develop new products faster, downsizing could cause loss of corporate memory (Silverthorne (1987)), and transfer of learning within and between organisations suggests a need to continuously stimulate knowledge systemisation (Argote, Beckman and Eppe (1990)).

It was noted that learning occurs in a cyclic manner, and that learning occurs at individual, team, and organisational levels ( Nevis, DiBella and Gould (1995), Senge (1995), Beard (1993), Goldhar and Lei(1991), Garratt (1995)). It was further noted
that the drivers of learning (eg maintenance, disruptive change or anticipating future needs (Fulmer, 1994)), and cultural factors (Muller and Watts (1993)) will influence the nature of that learning


- The learning organisation embodies new kinds of capabilities compared with traditional organisations
- The organisation is built from communities of servants/leaders, with many people fulfilling either role in different forums
- Learning results from performance and practice
- There is a need for pro-actively stimulating personal development experiences, as organisations get flatter, to replace the assignment opportunities and mentoring previously available
- Both personal mastery and organisational mastery must be achieved
- Process and content are inseparable
- Learning, particularly via experimentation, can be risky and lead to frustration without the support, insight and fellowship of a leadership community
- Organisational learning, like quality, is taken in small steps with strong commitments and clear ideas
- Substantial opportunities to learn from customers, suppliers and research institutions are recognised, which, with an understanding of the dynamics of competitive forces, enables companies to leverage knowledge and skills to obtain competitive advantage

A number of authors observed some factors that seemed to help one organisation learn better than another:

- Learning is seen as part of the process of managing and improving business performance and the combination of management practices involved to develop new knowledge becomes the basis for competitive advantage (Dolan, 1995), Anonymous (1995d).
- An empowering style of leadership, characterised by less control and more inspiration and wisdom, operating within a market driven, entrepreneurial culture will see employees setting competitive goals and continuously adopting better ways to achieve these goals (Bencivenga (1995), Dobbins (1995), Urban (1995))
• Challenging the status quo is encouraged in a team environment, where flexible processes for communication, coordination and conflict resolution among the members are practiced (Stanley, 1995)
• Change is managed so it is a positive experience for employees (Greene, 1988)
• Education starts with the recognition and acceptance of one's ignorance (Hyden, 1991)
• Learning and earning are blended in varied ways (Atkinson, 1994)
• Organisations must be flexible enough to do something about what they learn regarding their external environment, recognising that sufficient agreement must be developed for organisational consensus to result (Iles, 1994). Lalonde (1995)
• Shared vision and systems thinking support a consistency of purpose and process, in spite of high rates of change (Hodgetts, Luthans and Lee, 1994)

Barriers observed in some circumstances were:
• Simply emulating best practice in a piecemeal way, without stimulating organisational learning and real competitive advantage can lead to disillusionment (Day, 1994)
• A restricted view of the operating environment may give the wrong focus, tunnel vision and an inability to capitalise on diversity can restrict learning opportunities (Tremblay, 1995)
• A return to individualism, with cultures of disrespect or fear can inhibit organisational and team learning (Marsick and Watkins, 1994)
• Separate focussed business units may improve short term positioning, but organisational learning is retarded (Bartnett, Greve and Park, 1994)
• Research on how teams learn suggests unequal formal power among team members inhibits learning, yet complex work environments make it difficult for individuals to solve problems alone (Brooks, 1994)
• If employees could not relate their roles to company goals and how they contribute to the organisations success, they may not see the value in learning (Anonymous (1995g), Denton and Wisdom (1991))
• If training is inappropriate for either the individual or the organisation, and not synchronised with real needs, learning may not be achieved (Anonymous, 1995g)
• Operational and automated systems that serve the company, not the customer, will not support learning that is a source of competitive advantage (anonymous, 1995)
From an implementation point of view, it was considered that both the maintenance of excellence in current competencies and innovation in the development of new ones would be required, and that the organisation must continuously balance these two demands. The focus could not just be on learning to accumulate knowledge, but on its rapid conversion into action. That would lead to continuous but informed change in the way the organisation works and in who does what. Some particular learning practices were noted, and these were explored in Case Study one.

From a research point of view, the literature examined was primarily focussed on people issues without a clear understanding of the underlying processes that stimulated or inhibited them in an organisational learning context. There was little information about embedding learning in organisational routines, structures or processes to maintain a degree of independence from individuals, who may come and go. There were many pieces of a large jigsaw puzzle, and attempts to provide simple frameworks (eg Senge's (1990)) were helpful, but were not considered to be complete.

1.3 A Case Study

As a starting point, current training arrangements within the aerospace company were reviewed for consistency with the perceptions of a learning organisation obtained from the initial literature survey. This is summarised in case study one. It was that the focus at the time was on individual learning of manufacturing competencies, which was judged to be necessary, but not sufficient.

1.4 The way forward

Considering the reflections from the literature survey, and the case study position assessment, four general practices were considered to need improvement in the case study company (on the basis that enhancing the company systems and practices is how learning is embedded at the organisational level), and these became the initial research focus. These were:
(1) Enhanced individual learning within an updated employee development system that:
- Better aligned individual competency development with the company's strategic direction and environmental needs
- Addressed career development in a flatter, ever changing, knowledge based organisation
- Was integrated with day to day work so the relevance and impact of the learning is quickly apparent
- Provided new explicit knowledge and organisational learning in addition to individual learning that takes place.

(2) Structured problem-solving processes that become a way of life to both:
- Enhance effectiveness today (single loop learning) Rapidly corrected errors in the current system to assure excellence and
- Continually question current practices and identify "stretch" goals that supported company innovation and growth (double loop learning)

(3) Processes to acquire, share and use knowledge as a unique source of competitive advantage, recognising that, unlike other assets that depreciate as they are used more, organisational knowledge actually appreciates as it is used more widely. This will require:
- Refinement of systems to facilitate acquiring, sharing, using and re-using knowledge
- The application of such systems to the collective past and present knowledge base - the corporate memory
- The continuous assessment and sharing of new knowledge from the external environment, involving a higher level of collaboration with customers and suppliers

(4) Project management of change in the way the organisation works, involving
- Understanding what we must change from and what areas of change might yield the best competitive advantage (e.g. from audit and operations research projects)
- Understanding what the organisation needs to change to (e.g. through environmental scanning foresight and scenario analysis; and through seeking benefit from discontinuities)
The adoption of more sophisticated project management, risk management and innovation stimulation tools to understand how to rapidly introduce an endless succession of organisational "breakthroughs".
2. FLOW-ON LITERATURE SURVEYS AND CASE STUDIES

2.1 Research approach

The research approach taken was:

- to stimulate action along the lines suggested for company improvement in the previous section (essentially treating the four areas of interest as the research questions), to explore the practical application of any concepts emerging, and
- to produce a series of case studies of the relevant experiences of the aerospace company or other organisations to support concepts being developed. Twelve case study summaries are presented in a later section of this thesis.

From this view, and considering the follow-on literature survey work, four facets of organisational learning were initially pursued:

- Understanding better how people (as the agents of organisational learning) learned, and were stimulated to learn
- Exploring some processes that integrated organisational learning and business activities
- Considering issues arising from the need to balance learning to improve performance today against learning to be positioned for the future, and balancing internal and external learning opportunities.
- Considering some attributes of organisational structure and work organisation from an organisational learning point of view.

Knowledge management was a widespread theme in the follow-on literature surveys, and also arose from the research right from the start, leading to a focus on people processes and knowledge representation that supported the identification and utilisation of knowledge. Both organisational learning and knowledge management processes were found to be complex, and prone to failure, leading to some work relating to potential learning barriers. The four research papers included in this document are concerned with these last two themes:

- Identifying and sharing critical knowledge
- Barriers to learning and knowledge transfer

The construction of "models" and "maps" that were publicly tested by peer review within the authors' organisation, at research colloquia, and through publication
became the common style (consistent with the suggestions of Argyris and Schon described in section 3.2). Some twenty six presentation or publications were produced.

2.2 Flow-on literature surveys

Additional references relating to the different aspects of organisational learning being explored further were sought as each aspect, described in later sections of this report, was explored. Relevant literaturesurvey findings were included in publications associated with each section. These references have been added to those identified in the initial survey, and all references are presented in the bibliography section of this report.

Some particular references were found to be useful in either providing a foundation for the research area being explored, or in helping to understand what was being observed were:

- Jarvis (1987): from focus group of post-graduate adult educators, a model useful in understanding what might drive different kinds of outcomes was developed. Similar outcomes observed at the organisation level could be better understood by reference to this model.
- Senge (1990, 1994, 1999): persistent study of learning organisations over more than a decade, and the many case examples published provided a good basis of comparison with observations in the aerospace case study company.
- Nonaka and Takeuchi (1995): an appreciation of the interaction of tacit and explicit knowledge, and the use of metaphor and analogy in knowledge transfer supported a number of the models and propositions put forward in this thesis.
- Baghai, Coley and White (1996): from wide experience available to the McKinsey consulting company, ideas about what characterised long-standing businesses and the need to balance competing demands helped understand what was happening in the case study company.
- Dunphy and Stace (1994): the approach of matching the change management tools to the environment of a particular business, and using different tools as needed helped appreciate the forces at work in some of the case study material. The observations made in this thesis reinforce the Dunphy and Stace approach.
3. PEOPLE AS AGENTS OF ORGANISATIONAL LEARNING

3.1 Overview
Whilst organisational learning is about acquiring competencies and practices that persist as individuals within the organisation come and go, people are the agents of that learning. People will acquire new competencies or gain access to new knowledge, and by their actions will determine how this will ultimately be embedded within the organisation as a beneficial change. Consequently, appreciating how individuals learn has been found important in understanding how organisations learn, even though this is only part of the total process. The concept of an organisation consciously coping with change and learning from it has been observed in many countries over several decades (Garratt, 1995). From these observations, it is suggested that people are the only sources of organisational learning, and that learning has both personal value for the individual as well as potential asset creating value for the organisation. It was further noted that multiple feedback loops of learning are needed to create continuous organisational benefits. This is evidenced in various ways in a wide range of references.

3.2 People in learning organisations
Argyris and Schon are generally regarded as the initiators of “learning organisation” ideas in the USA, and their work will be used here to provide some background. From studies of how to introduce change in an education system, Argyris and Schon (1974) noted communication difficulties between those people whose focus was current “theories in use” and those with the new “espoused theories”, and they conducted research into this situation. It was also observed that people’s environment influenced their behaviour, but just how depended on their individual perception of the environment. This suggests that organisational structure affects peoples behaviour, but also that peoples needs should affect the form of an organisation. The research also led to the view that effective action requires the generation of knowledge that crosses traditional boundaries.

Argyris and Schon (1974) considered that traditional processes for generating new knowledge, that is, painstaking and detailed experimentation and analysis, should also be called into question. It was subsequently argued that people needed to
become more competent in taking action and simultaneously reflecting on that action to learn from it.

Argyris and Schon (1974) observed that people were making unstated (or even subconscious) assumptions about compatible theories in use in their interactions with others that may or may not have been valid, and that under appropriate circumstances, enunciating and analysing these "theories in use" could lead to beneficial learning. Attitudes toward change, and the way theories were tested were the most influential factors in this respect, as illustrated in Table 3a below. They coined the phrase single loop learning to characterise learning that enhanced a current theory in use, and the phrase double loop learning for learning that involved change in the governing variables on one's theory in use. It is suggested that people will behave differently, depending on whether they are refining current practice, or changing to a new one, which also requires extra competencies.

<table>
<thead>
<tr>
<th>ATTITUDE TOWARDS CHANGE</th>
<th>PRIVATELY TESTED</th>
<th>PUBLICLY TESTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLOSED</td>
<td>1. There tends to be little learning, and little behavioural change</td>
<td>3. Will tend towards a mutually defensive, self sealing situation</td>
</tr>
<tr>
<td>OPEN</td>
<td>2. Learning will tend to occur to the extent that it does not depend on others knowingly providing valid information</td>
<td>4. Most effective learning regime</td>
</tr>
</tbody>
</table>

Table 3a The influence of testing theories in use on learning outcomes

In later work, Argyris and Schon (1978) proposed a view of organisational learning that involved the detection and correction of error. When the error that was detected and corrected permitted the organisation to carry out its present policies or achieve its present objectives, then that error detection -correction process is considered to be single loop learning. Double loop learning occurs when an error is detected, and then corrected in ways that involve modification of the organisation's norms, policies and objectives. It is suggested that most organisations do quite well at single loop learning, but can have great difficulty with double loop learning, as a change of peoples' theory in use is commonly required. The explanation given is that people
develop these theories to make routine activities more efficient, so once they are formed they become deeply embedded and are hard to change.

It is observed that even when individuals in an organisation learn new things, there are cases where an organisation seems to know substantially less than its members, and cases where organisations simply cannot seem to learn. It is suggested that people use images and maps to relate to the organisation, and that each member of the organisation constructs his or her own map that is always incomplete. As organisations grow large or complex different forms of maps are published to guide individuals, leading to the suggestion that these private images and public maps are the media of organisational learning. The role of individuals is to embed their discoveries, interventions and evaluations in the organisational memory. Argyris and Schon (1978) suggested that the occurrence of organisational learning might be tested via a checklist, such as:

- did individuals detect an outcome which matched or mismatched the expectations derived from their images and maps of the organisational "theory in use"
- did they carry out an enquiry which yielded discoveries, interventions and evaluations pertaining to organisational strategies and assumptions
- did those results become embodied in the images and maps employed for purposes such as control, decision or instruction
- did members subsequently act from these images and maps to carry out new organisational practices
- were changes in images, maps and organisation practices regularised so they would be unaffected by the departure of some individuals
- do new members learn these new features or organisation theories of action as part of their socialisation to the organisation

Each of these questions point to possible sources of failure in, or capacity for, organisational learning, but focus on single loop learning. In this style, individuals respond to error by modifying strategies and assumptions within constant organisational norms. In double loop learning, response to detected error takes the form of joint enquiry into organisational norms themselves, to try and resolve their inconsistencies and make new norms more effectively realisable, with the results being encoded in new maps and images. A structured approach is advised, along with acceptance of conflict as normal whenever change is proposed. In an organisation seeking to learn and change, there will be inconsistencies to be dealt
with. For example it might seem reasonable to all pull together in the same direction, whilst at the same time being creative and innovative, but this might lead to paradoxical messages such as:

1. Do not violate rules versus take initiatives
2. you will be penalised if errors are made versus sound alarms early for errors detected
3. rewards and penalties are based on present performance versus think beyond the present
4. do not cross into other areas of responsibility versus think of the organisation as a whole
5. compete with other vs cooperate with others

It is observed that informal systems frequently compensate for organisational paradoxes and inconsistencies, so the total system is the formal plus the informal components, and the informal component may support or inhibit organisational learning. Suggested interventions include helping people become aware of existing theories in use and unfreezing them, and education in the use of double loop processes and learning systems. It is further suggested that maps of corporate memory bringing together information that may be contained in peoples heads, files, documents or computers are needed to define where the organisation is today, where it wants to be in the future, and how to get there.

Reflecting on 10 years of research, Argyris (1982) considered that most people prefer single loop learning processes, decomposing complex problems until they can be solved by these processes, but the result may be that we produce something for today, while losing control of tomorrow. He also observed that if this decomposition cannot be achieved, then people will distance themselves from the problem, blaming others or the system, and they will fail to cooperate in progressing potential solutions. If this becomes the norm, then the organisation can become ineffective.

Argyris (1982) also noted that at the organisational level, mechanisms that are created to coordinate the actions of many individuals may inhibit double loop learning and create internal conflicts and injustice. So we must learn to live with contradictions. However it was observed that people can govern themselves if they live in an environment where rules about inconsistency and injustice are stable and predictable. If these rules are changed unilaterally, the basis for detecting and correcting errors is gone and self governance is threatened. Further, Argyris (1982) defined organisational learning as a four step process: Discovery – Intervention –
Production – Evaluation and centralisation. He suggested a number of conditions that facilitate double loop learning as follows:

- Start with observable data, or propositions that can be independently confirmed or rejected
- Use structured techniques (instruments) that permit learners to design and produce new observable data and culturally accepted meanings embedded in that data
- Surface inconsistencies and incongruities step by step, as the process of unfreezing single loop processes can be emotional, and potential information overload needs to be avoided.
- Deal with ineffective management performance
- Facilitating the understanding of and the need for reducing distancing
- Analysis of the reasoning used in problem solving

It was also observed that, because there is more than one way to get from the current situation to the desired future one, then some proposed actions may seem to be inconsistent when they are compared at early stages of the journey.

The focus of the discussion to date has been in the context of problem-solving as a driver of organisational learning. But in the late 1980’s experience of beneficial organisational learning arising from strategic team planning processes was reported by de Gues (1988), who described practices used at Shell International. A team of world-wide managers, supported by a strategic planning group, developed scenario’s that might unfold in the future. As well as developing objectives and strategies, the group developed common understandings of the significance of business environment changes that might occur, and of the subtle shifts that might signal a change in a particular direction. Key success factors were the use of structured processes to examine possibilities, and the selection of team members who had the authority to act if change was needed.

Similar observations can be made in the aerospace case study company. In the early 1990’s the global market for aircraft halved over an 18 month period, leading to the need for significant change in the aerospace company. Two things were clear to both the management and the employees: the business environment would continue to change, and the previous style of company operation was unlikely to be competitive in the future. Workshops held both with the unionised workforce and union representatives, and with middle managers highlighted the need for a vision of the
future, and some roadmap of initiatives to get there. Twice yearly strategic planning workshops were utilised by senior management to progress this approach. These workshops identified actions needed, and reviewed the current vision against the perceived environment. Significant changes to past practices were intended, but not always realised due to both capability and capacity limitations. The process did however provide a strong alignment of views, as was evidenced in some particular customer reviews reported elsewhere in this thesis.
Stata (1989) describes an approach that includes strategic planning and the use of dynamic systems models to draw out underlying issues within his company. In addition, measures to assess progressive improvement in quality performance of the business were established, as this measure was meaningful to all parts of the organisation. It was noted that some other internal cost or profit measures could cause internal friction as each subgroup sought to optimise only their own element of the whole operation. This leads to the view that measurement of the benefits of change, as well as current performance is necessary to provide feedback, but selecting the right measures is critically important.

3.3 Some learning organisation implementation concepts

The concept of the learning organisation seemed to become fashionable in the late 1980's and early 1990's, and many people associate this with the work of Senge (1990), who enunciated a relatively simple "map" based on five "disciplines". Around this time there were many perspectives on the learning organisation, as represented by Harvard Business Review articles assembled into a book entitled "The Learning Imperative" (Howard and Hass, 1999). The first four disciplines represent clusters of attributes related to people that were discussed previously in this section. The fifth one involves describing a particular situation as a cause-and-effect system. A brief outline of Senge's (1990) five disciplines is:

- **PERSONAL MASTERY:** This discipline of aspiration involves formulating a coherent picture of the results people most desire to gain as individuals (their personal vision), alongside a realistic assessment of their lives today (their current reality). Learning to cultivate the tension between vision and reality can expand people's capacity to make better choices, and to achieve more of the results that they have chosen.

- **MENTAL MODELS:** This discipline of reflection and inquiry skills is focused around developing awareness of the attitudes and perceptions that influence thought and interaction. By continually reflecting on, talking about, and reconsidering these internal pictures of the world, people gain more capability in governing their actions and decisions.
• **SHARED VISION:** This collective discipline establishes a focus on mutual purpose. People learn to nourish a sense of commitment in a group or organisation by developing shared images of the future they seek to create, and the principles and guiding practices by which they hope to get there.

• **TEAM LEARNING:** This is a discipline of group interaction. Through techniques like dialogue and skillful discussion, teams transform their collective thinking, learning to mobilise their energies and actions to achieve common goals, and drawing forth an intelligence and ability greater than the sum of the individual members' talents.

• **SYSTEMS THINKING:** "In this discipline people learn to better understand interdependency and change, and thereby to deal more effectively with the forces that shape the consequences of our actions. Systems thinking is based on a growing body of theory about the behaviour of feedback and complexity – the innate tendencies of a system that lead to growth and stability over time. Tools and techniques such as system archetypes and various types of learning labs and simulations help people see how to change systems more effectively, and how to act more in tune with the larger processes of the natural and economic world."

Whilst this relatively concise enunciation of some principles is very helpful to many people, others have had difficulty in implementation just using these principles, resulting in the publication of a "Fieldbook" (Senge et al, 1994). Although this publication was intended as a practical guide, the authors also suggested some key theoretical arguments:

• Organisations are products of the way people in them think and act

• To change organisations for the better, you must give people the opportunity to change the ways they think and interact

• This cannot be done through increased training, or through command and control management approaches. No one person, including a highly charismatic leader or CEO, can train or command other people to alter their attitudes, beliefs, skill, capabilities, perceptions, or level of commitment.
Instead, the practice of organisational learning involves developing tangible activities: new governing ideas, innovations in infrastructure, and new management methods and tools for changing the way people conduct their work. Given the opportunity to take part in these activities, people will develop an enduring capability for change. The process will pay back the organisation with far greater levels of diversity, commitment, innovation, and talent.

Most recently, another book (Senge et al, 1999) considers issues of maintaining the momentum of change, providing observations on initiating further change, sustaining transformation, and the challenges of redesigning and rethinking.

### 3.4 Ways that people think and act

Leonard and Straus (1997) discuss the ways that people think and interact in terms of their natural cognitive differences, defined as varying approaches to perceiving and assimilating data, making decisions, solving problems, and relating to other people. They argue that learning how to derive benefit from differences involves managing conflict and tension in a creative way. They observe some inappropriate management responses to conflict, and suggest some ways of directing it positively. They note that managers most commonly have one of two responses: they may actively avoid the clash of ideas, and work with comfortable clones; or they may value variety, but not appreciate that people with different styles may not understand or respect one another, so fail in their coordination attempts. It is also noted that a particular type of organisation, or specialist occupation within it may attract a clustering of people with similar cognitive preferences that align well with the work to be done, and that managers who are successful at fostering innovation blend different approaches in a productive process termed creative abrasion.

The use of formal instruments to help people understand themselves and each other better is put forward. However it is also noted that all the assessment in the world means nothing unless new understanding brings different actions. In addition, it is suggested that communications be tailored towards the receiver, not the sender, and that people with different views be deliberately sought out. It is considered essential that diverse participants in a learning experience understand each other and accept
differences whilst remaining focused on the main issue even though they have different approaches to it. Structured processes must be used to depersonalise conflict in such situations.

A variety of personal assessment tools have been used for different purposes within the case study aerospace organisation, and these have shown a clustering of one cognitive style that, on reflection matches the type of work to be done quite well. This information has been used in selecting structured innovation processes that match this profile to stimulate learning. Without such structure, the assessment group did not handle creative opportunities so well. It has been noted from experience however that an appropriate level of technical competency relevant to the task or problem at hand is also needed to sensibly achieve results. Just blending profiles is not enough. This is particularly important in working with technologies new to the organisation, where jargon and the clarity of concept definition may be initial barriers to learning. This is also consistent with the views of Bennis and Biederman (1997) who observed that combined talent and breadth of view was a recurring attribute in the creative collaborations they studied.

Elsewhere in this thesis, the practice of mentoring has been mentioned as supporting transformational learning associated with the introduction of new technologies or new ways of working. A number of examples of mentoring in the context of a learning organisation are cited by Senge (1999) as not only facilitating learning, but beneficially enhancing the knowledge sharing culture of organisations that adopt the practice. From the case study work carried out for this thesis, the process has been found to be very important, and is considered in some detail in reference paper A that forms part of this document.

3.5 Team learning

A number of researchers have highlighted the importance of team processes in organisational learning. Argyris and Schon (1974) suggested that effective action requires the generation of knowledge that crosses traditional boundaries. Senge (1990) sees team dynamics supporting dialogue that stimulates learning. A long term researcher of team-based work organisation, Belbin (1996) sees enterprises operated as a hierarchy of teams to support functioning with flatter organisation structures, and establishing faster concurrent decision systems to replace traditional sequential ones. He also notes however that teams can develop poor dynamics, and
that there will always be some decisions that need to be directive in their nature. Belbin (1996) identifies three kinds of teams (operational, cross-functional, and strategic) and nine team roles, some of which are more dominant in particular kinds of team. From subsequent research Belbin (1997) also identifies seven generic kinds of work carried out within any organisation; some structured and some unstructured, some concerned with decision-making, and some simply unproductive. This mapping of teams and their work supports the design of teams for particular purposes, but the large number of things to be attended to also gives an insight into some of the difficulties in getting it right.

In the context of this research, it is suggested that the value of teams in supporting organisational learning has two aspects to it:

- having teams of people learning together makes the organisation less vulnerable to the departure of a particular individual, develops common language that enhances communication, and develops a common sense of purpose that aligns decision-making.

- the ability of the team to implement beneficial change will depend on the power shared with it, recognising that the acceptance of interdependencies within and outside the team is necessary to ensure appropriate priorities are assigned to the work and performance of the team. Achieving an appropriate balance can speed up learning and change arising from it.

Lucas (1998) discusses achievement of the right balance between authority (power in the manager's hands) and empowerment (power in the employees hands) that will sustain an interdependency where appropriate employees have enough decision-making authority to do their jobs well, but are not burdened with inappropriate responsibilities. He notes that what can not be done must also be clearly enunciated. He also notes that this balance will change with time, being driven by cultural, generational, knowledge and educational factors.

Other researchers have also noted that an individuals power and position within an organisation impacts their ability to participate in cross-functional or task force teams in terms of time availability, resource access, and influence on team processes (Brooks, 1994). In the early 1990's the case study aerospace company embarked on
a wider implementation of team-based work. Cross functional teams had been used to start up new projects in the company for several decades, but the plan was to stimulate innovation in the whole business using a hierarchy of teams along the lines described by Belbin (1996). Before the new practices were fully bedded down, the company changed ownership, resulting in some reversion to command and control practices. A number of observations can be made from the experience gained over several years however. The position at the introduction of the change was somewhat tenuous, with some middle managers concerned about the decision processes to be used, and only about fifty-five percent of the unionised workforce in favour of the change (even though it was supported by the unions). More than fifty teams of varying size were set up, with a progressive take-up of agreed responsibilities and some off-line training sessions for each team and their managers. Over time, a number of issues arose:

- Power issues: finding the right balance between dependence and independence, and the acceptance of interdependency did not go well in all groups, or between middle managers and unions in some cases. Whilst decision boundaries had been agreed at the outset, some teams did not seem to want to make decisions, and others wanted to exceed the boundaries. It is suggested that inadequate attention was paid to establishing the interdependencies.

- Workforce homogeneity: the workforce was not culturally homogeneous in a number of ways. In broad terms, employees could be clustered into three groups. The first was the longest serving group that had been with the company more than fifteen years. It had a predominantly Australian/European background, and was not comfortable about taking non-traditional decision-making responsibilities, arguing that was what supervisors were paid for. The second group had been with the company for some time, was younger, and wanted to have a say in everything. The third group had been with the company just a few years, and had an Australian/Asian background. It had a more transient view about its place in the company, and was more driven by past experiences outside of the company. Attitudes to the acceptance of responsibility, learning, and decision-making were strongly influenced by cultural perspective. What worked within a particular team depended on the mix of the three groups within it.

- Diversity issues: a number of ethnic issues that had not been previously experienced arose in determining how individual teams would get their work done and how they would deal with day-to-day problems. People from the Indian sub-continent suddenly became more sensitive about their relative native class when
they were all together in one team. People from South-East Asia were reluctant to engage in active debate, or put themselves in a position where they might lose face. Ethnic norms regarding the interaction of people of different gender took some time to emerge and be dealt with. Overall, it was observed that surfacing mental models in teams of mixed ethnic origin takes skilled external facilitation, and must be done in small steps over an extended period.

On the issue of diversity, Cope and Kalantzis (1997) note that in most countries, there is a larger diversity of cultures than ever before. They see that this potentially introduces an inconsistency with always carrying out the same task in the same way, and argue for a productive diversity approach where work and environmental circumstances are better matched. For this to be achieved, they suggest some particular practices must be in place:

- Accepted equality of contribution, and skills in listening to communication differences
- A process of cultural negotiation to make an organisation in which different experiences shape common purpose; and they see negotiation as a major aspect of organisation competency.

Lewecki, Saunders and Minton (1999) point out that issues of ethics, social context and trust all impact on the process of negotiation, and it is suggested here that such issues make Cope and Kalatzis’s (1997) proposition of acceptance of equality of contribution difficult to sustain. It is never-the-less accepted that negotiation is an important competency in implementing change that embeds organisational learning in place, and it is appreciated that change is made more complex by diversity in the workplace.

Independent of any extension of team-based work in the aerospace company, a research study was undertaken in conjunction with a University (Delany, 1996) to examine existing training delivery and assessment systems, and to suggest ways of accelerating competency acquisition that integrated training and work (refer case study 2). A case study of the introduction of an advanced quality system was used to explore learning about something new. The company had operated an apprenticeship scheme for many years, and a master/apprentice buddy system was embedded in the company culture as a knowledge transfer mechanism. But when
new practices were being introduced, this approach did not seem viable, and without it there seemed to be some difficulty in translating classroom training into reality. Whilst the classroom trainers could help, they were not readily accessible because of their workload. Difficulties were also observed with formal problem analysis skills, advanced statistical process control, and acceptance of process ownership (this might be an example of people distancing themselves from a problem they could not handle, as noted in the work of Argyris (1982)). A broader look at the resources available showed that whilst an expert in the new quality system might not be available to every group, in conjunction with their extended group of support people, some-one had knowledge about some aspect of the new system. For example, engineers could understand the statistical process control aspects, so a mentoring team approach was set up. In operating this learning team, the soft skills referred to above became more important than they had in the previous style of operation, whilst mentoring remained a very important practice. This notion of establishing learning teams has been taken further in recent times, including more remote participants, with a collective focus on a mission rather than an agenda, to form communities of practice (Skyrme and Amidon, 1998).

3.6 Learning process models

Earlier in this section, mention was made of an organisational learning cycle suggested by Argyris (1982): discovery - intervention - production - evaluation and centralisation. About the same time, Kolb (1984) published a model derived from studies of experiential learning, that has provided a foundation for much of the later research, and is still popular today. The model, in the form of a continuous cycle, is shown in Figure 3a below.
Experience has shown that individual learners seem to favour a particular aspect of learning (for example active experimentation), and instruments have been developed to help understand the relative strengths of these preferences in individuals. Within the aerospace organisation, this kind of instrument has been used to help put together teams of people with complementary strengths for particular purposes.

Building on this model, Jarvis (1987) noted that the orderly cycle projected by Kolb (1984) was not always observed, and that there were a number of different potential outcomes arising from exposure to a learning opportunity:

- No learning may take place: the opportunity may not be understood, it may conflict with an individual's values, or it may be perceived as simply reinforcing current knowledge.
- Non-reflective learning may take place: a skill may be enhanced, or some information may be committed to memory
- Reflective learning may take place: resulting in a changed person, or changed personal practices

The Jarvis (1987) model is shown in Figure 3b below, and a more detailed summary of outcomes is shown in the following Table 3b. In the table, there is reference to the practice of mentoring stimulating reflective learning. This is certainly the experience in the case study aerospace company, as noted in the discussion of team learning.
Figure 3b complex learning cycle (based on Jarvis, 1987)
<table>
<thead>
<tr>
<th>LEARNING RESPONSE CHARACTERISTIC</th>
<th>RESPONSE TYPE DESCRIPTOR</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NON-LEARNING (the opportunity generally perceived as meaningless to the experience of the learner)</td>
<td>PRESCRIPTION (1 – 4)</td>
<td>Outcome is the person’s views/knowledge is re-inforced, but not significantly changed. Commonly involves a great deal of social interaction, utilising patterned behaviour. These patterns facilitate rapid responses to common situations in life. People might presume they have nothing more to learn, so they don’t effectively participate. Or, they may participate only to satisfy another need (e.g. direction from the boss) not to learn.</td>
</tr>
<tr>
<td>NON-CONSIDERATION (1 – 4)</td>
<td>REJECTION (1 – 3 TO 7, TO 9)</td>
<td>Outcome may be some re-enforcement, but relatively little change. Readiness for learning (too busy, no time to think, don't understand the jargon) may be an issue. There may be a gap between the experience and the biography of the individual, so they do not see the significance of the experience. They may become pre-occupied with one aspect of a lecture and miss some other aspects.</td>
</tr>
<tr>
<td>NON-REFLECTIVE (can reproduce the knowledge, skills and attitudes in many situations. Best presented, through a variety of sensory modes and experiences)</td>
<td>PRE-CONSCIOUS (1 – 3, TO 6, THEN 4 OR 9)</td>
<td>Outcome is the storing of experience in memory, that may ultimately lead to a re-enforcement of existing views/knowledge or result in a changed and more experienced person. This is sometimes called “incidental learning”. It is considered to be a common process in the access of culture, which influences behaviour. In this area, actions speak louder than words, as people emulate those around them.</td>
</tr>
<tr>
<td></td>
<td>PRACTICE (1 – 3, TO 5, TO 8, TO 6, THEN TO 4 OR 9)</td>
<td>Outcome may be that a person is changed and more experienced, or re-enforced, but relatively unchanged, depending on the starting skill level. Practice certainly forms the basis of skills learning that is applicable to manual occupations, sport, social skills and language. The skills are often obtained through a process of conscious imitation of a peer group, recognised expert or icon. The apprenticeship model utilises this form of learning.</td>
</tr>
<tr>
<td></td>
<td>MEMORISATION (1 – 3 TO 6, POSSIBLY TO 8 TO 6, THEN 4 OR 9)</td>
<td>Outcome is the acquisition of “correct” information that can be reproduced at another time. It is regarded as the logical result of much traditional teaching, especially in children. It presumes a specific form of knowledge: an empirical fact that is the only correct formulation of that knowledge. If skill in memorisation results in a sense of success, it may enhance the learner’s self-image, but otherwise is unlikely to change the person without other processes, such as reflection, coming into play.</td>
</tr>
<tr>
<td>REFLECTIVE (frequently has pre-requisite competencies and knowledge as some risk can be involved. Most likely approach to innovative outcomes)</td>
<td>CONTEMPLATION (1 – 3, TO 6, TO 6, TO 9)</td>
<td>There may be no behavioural outcome. The learning situation itself may be considered and an intellectual decision made about it. This may be memorised or articulated for later use. The evaluation step involves self-evaluation. Both logical knowledge and belief may be acquired through this process. It may be stimulated by a mentor encouraging the learner to think through an issue, to discover innovative answers, or by a group ritual.</td>
</tr>
<tr>
<td></td>
<td>REFLECTIVE PRACTICE (1 – 3, TO 5, TO 7, TO 5, TO 8, TO 6, TO 9)</td>
<td>This form of learning relates to problem-solving. Experimentation, evaluation and reasoning/reflection are all combined. It is the basis of a great deal of pragmatic knowledge. Many skills are learned, thought about and experimented with in practice. Learning may be in response to a discontinuity but, in any event, is likely to create one in seeking to implement new ideas.</td>
</tr>
<tr>
<td></td>
<td>EXPERIMENTAL LEARNING (1 – 3, TO 7, TO 5, TO 7, TO 8, TO 6, TO 9)</td>
<td>The outcome is pragmatic knowledge that has been shown to be close to reality through experimentation. It is common practice in the sciences and social sciences. It is more likely to be pro-active than reflective practice, setting up experiments to gather new knowledge rather than reassessing to problems. It can involve an element of risk (e.g. experimenting with the structure of an organisation), so, if associated with groups, requires a high level of self confidence and/or trust.</td>
</tr>
</tbody>
</table>

Table 3b potential learning outcomes arising from different learning paths (developed from Jarvis, 1987)
It has been suggested in various ways through this section that people and organisations learn progressively via a series of learning cycles, and some representative learning cycles have been noted. Table 3c below provides a summary of these and other learning cycles that are used later in this thesis.

<table>
<thead>
<tr>
<th>LEARNING CYCLE ELEMENT</th>
<th>TYPICAL APPLICATION</th>
</tr>
</thead>
</table>
| DISCOVERY
| INTERVENTION
| PRODUCTION
| REFLECTION             | ORGANISATIONAL LEARNING & CHANGE (EG ARGYRIS & SCHON, 1974 -1992) |
| PLAN
| DO
| CHECK
| ACT                  | PROCESS CONTROL & IMPROVEMENT (EG TQM) |
| CONCRETE EXPERIENCE
| OBSERVATION & REFLECTION
| ACTIVE EXPERIMENTATION
| GENERALISATION & ABSTRACT CONCEPTUALISATION | INDIVIDUAL LEARNING (EG KOLB, 1984) |
| LEARNING SITUATION / OPPORTUNITY
| REASONING / REFLECTION
| PRACTICE / EXPERIMENTATION
| EVALUATION
| MEMORIZATION
| CHANGED PRACTICES     | INDIVIDUAL LEARNING (EG JARVIS, 1987) |
| DISCOVER
| CHOOSE
| ACT                   | ORGANISATIONAL LEARNING (EG STACEY, 1996) |

Table 3c some learning cycle representations

3.7 Some barriers

In the early 1990's the American Productivity and Quality Centre supported clubs of firms utilising a benchmarking approach to identify and share best practice. After some years of enthusiastic benchmarking, it was observed that significant change was only achieved in a modest proportion of the participating organisations. A study was commissioned, and subsequently reported by Szulanski (1996), who noted a number of barriers. Whilst he found that in the firms studied that there was a willingness to share knowledge there were frequently communication failures. Three particular kinds of failure were noted repeatedly. The first related to language. Whilst
there may have been ethnic language differences, there was different jargon used at
different benchmarking sites that left some uncertainty of understanding in the minds
of the recipients of the benchmarking information. In a similar way, the language may
have been understood, but an explanation of why a particular practice was effective,
which made sense in the context of its original application, did not make sense in the
context of the intended new application. Perhaps the practice was fine, but the
understanding of it was imperfect. The outcome however, was again, uncertainty in
the minds of the recipients. A combination of these two factors caused by multiple
interpretations and handovers of information about a best practice along the pathway
to its intended application also lead to uncertainty. So whilst the principles enunciated
in some of the best practice examples identified were accepted in principle, the
application of evaluation, reasoning and reflection processes in relation to their
implementation raised uncertainties which inhibited that implementation.

Within the aerospace organisation, similar observations have been made, but
additional factors that inhibit implementation of what has been learned have been
observed. In the changeover from a current practice to an improved one, at some
time, both practices may coexist, operations may be shut down to introduce the
change, and it may take some time to become efficient at the new practice. This
means that costs will increase, and service to customers may be compromised,
potentially introducing significant business risks. Consequently, any uncertainty about
the better practice will result in a sensible reluctance to introduce it.

In a rapidly changing environment, even emulating current best practice may not be
sufficient. Cairnes (2000), the author of a number of books related to dynamic
change, recently advised a Sydney meeting of Managers and Directors that
controlling and improving old practices may be irrelevant. She points out that in many
industries, the old practices of scientific management and human resources are
breaking down. People want autonomy, authority, variety and equitable rewards. If
they do not get these things, they walk out the door, diminishing the capability of the
company. This reinforces the need to link learning, communication and change in
operating practices built around a succession of small, fast learning cycles to
enhance the ability of a company, not just an individual, to retain knowledge. In
addition, it is suggested here that if employee turnover is an issue, large scale
change programs may be difficult to sustain.
3.8 Discussion

Learning involves multiple steps, and there are some pre-requisites to successful individual and organisational learning. For a variety of reasons, the use of structured processes is seen as necessary.

It is noted that double loop learning requires different behaviours and competencies within the organisation to support transformational change. These include:

- Communication competencies, dealing with issues of language (ethnic, technical jargon or enterprise jargon)
- Inter-personal skills to support team learning and the exploration of multiple views in an environment of potential conflict
- Technical mastery of the topic being explored, so that the jargon is understood, and the significance of learning opportunities is appreciated
- Negotiation, to facilitate action in the face of different cultural and implementation views

Structured processes identified to support a variety of facets of organisational learning are:

- Practices to identify benefits for learners, provide incentives to learn and to understand the outcomes sought
- Participative, tangible activities that:
  - Introduce a variety of perspectives
  - Identify single loop / double loop contradictions
  - Use practices that de-personalise conflict
  - Lead to action and simultaneous reflection on it to further enhance learning
  - Involve exploration of, and planning for, the future
  - Identify ways of measuring performance that supports sharing of knowledge and learning
- Establishing team learning configurations that:
  - Make the team boundaries clear
  - Make the team interdependencies clear
  - Beneficially blend people with different cultural views
- The utilisation of mentoring practices at the individual, team or enterprise level to facilitate transformational learning practices
• The adoption of learning cycle representations to show the whole process involved
• The use of systems thinking and other mapping techniques to facilitate the understanding of particular issues and their inter-relations
• The recognition and identification of elements of an organisational memory

These competencies and processes are generally additional to those operational ones needed to efficiently run the enterprise as it is today, but for the establishment of a learning organisation the additional capability must be integrated with day-to-day activities.
4. INTEGRATION OF LEARNING AND BUSINESS ACTIVITIES

4.1 Overview

In a fully developed learning organisation, learning and business activities are merged. In this section, some structured processes that support this objective are explored. In section 3, learning arising from the identification and correction of errors in the way an organisation worked was noted. Problem solving processes that involved correction to preserve present organisational norms were designated single loop learning; those that involved changing the organisational norms were designated double loop learning. More recently, Senge (1990) has combined these concepts with systems thinking processes to provide models for organisational learning. Senge (1990) also noted the need for personal mastery of a number of competencies.

A key step in these learning processes is the detection of an error condition and questioning of current norms. In this section, the idea is explored of using different kinds of audit processes to systematically detect errors in advance of those errors becoming operationally troublesome to an organisation. It is argued that applying audit processes to a projection of where an organisation would like to be, rather than where it currently is, facilitates double loop learning in a structured way. In addition, if properly selected, the audit process can align strategy and operational reality, and integrate with business activities so that finding time for learning is not so much of an issue. Finally, the processes offer a structured approach that builds on competencies most organisations should have.

From observation of and participation in a number of audit and benchmarking programs, it was observed that some kinds of audit offered an opportunity to reconsider the way things were done in the business enterprise. Specific examples are given in Case Studies 3 and 5 presented later in this document. Such processes have the virtues of providing some structure to a learning process (identified as beneficial in earlier sections of this document), and of integrating learning and business processes (minimising time availability issues and establishing relevance). Both learning audits and internal benchmarking (perceived to have some benefits over external benchmarking) were observed to yield more opportunities for improvement than could be coped with, creating some knowledge management issues.

Enhancement of individual learning, consistent with the company's strategic direction and environmental circumstances was pursued via an internal university program that sought to link theory and practice in the context of company issues. Some specific benefits observed
were in the improvement of collaborative and mentoring competencies, and in better understanding company strategic directions.

4.2 Learning by auditing

The conventional audit process uses a structured approach to assess errors between actual practice and established standards. As such, the processes would normally involve single loop learning, because problems of existing operations or procedures are only adjusted back to the current norm. Learning comes from both a systems thinking approach, from the early detection of error and from the formal requirement to understand the sources of mismatch and implement a corrective action. If there is broad organizational participation at all levels in the audit, this participation helps people understand company systems and re-inforces the outcomes sought from current business systems as well (Horsley et al, 1994).

A number of different strategies could be adopted in undertaking an audit. For instance, a vertical audit would trace an example of the audit subject through a whole range of processes. A horizontal audit may look at how a particular process is carried out for a range of applications. So, different audit strategies may explore different processes or outcomes of a business. Whichever audit is adopted, however, a good audit team needs a range of skills, such as critical questioning, which are also important in stimulating double loop organizational learning.

Some audits may involve a form of self assessment using a process developed by experts in the audit topic (Dichter, Gagnon and Alexander, 1993). Buckner (1995) represents a good example of this approach, providing work books that cover a portfolio of Business and Management systems (such as the Company’s Information Technology system). Such audits offer a number of opportunities for learning. These include:

- Comparing a range of participants’ perceptions of what is with an independent expert’s perception of what-should-be can enhance individual conceptual skills (Handy, 1993) and stimulate critical questioning of current organisational norms (Argyris and Schon, 1974) in a non-threatening environment
- The self assessment approach forces the collection and recording of information by people in the organisation about the organisation, which can then be further shared, an important aspect of double-loop learning (Argyris and Schon, 1974)
- The feedback aspect of an audit can beneficially change the behaviour of organisational personnel (Taylor, 1987)
- Developing strategies for closing the gap between what is and what should be supports the learning process elements described by Wick and Leon (1995): Vision, a plan, information, inventiveness and implementation.

4.2.1 Application of audits to double loop learning

Considering some of the attributes of auditing processes discussed above, it is proposed that, rather than have learning occur as a peripheral outcome of the audit, the audit process is deliberately used as vehicle for double-loop learning. Since this involves the correction of an error in such a way that organisational processes and norms are altered, the standard against which the test for error is made must be a vision of the future or a benchmark/best practice that would require significant change to achieve it. The corrective action must yield better ways for the organisation to achieve its goals (Dobbins, 1995). Murphy (1992) describes the benefits of self evaluation in improving the effectiveness of organisations, which suggests this should be a preferred audit strategy. This would be consistent with research on how adults learn. Jarvis (1987) concluded that "evaluation" was an important step in assessing if the learning experience was meaningful and thus appropriate for commitment to memory. From this perspective, it might be regarded that some form of auditing is a natural and essential aspect of learning.

Drawing from some of these ideas. A Plan-Do-Check-Act characterisation of a learning or improvement cycle, (a double loop model that has "check" as the connecting point) has been drafted to form a "map" of the learning-by-auditing concept. The elements are described in Table 4a below and illustrated in the following figure 4a.
SINGLE LOOP

PLAN
- Define operational systems
- Develop schedules, operational task requirements
- Set targets, KPIs

DO
- Carry out internal business operations
- Implement customer support programs

CHECK
- Review performance to plan
- Benchmark competitive performance
- Audit business systems for compliance against current standard

ACT
- Correct errors in current systems
- Pursue continuous improvement to sustain competitive performance

DOUBLE LOOP

- Enunciate organizational vision strategic intent
- Identify strategic change programs
- Identify sources of competitive advantage sought

- Implement strategic change program

- Review change program progress and issues
- Audit current state against strategic intent
- Consider unresolved issues arising from operations

- Introduce new operational systems
- Pursue organizational transformation projects to address issues identified

Table 4a Typical single and double loop learning cycle elements

It is recognized that there are other learning cycle representations that could be used: The Discovery, Invention, Production, Evaluation and Generalization, steps observed by Argyris (1982); or the three steps – discovering, choosing, acting – noted in Stacey (1996). The Active Experimentation – Concrete Experience – Observation and Reflection – Generalization and Abstract Conceptualization learning cycle of Kolb (1984). Or the more complex model developed by Jarvis (1987) to describe the learning processes of individual adults. The PDCA cycle was selected for convenience because it is familiar to many people in many organizations from its use in TQM programs.
Figure 4a Double loop learning model and associated competencies

4.2.2 Reference condition or desired end state

The reference condition appropriate to single loop learning is the program of activities undertaken to meet customers’ needs and the business system intended to achieve that. Typical desired norms are stability, consistency and current profitability. The reference condition appropriate to double loop learning is the strategic change program undertaken to assure organisational survival and the organisational positioning for the future intended to achieve that. Typical norms are adaptability, agility and future profitability. It can be seen that there is a paradox between the underlying norms that need to be dealt with in some systematic way to develop compatible reference conditions.

The different norms associated with single and double loop learning suggests that developing reference conditions appropriate to double loop learning involves:
• "Unfreezing" from single loop learning norms and governing values (Argyris, 1982) to reframe issues or questions (critical questioning).

• Building shared visions, surfacing and challenging mental models, engaging in systems thinking (Senge, 1990), for example as part of a strategic planning process

• Listening to customers (Zivic, 1995); learning about customers' perspectives and helping customers to learn (Flood, 1993), aligning new organisational norms with customers' needs

• Building communities of servant/leaders (Senge, 1994) to support adaptability and agility that facilitates ongoing organisational learning

• Creating or acquiring information relevant to the world from outside the organisation and by reflecting on future (Argyris, 1982) to consider a range of possible future states

The desired end state may be an end point or it may be a rate of improvement (Stata, 1989). It may be a management process key to achieving the organisation's strategic intent (Buckner, 1995). Clearly, defining the reference condition or end state can be a complex process. An example from the aerospace company is presented as Case Study 4. Alternatively, it may be convenient to adopt a model developed external to the organisation, such as that developed by the European Foundation for Quality Management (EFQM, 1997), or the U.S. Malcolm Baldridge award (Anonymous, 1997d). In either case, it is suggested the reference condition be developed collaboratively with customers, suppliers, universities or other strategic partners to introduce a variety of external perspectives (Slater, 1995).

4.2.3 Identification of appropriate audit procedures

Double loop learning governing variables include access to valid information, the opportunity to make free and informed choice, internal commitment to choice and the constant monitoring of its implementation (Argyris and Schon (1974), Argyris (1982)). Not all audit processes, however, provide opportunities in all three areas. Table 4b presents some audit procedure options and considers the perceived advantages, disadvantages, information attributes and learning opportunities each might yield.

Several of the audit processes require particular skills to be accessed, in areas such as statistical analysis, focus group facilitation, interview processes, critical questioning, and
those competencies identified by Dunphy, Turner and Crawford (1996), as characterizing a learning organization. So, where such practices exist, these should enhance the general ability to achieve organizational learning. As people are the agents of organizational learning, audit processes which favour public testing of theories and multiple sources are paramount. So, it is suggested the following procedures should be used when many people are involved and collective learning is sought:

- Focus groups/workshops using propositions previously developed by some independent process (refer Case Study 2)
- Matrix charts, with wide spread involvement in their development as well as their use (refer Case Studies 2 & 3)
- Benchmarking involving representatives from across the organization. (discussed further later in this section)

Other audit processes may be used to provide specific information. Finally, arrangements for repeating the audit processes over long periods of time and assessing rates of improvement need to be identified (Stata, 1989). This repetition is also important, as, by progressively reducing the gap between one’s current knowledge and the experiences encountered, those experiences become more meaningful (Jarvis, 1987).
<table>
<thead>
<tr>
<th>PROCESS OPTIONS</th>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
<th>INFORMATION ATTRIBUTES</th>
<th>LEARNING OPPORTUNITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEYS (Buckner, 1995)</td>
<td>• Inexpensive way to gather and analyze large amounts of data • Enables quantitative summary of issues</td>
<td>• Imposes researchers' framework on data gathering • Requires expertise in statistics • Doesn't probe deep data</td>
<td>• Factual data from large population</td>
<td>• Valid information input to double-loop learning process</td>
</tr>
<tr>
<td>QUESTIONNAIRES (Buckner, 1995)</td>
<td>• Consistency in data gathering • More flexibility than surveys</td>
<td>• May limit richness of insights to be drawn from informants • Projection to large populations less certain</td>
<td>• Factual data from small-medium populations • Useful when all respondents can't be interviewed</td>
<td>• Valid information input to double-loop learning process</td>
</tr>
<tr>
<td>FOCUS GROUP (Buckner, 1995)</td>
<td>• Allows for collection of a diversity of data in a short time • Group interaction may develop common views, new insights</td>
<td>• Requires skilled facilitator • Difficult to quantify results • Can lose focus, some scoring may be unrealistic</td>
<td>• Gathering data about beliefs and assumptions • Allows a variety of perspectives to be examined</td>
<td>• Gain a variety of views to support free and informed choice • Supports feedback loops to stimulate continuous learning</td>
</tr>
<tr>
<td>UNSTRUCTURED INTERVIEWS (Buckner, 1995) OR PEER INVOLVEMENT (EFQM, 1997)</td>
<td>• Allows sharing of mental models • Flexible data gathering – allows probing specific areas • Good for identifying strengths and areas for improvement</td>
<td>• Expensive in terms of time • Results cannot be quantified • Requires skilled and experienced interviewers</td>
<td>• Can collect &quot;trace&quot; and &quot;archival&quot; data for comparison with other information • Can identify informal, as well as formal processes at work</td>
<td>• Cross-functional learning for the assessors and for the organisation</td>
</tr>
<tr>
<td>DIRECT OBSERVATION (Buckner, 1995)</td>
<td>• Skillful direct observation requires high training • May use existing data • Observe differences between what should be and what is</td>
<td>• Potential inconsistency in observer perspectives • Requires comprehensive reports to be able to share data</td>
<td>• Strengths and areas for improvement identified</td>
<td>• Comparison of &quot;theories in use&quot; with &quot;assessed theories&quot;</td>
</tr>
<tr>
<td>PROFORMA (EFQM, 1997)</td>
<td>• Documents evidence on basis of current assessment, strengths and areas for improvement • Multi-level approach supports more consistent &quot;sizing&quot;</td>
<td>• Only summarises current status, the full story is not necessarily represented</td>
<td>• Demonstrates a variety of perspectives on current status if used by small groups throughout the organisation</td>
<td>• Breaks top level process down into &quot;bits&quot; that can be shared throughout the organisation • Interview process allows some comparison of &quot;mental models&quot;</td>
</tr>
<tr>
<td>MATRIX CHART (EFQM, 1997)</td>
<td>• Simple to use • Can be used to involve everyone in the organisation • Practical way to understand the assessment criteria</td>
<td>• Potential variability in self-assessments made • Data on strengths, areas for improvement not necessarily drawn out</td>
<td>• Performance gap documented • Process performance &quot;enablers&quot; must be identified to facilitate improvement process</td>
<td>• Involvement in development of the matrix forces sharing of mental models of what &quot;should be&quot; • Self evaluation shares mental models • Groups with higher level assessments can help lesser groups</td>
</tr>
<tr>
<td>BENCHMARKING (Buckner, 1995)</td>
<td>• Provides focus on gaps in current performance • Identifies credible &quot;priority&quot; targets • If conducted regularly, assesses relative improvement over time</td>
<td>• Selection of the correct process/outcome is critical • Involves considerable effort and good project management</td>
<td>• Focus on strengths of the organisation • Assesses status against some &quot;ideal model&quot;</td>
<td>• Supports &quot;unfreezing&quot; from existing norms and values • Learn from collaboration with customers, suppliers and others</td>
</tr>
<tr>
<td>AWARD SIMULATION (EFQM, 1997)</td>
<td>• Requires self-evaluation and documentation of strengths • Uses a variety of the other processes • Provides incentive for and high status of the audit process</td>
<td>• Can be seen as an exercise in creative writing, not covering the real issues • Requires significant time and resources</td>
<td>• Perceived status provides incentive to change, commitment to the choice of, and public testing of theories • Similar to benchmarking</td>
<td></td>
</tr>
</tbody>
</table>

Table 4b Comparison of audit approaches from a learning viewpoint

4.2.4 Subsequent developments

Further investigation of the knowledge creation aspects of the learning-by-auditing approach was undertaken in conjunction with Peter Murray from the University of Western Sydney. The approach was redefined in terms of a Discover-Choose-Act learning cycle for this purpose, and noted a good fit between the predominant temporal styles of the company
employees and a structured approach (referred to in the previous section). It was also noted that the audit process actually involved three learning cycles: one in the audit familiarisation/preparation phase, the next during conduct of the audit, and the third one in follow-up corrective action (Beckett and Murray, 1998). A construction industry case study using the learning-by-auditing approach was also undertaken. The results were published in the TQM Magazine (Beckett and Murray, 2000).

4.3 Internal benchmarking

Benchmarking has been identified as a form of auditing likely to stimulate organisational learning. External benchmarking programs are a popular way of identifying best practices, and have the benefit of demonstrating what is realistically achievable. The learning processes involved in establishing and implementing such programs also provide benefits to the participants. Drew (1997) identified a number of areas of success from various forms of benchmarking, but also noted some potential barriers. The American Productivity and Quality organisation stimulated a substantial number of such programs in the 1990’s, but found that the best practices identified in one organisation were not necessarily easily transferred to another. Some of the reasons for this were investigated by Szulanski (1996), who suggested that some aspects of organisational culture and communications were the main inhibitors. What made sense to the people in one organisation was not necessarily understood completely by the people in another one, particularly if the information transmission path was complex. It is suggested here that such problems are much reduced with internal auditing programs.

Benchmarking programs sometimes found that, particularly in large organisations, best practice was already established elsewhere within the organisation that was doing the benchmarking. This experience is reflected to some extent in Case Study 5, when subsidiary parts of a large global conglomerate company got together to compare their practices. In studying internal knowledge transfer, researchers from the American Productivity and Quality organisation, O’Dell and Grayson (1998), observed a richness of untapped internal knowledge that lead to the comment frequently echoed by others “If only we knew what we know”.

The view taken here is that having a vision of what constitutes globally competitive performance is essential, (and this was a feature of the organisations in Case Study 5). But using an internal (as compared with external) audit process to identify practices to achieve this performance has significant benefits over simply trying to adapt practices from external sources. Language and values are more likely to be similar, and there are no competitive
implications. There is more likely to be some kudos associated with sharing information with others.

4.3.1 Learning to change

Benchmarking should lead to beneficial change in an organisation, otherwise the significant effort involved is wasted. Beer and Eisenstat (1996) maintain that for change processes to be effective in terms of strategy implementation and organisational adaptation, they need to be; systemic, should encourage open discussion of barriers and should develop a partnership among all relevant stakeholders. Systemic change needs to incorporate elements of structure and systems as well as elements of values, leadership and competences. Individual learning can not be separated from organisational learning or organisational change when interventions require alterations in managerial behaviours and values. These attributes are described in Case Study 5.

They (Beer and Eisenstat 1996) further claim that strategic change is impeded in organisations by defensive routines and internal politics. Also a lack or low levels of competence in critical questioning and inquiring dialogue makes it difficult for organisations to identify underlying causes and to develop systemic solutions. Similarly Lawson and Lorenz (1999) argue that organisational inertia means firms have difficulty using new knowledge effectively because individuals resist changes to their organisational routines and behaviours as these embody their knowledge. These factors were also observed in Case Study 5, where, in one case staff changes had to be made to ensure progress.

Larsen, O’Driscoll and Humphries (1991) maintain that to reduce barriers and impediments to change, involving stakeholders increases the likelihood of successfully implementing change. Involving employees in decision making heightens their interest, commitment and contribution and improves the quality of decisions and the likelihood a decision will be implemented. Again, this was observed in Case Study 5, where employees were involved in setting the priorities for the change opportunities identified. Moshowitz (1989) maintains that meaningful participation reduces uncertainty and its adverse effects and can increase the climate of trust enhancing employees commitment to implementing change.

4.3.2 Learning processes at work

From the material presented in Case Study 5, key elements of organisational learning observed were:
Each of the seven companies in a Best Practice Club had some form of externally competitive measure and processes for comparing current performance with it (e.g., one company was scored every month by its major customer against a kind of balanced scorecard).

Top level sponsorship was essential to keep the Best Practice Club active.

External facilitation at and between meetings helped keep the benchmarking process going and recorded the outcomes so they could be shared.

The network of Managers arising from the Best Practice Club helped the participants test ideas with each other through informal networks arising from the formal meetings.

The generic kinds of change processes utilised aligned well with the Developmental and the Task Focussed characterisations of Dunphy and Stace (1994).

For those closely involved in developing and implementing the audit process itself, a previous study of Beckett and Murray (2000) suggested a range of learning possibilities, as shown in Table 4c below. In the present study, some of these learning processes were also observed in action.

There was some evidence of mentor relationships developing, in Company A both within the audit team, and between individuals in the program groups being audited. This is consistent with the observations of Nonaka and Takeuchi (1995) that Tacit to Tacit knowledge transfers take place through socialisation types of processes.

Various approaches were taken to codifying tacit knowledge so it could be subsequently shared with remote participants. Company A began reviewing performance in each of the 20 audit areas, and looking for common themes in the best practice program groups. Where barriers were identified, they were also noted. Company B began documenting and formally publishing best practices in specific functional areas.

Barriers to learning seemed to be mainly concerned with people or process. As Szulanski (1996) found, willingness to share knowledge was not a major issue. Once the programs got going, neither was the lack of good ideas. The main difficulty was a failure to take action. Some people had genuine concerns of two kinds. They could see a downside to the proposed action; either it had been tried before in some way and had failed, or the implementation phase would be disruptive, and this would compromise current operations. This was dealt with by working through a receptive group to demonstrate success, and/or by providing supplementary resources. Process issues were commonly to do with the availability of specialist support resources to change some operational system or hardware, and the prioritisation of work to be done. Taking things in small bites helped with this.
problem, as did establishing linkages to bottom-line financial outcomes that helped select
the most beneficial actions.

The value of internal benchmarking, compared with external benchmarking has been that
questions of culture and language arise to a lesser extent, and the relevance of best
practices identified cannot be reasonably questioned. Peer group competition also aids in
stimulating action.

<table>
<thead>
<tr>
<th>AUDIT PROCESS STEP</th>
<th>FAMILIARISATION &amp; PREPARATION FOR AUDIT</th>
<th>CONDUCT OF AUDIT</th>
<th>FOLLOW-UP OF ACTIONS FROM AUDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCOVER (knowledge acquisition, analysis and reflection)</td>
<td>Understand the reference model and the audit process</td>
<td>Discover the perspective's of the various audit team members</td>
<td>Reflect on new &quot;mental models&quot;, considering knowledge made explicit during the audit</td>
</tr>
<tr>
<td>CHOOSE (knowledge distribution, evaluation and selection of options)</td>
<td>Choose how to organise participation in the audit</td>
<td>Choose to question auditor's perspective or decide how to align the evidence to be presented consistent with those perspective's</td>
<td>Identify options for action, accept new mental models</td>
</tr>
<tr>
<td>ACT (knowledge utilisation, experimentation, implementation)</td>
<td>Collect data necessary to support the audit process</td>
<td>Provide further evidence of compliance or immediately fix up minor concerns</td>
<td>Pursue mandatory corrective actions; follow action plans for chosen options.</td>
</tr>
</tbody>
</table>

Table 4c Multiple learning opportunities associated with auditing

Whilst many organisations accept the need for continuous organisational learning, and
embrace the concept of the learning organisation, most find it easier to focus on data
capture and in some cases, data transfer. To stimulate learning within a complex
organisation, individuals need to convert data into information or knowledge that can be
encoded and transmitted in ways that are useful to the organisation. It needs to be easily
retrievable and couched in the language and vocabulary of the organisation, and it needs to
lead to change in the way the organisation operates involving the selection of the most appropriate change implementation strategy.

Even if new knowledge is readily accessible, it must also appear relevant to the individuals and their day-to-day work environment, and for a group to make use of this knowledge, it must be able to accept that both the information and its sources are relevant. That is, they must trust that the original data is valid and reliable; and for this to occur, the data must be collected in a way that the group understands and accepts. Otherwise, there will be a reluctance to act on it.

4.3.3 Subsequent developments in case study 5

Both case study companies A and B have undertaken very selective external benchmarking. Company A has replaced its internal benchmarking program with a focus on lean manufacturing practices. Company B has continued to refine its internal benchmarking program. Company A followed a very structured external benchmarking process, comparing the outcome with a German company in the same industry. Again, there was considerable beneficial learning in establishing and conducting the study, but the translation of its findings into action was difficult because the culture and the support infrastructure of the two benchmarking partners was very different. As others have reported (Day, 1994), making piecemeal changes without recognising these factors would be inappropriate. Company B sought out partners in other industries, looking at particular process elements, more to stimulate new perspectives than to adopt the practices observed.

4.4 Testing the Vision

Learning by auditing and internal benchmarking practices both have the notion of a desirable top level future state or vision associated with them. In general, this vision is intended to help align the actions of people with practices or outcomes that beneficially position the enterprise for both the present and the future. As the operating environment changes that vision may have to be modified, but at any time, reflection on progress being made toward achieving the vision is necessary. A structured approach to the development of a self-assessment progression matrix (see Case Study 4) was explored. The aim was to provide a tool for the case study aerospace company, to develop a consistent approach to advancing from one level of performance to the next, and to assess potential benefits in understanding the vision and stimulating action. The attainment of different levels of
sophistication in continuous improvement practices was used as a basis for a progress measurement (refer case study 4).

The results of applying the case study capability and performance-based progression matrix revealed a number of significant findings. The macro-level assessment showed the organisation to be further advanced in the achievement of some of the five individual vision statements than others. Reflection on this observation led to the view that this outcome of relating vision to time horizon was not unreasonable. Some components of the visions (e.g. to do with R&D) were of a longer term nature, and others (e.g. the Health & Safety aspects of corporate citizenship) needed to be well advanced at any given time. Moreover, the assessment revealed that many lower level stages were not closed out despite the organisation moving to more advanced stages. By themselves, such observations raised as many questions as they answered yet were valuable reflections of company activity.

By reflecting on performance gaps at the detailed level, management found that this provided a large number of opportunities to improve business systems and processes that would align with progressing the vision. Pursuing a number of change initiatives whilst sustaining a lean manufacturing production operation however had already proved a challenge for the business. There were also pre-existing requirements for change to meet new customer expectations and to enhance current systems of operation. So, what needed to be done - and why - was understood and accepted; but how it could be achieved was not clear. The process did not progress to its full conclusion, as the company changed ownership, and a different process to develop a new vision began.

Never-the-less, the methodology utilised here integrates two concepts: one about vision and one about the dynamic stages of continuous improvement. In the view of Murray and Beckett (1998), such processes stimulate double-loop organisational learning when each can be reduced to its most basic level of understanding. Some people think about vision for instance as the corporate one-liner or the cultural statement that permeates the organisation. Motorola’s “What you never thought possible” or Nike’s “Just do it” can indeed be extremely beneficial but as illustrated in this study, what is needed is a process which helps people move conceptually from traditional thinking to transformational learning based on both explicit and implicit means. Expressing each vision in more concrete terms, allowing higher levels of participation through cross-functional teams, and writing performance characteristics in learning terms has helped achieve this goal in the aerospace company. And the process of creating a company-specific vision, and working out how to
test progress against it requires the application of reasoning and reflection processes with respect to the company’s operating environment.

4.5 An “internal University”

The ability of companies to survive and grow in an increasingly competitive global environment is tied to the people in the organisation. Many firms recognise the need to multiskill employees on the factory floor, and the benefits from multiskilling other operational employees has long been recognised. In many companies, changes have resulted in leaner, flatter organisational structures that require some form of multiskilling at all levels, but the difficulty in finding time for learning through traditional practices has increased.

The case study aerospace company had developed a team based approach at all levels in these flatter structures that are evolving to utilize the whole experience of all people in the organisation. In addition, specialists are being utilized differently to help people make technical and operational decisions, consistent with business needs, at the lowest possible level in the organisation (also refer case study 2). The objectives are: to get better informed decisions faster, and to free higher level people to adopt more of a strategic focus in building the company’s future.

The ability to quickly adapt products or processes, to extend the boundaries of current technologies, and to adopt new technologies earlier in their life cycle is seen as a source of competitive advantage. But this was also considered to require management competencies new to many people accustomed to working with proven technology. Some learning research suggests that individuals accumulate and experience learning in a cyclical process that transforms their experiences (Kolb, 1984). According to Kolb (1984), effective learning generally requires four kinds of abilities:

1. The ability to be involved fully, openly, and without bias in new experiences (concrete experience);
2. The ability to reflect on and observe experiences from different perspectives (reflective observation);
3. The ability to create concepts that integrate reflection and observation into logical theories (abstract conceptualisation); and,
4. The ability to use theories to make plans and implement action (active experimentation).
The reality of learning however suggests that learners will develop preferences and abilities for particular kinds of learning. Schein (1996) argues that management cultures are based on shared assumptions, similar educational background and organisational experience. People will be trained for instance to be both reflective as well as active experimenters. Unless trained and encouraged to think differently, most people think in a structured way, ordering their thoughts to line up with the established patterns and beliefs that are time-honoured (Morgan 1997). This process of structured thinking for handling various decision criteria is found in most plan-do-check-act cycles of continuous improvement where actions and strategies are repeatable on a consistent basis. It is generally acknowledged that a diversity of learning behaviours are required to help organisations create a versatile team capable of solving an array of problems quickly (Takeuchi and Nonaka, 1986).

From these considerations, and reflections of the experience of others (Handy (1992), Wiggenhorn (1990), Baldwin, Danielson and Wiggenhorn (1997), Atkinson (1994)), a significant expansion in the delivery of in-house post-graduate modules was undertaken in the aerospace company (refer case study 6). Some company strategic objectives being pursued via the post-graduate program were to stimulate people to adapt to change, to create a learning culture, to make better business decisions at lower levels in the organisation, and to rapidly adopt new technologies earlier in their life-cycle. The delivery arrangements were interactive, team based, and had assignments that linked company issues with theory. Part of the learning process was to question current company practices, consistent with the views of Kolb (1984) described earlier. The program has been reviewed twice over a three year period, and the results published (Sloan et al (1999), Beckett, Hyland and Sloan (2000)).

In responses to a survey to assess the outcomes of the program, the participants reported an improved capacity for change. They reported a very positive attitude towards continued learning, with the majority indicating they would continue studies at their own expense if necessary. This is in contrast to an attitude at the beginning of the program (Sloan, Hyland and Beckett, 1999) where students said they would not have started if the Company had not established and paid for the program (also see an initial survey in case study 1). The intensity of effort applied by most people was also notably higher than observed in off-site, individual learning environments. Where their working environment permitted, course participants felt they were making more balanced business decisions. However, there is no clear evidence that new technology introduction processes have improved in the Company as a result of the courses.
Course participants felt they understood the strategic direction of the Company better, and were able to contribute to its continued competitiveness. Management observations were that participants considered more options and were more open and receptive to critical questioning and dialogue as a result of the total course experience. Initial concerns about loss of focus on specialty core skills as a result of the programs broadening experience appear to be unjustified. The significant improvement in collaboration competencies observed has helped people work together effectively as the company continues to reshape its operations, and is providing a good foundation for extended inter-company collaboration. The competencies acquired are consistent with those needed by a learning organisation as identified in earlier sections of this thesis.

Obtaining clear benefits from the program at the company bottom line seemed dependent on both the ability of the individual participant to drive change, and on the working environment to allow it. Beneficial change could be demonstrated when the two matched, but otherwise was less likely. An intended action learning component was not always realised. Reports on company issues and practices that suggested improvements were not commonly acted on. It is suspected that this was sometimes due to resource constraints, and sometimes due to an organisational learning problem (eg Not-Invented-Here syndrome). This suggests two improvement actions for any future program: some screening of the participants ability to deliver change (not just their ability to undertake the study), and the establishment of a negotiated position between the participant and their supervisor to ensure a visible benefit is delivered.

The culture of teamwork adopted had a significant effect on the learning style of the participants. They accepted a mutual interdependence, and supported each other if one team member could not complete their part of the research for an assignment due to unforeseen workplace commitments. They valued whatever contribution or critique that person could make, focussing on outcome, not on process. Mentoring was a commonly observed practice. It is suggested here that this approach, combined with the real-world nature of the assignment work simulated the business environment quite well. There were also questions of the digestible volume of coursework the company could handle, and of a process to obtain value from the course assignment reports. These are unresolved issues for the company.

From the University point of view, being able to adapt course modules to align with company direction, and to deliver them in block form permitted a more interactive approach that showed the relevance of the theory and the study exercises. This resulted in a higher level
of participant satisfaction than observed with traditional delivery. In summary, the participants and the University gained considerable benefits from the program. Whilst the Company obtained some clearly identifiable benefits consistent with implementing a learning organisation, opportunities for an enhanced outcome were also identified. Comparing this with the experience of Motorola over a much longer period (Baldwin et al, 1997), the outcomes described suggest that the aerospace company has moved from a stage 1 (employee development) to a stage 2 (imminent business needs) focus (refer Table 4c), which would seem consistent with its level of environmental turbulence.

<table>
<thead>
<tr>
<th>MODEL OF LEARNING STRATEGY EVOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAGE 1: EMPLOYEE DEVELOPMENT</td>
</tr>
<tr>
<td>STAGE 2: IMMINENT BUSINESS NEEDS</td>
</tr>
<tr>
<td>STAGE 3: UNKNOWN BUSINESS DEVELOPMENT</td>
</tr>
<tr>
<td>SCOPE</td>
</tr>
<tr>
<td>FOCUS</td>
</tr>
<tr>
<td>ENVIRONMENTAL TURBULENCE</td>
</tr>
<tr>
<td>RESPONSE</td>
</tr>
</tbody>
</table>

Table 4c: The impact of environmental turbulence on learning strategy (based on Baldwin, Danielson and Wiggenhorn, 1997)

4.6 Discussion

The literature concepts of single and double loop learning and competencies associated with them have proven useful in mapping some underlying individual and organisational processes at work in the learning-by-auditing and post-graduate learning programs undertaken by the aerospace company. The processes were participative, as recommended by Horsely et al (1994), dealt with conflict, as recommended by Leonard and Strauss (1997). And helped unfreeze mental models, as recommended by Senge (1990) and others. The practices described in this section generally involve open public testing of mental models, and from Table 3a, this should lead to most effective learning.
Certainly, more ideas were generated than the organisation could cope with. Some could support immediate improvements and others could support longer term improvements. Whilst it is not explicitly drawn out in the case studies, this is a significant difference from the position five years before, after major market changes and business re-engineering had somewhat exhausted the company. Choosing which initiatives to proceed with first became an issue, with links to the bottom line becoming a decision criteria. Learning through processes with significant evaluation, reasoning and reflection processes that included customer perspectives was also observed in a number of other organisations (for example, the case study 5 best practice club) that also had to find ways to prioritise the implementation of ideas for improvement. Effectively sharing best practices was seen as an issue, as was following though with effective change programs. In terms of change programs, the contingency views of Dunphy and Stace (1994) were considered to be well supported by the case study material. Consistent with these observation, but at a more macro level, Bryan, Fraser, Oppenheim and Rall (1999) report from a survey of 155 companies that most had more opportunities than they could deal with, and choosing which ones to proceed with requires an appreciation of the possible future operating environment in establishing decision criteria.

The notion of testing progress towards some vision of a desired future state was an important aspect of double loop learning. Defining a future state unique to the organisation and its environment required considerable effort, as did developing the assessment instrument. In the case study aerospace company, there was some environmental turbulence that resulted in relatively frequent review of that state. Other case study companies had chosen to pursue an externally derived desired future state, for example, supplier assessment criteria developed by a global customer. As a stimulus to double loop learning, this seemed just as effective.

The internal university program was considered to be effective in broadening the business view of the participants, but did not always deliver tangible economic benefits to the company. Some criteria for improving effectiveness in this regard were noted. The program clearly improved the participants collaboration and critical questioning competencies, and in that respect, prepared them better for a learning organisation style of operation.

Both in assessing effectiveness of the various programs, and in prioritising initiatives to be progressed, the issue of performance measurement came up. The auditing processes themselves provide a form of performance measurement, but how do the emerging good ideas being progressed enhance the current or future bottom line. The significance of
measuring performance was highlighted by Dunphy et al (1996) in their study of learning organisations, and the need for a balanced range of measurements has been identified by Kaplan and Norton (1992). Subsequent developments in the aerospace company utilise a task-focused change strategy, and also deal with this issue.

Progressing all of the learning organisation initiatives and the subsequent flow of good ideas required a level of effort beyond the previously planned capacity, and that was inconsistent with the continuing drive to reduce costs in the short term. In the aerospace case study company, this was dealt with by making an improvement in some area that released people, then using this capacity to enhance the rate of change. In case study company B (refer case study 5), priority was given to those ideas which provided a demonstrable immediate bottom line benefit. In either case, it was clearly necessary to relatively quickly show a benefit in some part of the organisation to retain management support. This is consistent with some observations in the literature; that pilot programs help get started (O’Dell and Grayson, 1998), Senge et al (1999)), and that organisational learning, like quality, is taken in small steps with strong commitments and clear ideas (Calvert, Mobley and Marshall, 1994).
5. ISSUES OF BALANCE

5.1 Overview

In implementing a learning organisation, issues of what has to be learned, by what processes, and when need to be identified. The previous section of this thesis considered some candidate learning processes and brought out the need to balance the application of resources. Various approaches to organisation learning that optimise today’s operation have been studied by many researchers. Others have focused on acquiring new competencies that will be needed by the organisation tomorrow, and on implementing change to embed improved practices within the organisation. Yet, others have focused on exploring possibilities for the future, to be better prepared for a range of possibilities using techniques such as scenario analysis. The view presented here is that all three time horizons must be pursued concurrently. But it is observed that pursuing this multi-faceted approach can be potentially confusing to people within the organisation and conflicts can arise. A model based on three interlinked learning loops, containing ten generic subprocesses in total, covering the pursuit of excellence for today, building for tomorrow and exploring the future is presented as a form of map. The model also notes competencies needed to operate each of the three learning cycles. Some researchers identify customers and suppliers as a significant source of learning, and as companies explore outsourcing and reduced time-to-market in seeking competitive advantage, such sources become more important. A balance between internal and external learning opportunities needs to be struck. These issues of balance are considered in this section.

5.2 The time factor

It has been observed that the rate of organisational learning is influenced in a number of ways by what must be learned to cope with the operational environment and by time factors. For example, technology may be rapidly acquired, but getting leverage from it, that involves people learning new skills and changing the way they work, takes longer (Ford, 1995). Having people understand and begin to utilize a new concept can take a long time, unless the learning process is facilitated (DeGues, 1988). So, people need to start thinking about new concepts well before they might be implemented so they become familiar with the language, and can start to place things in relation to their current framework and mental models.
The rate of change needed in an organisation just to survive may set the time-table. And this will depend on the nature of the industry it is involved with. An organization's characteristic product life cycle duration, process technology life cycle duration and unexpected changes in the operating environment (e.g. government legislation) will all influence the degree and nature of the turbulence to be dealt with (Lipnack and Stamps, 1994). So, it can be argued there are multiple, time influenced, drivers of learning, some of which relate to surviving today and others with creating a future. Various studies of organisations, that are successful over long periods of time, indicate that, not only must they achieve excellence in today's operations, but they must understand future options and pursue strategic innovation (DeGues(1988), Lucier et al (1997), Baghai et al (1996)).

Goodman (1973) examined the timelines of decision making in a variety of organisations. It was observed the outcome was dependent on the information available and the time horizon scanned, as illustrated in table 5a below. The most robust outcome involved environmental scanning and scenario analysis in parallel with day-to-day business.

<table>
<thead>
<tr>
<th>ACTIONABLE TIME HORIZON</th>
<th>KNOWLEDGE OF ENVIRONMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHORT</td>
<td>NAÏVE: Lack of knowledge about the environment leads to a reliance on the current steady state continuing and/or good fortune. The organisation responds to change by trial and error. Common in small businesses.</td>
</tr>
<tr>
<td></td>
<td>PROFESSIONAL/TECHNICAL: Commonly have detailed planning systems covering day-to-day and a few years into the future. Longer plans are usually based on extrapolations of the present. May be caught out by sudden changes in the environment, but otherwise do well.</td>
</tr>
<tr>
<td>LONG</td>
<td>IDEALISTIC: Always preparing for the future without necessarily protecting the present. Survival is based on somehow having the present guaranteed. Examples might be government funded programs, or those holding a market monopoly position. Problems can arise of these organisations neglect their source of guarantee.</td>
</tr>
<tr>
<td></td>
<td>PROFESSIONAL/SOPHISTICATED: Have well developed techniques for exploring future scenarios and identifying contingency plans. They see the environment as full of discontinuities and face up to the challenge of anticipating or dealing with them.</td>
</tr>
</tbody>
</table>

Table 5a Decision timeline and knowledge richness scenarios
Hosley et al (1994) contend that an organisation's learning focus will change with time, with the dynamics influenced by a number of drivers:

- Changing customer needs (after Garvin (1987))
- The dynamics of forces and change within an organisation that influence competition and co-operation (after Mintzberg (1999))
- The need for an integrated picture of the process of change, using systems thinking approaches (after Senge (1990))

Baghai, Coley and White (1996) studied businesses that had achieved continuous growth over many decades and concluded that they concurrently managed three time horizons: the present to create resources that fuel growth, tomorrow to develop additional capabilities and the future to create new opportunities. It is noted that each time horizon has different characteristics and drivers, as shown in table 5b below. Consequently, throughout such businesses, a variety of people will be working on such different time horizons. So there will be a mosaic of different processes at work throughout the business.

A parallel study by Lucier et al (1997), of companies that had grown consistently over long periods, suggested:

- Traditional financial planning that focused on achieving advantageous market and cost positions through superior planning and management only had a minor impact
- Innovation in strategy or in products and services was needed to result in breakthroughs that changed the rules of the game, generally by a series of ideas, not a single big idea.

A range of suggestions relating to strategic innovation were given but, together, they describe an inter-woven set of cyclic processes covering the 3 time horizons previously described. The focus was on leveraging current assets to create superior customer value, whilst setting strategic goals that require re-thinking the business. Examples of the aerospace company initiatives to pursue this kind of strategy are shown in case studies 10 and 12.
Table 5b The focus of different time horizons

DeGeus (1988) similarly puts weight on strategic processes, favouring wide-ranging scenario analyses. His study of thirty companies that had been in business for more than seventy five years highlighted an impressive ability to live in harmony with the business environment, to switch from a survival mode when times were turbulent to a self development mode when the pace of change was slow. This would imply dynamically re-balancing the resources applied to each of the three time horizons described by Baghai et al (1996). DeGeus (1988) also noted however that, even if an emerging message was clear, it could take some time before it was heard and acted on, if it was in conflict with people’s existing mental models. Twelve to eighteen months was considered typical. He contends that the only relevant learning in a company is learning done by people who have the power to act.

The common thread running through this literature is the pursuit of excellence for today, refining technology application and work practice; constant scanning of the environment to identify significant changes and new options and pursuing strategic innovation and change to capitalize on those options, all concurrently. Clearly, a situation with a need for complex balancing, and with potential for conflict between the needs of today and between the various drivers of change.

5.3 Learning organisation operational conflicts
Many authors have identified that, because organisational learning involves action to change the status quo, it may result in conflict. Conflict may arise from individual concerns, or with organisational rules, norms and structures, and from the different needs of different time horizons.

Argyris and Schön (1978) introduced concepts of single loop and double loop learning. In this context, it might be argued the focus appropriate to single loop learning is the program of activities undertaken to meet customer needs and the business system intended to achieve that. Typical norms are stability, consistency and current profitability. The focus appropriate to double loop learning is the strategic change program undertaken to assure organisational survival and the organisational positioning to achieve that. Typical norms are adaptability, agility and future profitability. It can be seen there is a paradox between the underlying norms that need to be dealt with in some systematic way to enable an organisation to move forward through double loop learning. Argyris and Schön (1978) observed that individuals who were well versed in single loop problem solving also had difficulty adapting to the processes appropriate to double loop problem solving, illustrating there are issues at both the individual and organisational level to be dealt with.

Dunphy, Turner and Crawford (1996) noted that operational competencies needed for efficient current business activities did not help in reshaping activities, and vice-versa. From personal observation, it is suggested that this creates conflict between people focussed on one area or the other, as they do not value each others competencies highly. The achievement of learning, and processes appropriate to it, also seems to depend on the extent of any gap between an individual (or organisation's) current state and that represented by a learning opportunity. In studying adult learning processes, Jarvis (1987) found that, if a learner could not relate to a situation or experience, it was discounted as having no value. Argyris (1982) noted that if people could not see how to deal with an issue (that could be a learning opportunity), they would distance themselves from it, blaming others or the system. Bohn (1994) observed that, in the early stages of new technology introduction, the state of knowledge about it will be limited to a few experts and the language associated with it may be unique. So, the application of traditional approaches, such as sophisticated process control techniques that might be encouraged from company implicit or explicit rules, may be inappropriate while there was still experimentation with the underlying process. Correctly matching competencies and the environment, knowledge and context would seem to have a significant influences in achieving a successful outcome.
Some key factors, metrics, people attributes and capabilities identified by Baghai et al (1996) appropriate to their three time horizons (refer table 5b) were all different and potentially incompatible with each other in terms of the business imperative, performance measurement and individual attributes. Yet, their research presents a powerful argument for their co-existence.

DeGeus (1988) puts forward arguments for environmental scanning, scenario analysis and strategic planning. In pursuing this strategy, he noted that, when the work was done by off-line strategic planners, the data and suggested actions were questioned and/or discounted by operations managers. What evolved was a structured process of business planning and game playing/simulation by cross-corporation teams of people with the power to act and change the organisation. As mentioned earlier, resource balancing can be an issue, and Nonaka and Takeuchi (1995) have ideas about dealing with the time conflict associated with being part of a cross-functional team, whilst fulfilling an operational role. Don’t do it! Assign people to the cross-functional team full time, or in a series time-slices if necessary. They see some sorts of competition/conflict and ambiguity useful in developing a creative tension that is more likely to lead to innovative outcomes than more structured approaches. So, we have the paradox of deliberately combining ambiguity with focus.

So, whilst conflict is inevitable in organisations seeking to balance their concurrent focus on today and the future, it needs to be turned into a creative tension that provides benefits in faster learning, rather than degrade into destructive competition. Resource access conflicts need to be balanced, possibly by time-sharing and making use of the collective knowledge and balanced diversity of teams at all levels. Team members need to have equal power to act with the team leader being more of a facilitator. A diversity of views and personal styles need to be tolerated. Friendly, fail-safe processes need to be used to expose people to new ideas, challenge and enhance their mental models. Sophisticated processes are needed to collect and analyse information about the current status and future options for an organisation. And, as the status and options of an organisation change, so may the learning processes and competencies needed.

5.4 Learning processes and competencies
Some researchers have characterised the learning organisation in terms of competencies, some in terms of processes. As noted above, different competencies are needed to support the activities of each time horizon.

Turner and Crawford (1995) studied two hundred and forty three Australian and New Zealand cases of organisational change. They found that a package of business technology competence factors were strongly linked with current business performance, but not with change effectiveness. The converse was found for a package of engagement competence factors. Performance management competence was found to be relevant to both forms of outcome. This was followed up by a questionnaire survey of one hundred and fourteen organisations to examine competencies appropriate to the learning organisation, which found a similar pattern: operational competencies impacting today's performance and reshaping competencies influencing future performance (Dunphy, Turner and Crawford, 1996). Waldensee (1996) studied the transformation of a workforce to acquire these reshaping competencies and found that leaders needed to pursue a range of diverse and situation specific actions to develop the desired competencies. This highlights the critical role of leadership in the change process.

Baghai, Coley and White (1996) observed that, in many successful organisations, two or three leaders teamed together, with one focussing on sustaining the current business and operational competencies, whilst the others focussed on the future and reshaping/innovation competencies. Within the aerospace organisation it has been observed that, whilst a few individual leaders seem to be able to manage operations and change concurrently, those that team up with a buddy do much better at achieving both goals, than those who are predominantly operations oriented. Belbin (1996) contends that different mixes of team member personal competencies are needed for strategic, cross-functional and operational teams. These would generally align with different time horizon focuses of the future, change and today's operations respectively. Nevis, DiBella and Gould (1995) identified three core competencies that facilitated the acquisition, dissemination and utilization of knowledge: a focus on skill development, involved leadership and a systems perspective.

Case study 7 provides an indication of how the operating environment of the aerospace company has changed dramatically with time, sometimes requiring a short term focus, and sometimes a longer one. But maintaining appropriate competencies has been a key to its survival.

The perception gained from the literature is that:
Any model or map of interacting learning processes should recognise associated competencies

A key leadership role is in the development of the required individual and organisational competencies

Team based, structured approaches are favoured in implementing the variety of learning processes needed throughout an organisation

What needs to be learned will depend on the maturity of the organisation and its processes. In addition, if the gap between people's current reality and the future changed state is too large, people may dismiss the prospect of bridging that gap. So, learning is as much about exploring what might be possible, as it is about how to turn possibilities into reality.

5.5 A multiple cycle model

Building on a double-loop learning model described in figure 4a, a triple-loop model, with associated competencies, was constructed. One loop represents current operations; the second loop represents change to achieve a long term vision; and the third loop represents the development of that vision and its constant review to ensure harmony with the operating environment. Again, to create a map that the aerospace organisation could easily relate to, each loop is characterised by four stages, following a plan-do-check-act pattern. Typical processes associated with each of the four stages in each cycle are shown in table 5c.
<table>
<thead>
<tr>
<th></th>
<th>SINGLE LOOP</th>
<th>DOUBLE LOOP</th>
<th>TRIPLE LOOP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PLAN</strong></td>
<td>• Define operational systems</td>
<td>• Enunciate organisational vision/strategic intent</td>
<td>• Review business options from innovation projects, new organisational capabilities</td>
</tr>
<tr>
<td></td>
<td>• Develop schedules, operational task requirements</td>
<td>• Identify strategic change programs</td>
<td>• Review and prioritise “seed” business opportunity portfolio</td>
</tr>
<tr>
<td></td>
<td>• Set targets, KPIs</td>
<td>• Identify strategic positioning requirements</td>
<td>• Clarify sources of competitive advantage sought</td>
</tr>
<tr>
<td><strong>DO</strong></td>
<td>• Carry out internal business operations</td>
<td>• Implement strategic change program</td>
<td>• Progress “seed” business opportunities</td>
</tr>
<tr>
<td></td>
<td>• Implement customer support programs</td>
<td></td>
<td>• Develop privileged assets</td>
</tr>
<tr>
<td><strong>CHECK</strong></td>
<td>• Review performance to plan</td>
<td>• Review change program progress and issues</td>
<td>• Scan environment</td>
</tr>
<tr>
<td></td>
<td>• Benchmark competitive performance</td>
<td>• Audit current state against strategic intent</td>
<td>• Undertake foresight analysis to identify macro-environment trends</td>
</tr>
<tr>
<td></td>
<td>• Audit business systems for compliance against current standard</td>
<td>• Consider unresolved issues arising from operations</td>
<td>• Audit current strategic intent and seed project possibilities against environment trends</td>
</tr>
<tr>
<td><strong>ACT</strong></td>
<td>• Correct errors in current systems</td>
<td>• Introduce new operational systems</td>
<td>• Undertake scenario analyses</td>
</tr>
<tr>
<td></td>
<td>• Pursue continuous improvement to sustain competitive performance</td>
<td>• Pursue organisational transformation projects to address issues identified</td>
<td>• Pursue innovation projects to create and test new directions, new product and process options that change the “rules of the game”</td>
</tr>
</tbody>
</table>

**Table 5c typical learning cycle elements**

The first two loops intersect at a “check” stage. This is seen as consistent with establishing where we currently are. Audit processes of various sorts are seen as a feature of this stage, as discussed in previous sections of this report. The second two loops intersect at a plan stage. This is seen as consistent with strategic planning and the learning-by-planning ideas of DeGeus (1988) that identify where we want to be. The model itself describes the processes for getting there.

It had been noted from discussion earlier in this section that both appropriate process and specific kinds of competencies were needed by enterprises that learn and grow in the long term. Figure 5a shows a pictorial overlay of the triple-loop model and generic competencies associated with each loop.
Each of the ten elements of the model is a complex process in its own right and the tools and techniques that could be applied to each elemental process are many and varied. Some of them have been mentioned elsewhere in this report. However, it is not intended to explore these further here, only to invite the reader to reflect on what they might be in an enterprise they are familiar with.

**Figure 5a Learning model and associated competencies**

### 5.6 Application of the model to start-up companies

Due to the stimulus for this research, the orientation has been towards established companies. In a recent innovation study Gwynne (1999), suggested that whilst the challenge
for large organisations is how to introduce innovation; in contrast, the challenge for small business is how to introduce management.

The multiple cycle model presented here has been useful in discussions related to start-up companies by assuming they are initially operating in the third, long term learning cycle mode, with an emphasis on business building competencies, and have yet to acquire re-shaping, then operational competencies. The model can stimulate discussion of what processes and competencies are needed as the business evolves.

It was noted earlier that businesses may change their time horizon emphasis consistent with changes in their operating environment. For startup companies this may be a more urgent matter, and at each stage of their evolution, companies have to change their dominant paradigms and this will also emphasise different competencies, as shown both in the model and in table 5d. It is suggested here that the two PLAN and the two CHECK activities in the model (figure 5a) will have a different emphasis at each stage of company evolution (Table 5d). For example in the creativity stage, environmental scanning (CHECK) will focus on finding a launch customer. In the co-ordination stage, it may be better understanding customer needs. This illustrates the potential for the model to be used in a number of different operating environments.
### Table 5d Growth phases and potential discontinuities (based on McGann, 1997)

#### 5.7 Balancing internal and external initiatives

Whilst most learning organisation literature is about internal organisational improvement, a number of researchers (e.g. Malerba (1992), Leonard-Barton (1992), Slater (1995) highlight the potential value of learning in conjunction with suppliers and customers. For some time, innovation in supply and value chains have been explored to seek competitive advantage (e.g. Porter (1985)), and this is an ongoing aspect of business process redesign. The economic logic behind this situation is quite straightforward: as enterprises become more internally efficient, the cost of the materials they use can become the dominant component of total cost. In the case study aerospace company, the cost of materials and services is approaching twice the cost of labour. And the same is true for its customers. This is driving changes in the way they work together, and some examples, along with issues this raises, are given in case studies 9 and 12.
Von Krogh, Nonaka and Nishiguchi (2000) considered exchanges of knowledge between collaborating firms (considered to be a new economic order – knowledge based economies), within networks and spinoffs, noting that these areas had been studied less than exchanges within firms. They saw two types of focus area emerging:

- Knowledge creation for new product and service innovations (illustrated in case studies 10 and 12 here), and
- Knowledge transfer for particular leverage within the company (discussed to some extent in reference paper B here)

Grant and Fuller (2000), in taking a knowledge view of markets, firms and collaborations, considered the balance between three aspects of knowledge use in determining productive efficiency:

- Efficiency of integration, defined in terms of knowledge transfer, sequencing of knowledge application, direction in knowledge application, and the use of organisational routines.
- Efficiency of knowledge utilisation in supporting economies of scale or product innovation benefits.
- Appropriating the returns to knowledge, considered in terms of rent generation efficiency.

In all three aspects, the blend of explicit knowledge and tacit knowledge components leads to unique considerations, and it is noted that markets and firms have different strengths and weaknesses related to the form of knowledge available. For example, in terms of efficiency of integration, market transactions are only compatible with transfer and sequencing aspects. Inter-firm arrangements were seen as potentially exploiting specialised knowledge across a broader range of products, or rectifying incongruent product and knowledge domains. It was also noted that there may be potential barriers to inter-firm collaboration (for example, the development of trust, perceived equity of returns). This research provides a generic framework for considering knowledge views of collaboration, but at the same time, highlights the contingent nature of collaborations.

Gerlach and Lincoln (2000) considered the practice of linking small and large firms in innovation chains, and using satellite operations to create small firm benefits in innovation activities. They provide examples from the Japanese electrical and electrical machinery industry. They observed that the parallel processes of separating particular activities into
distinct business units whilst linking them up again in inter-firm networks promotes flexible knowledge sharing and resource flows, effectively expanding the boundary of the core firm.

Nishiguchi and Beaudet (2000) analysed Toyota’s supply chain management approach and suggested its strengths lie in the re-use of knowledge associated with a “fractal” design of its elements (repetitive use of similar patterns at multiple levels). They also observed that this resulted in a common language across the whole supply network that facilitated multilateral and inter-supplier networking.

5.8 Discussion

Issues associated with time factors, particularly processes and competencies associated with different time horizons are addressed in the learning organisation literature, but in a piecemeal way. Representing a total view in one figure (figure 5a) has been helpful in the aerospace company in understanding where a range of current or planned initiatives fit in this framework. This has facilitated the review of appropriate balance.

In addition, each of the ten generic processes can be identified with specific process the company currently utilizes (or should utilize), some of which have been described here. In addition, from a systems engineering viewpoint, each of the ten processes involved in this model can be examined for its current effectiveness, and changed with time as appropriate, provided the inputs and outputs are consistent with the needs of linked processes.

The implementation of the model requires not only an understanding of the processes in play, but the competencies associated with working those processes. The case study company has had a long standing focus on business and technical competencies associated with the single loop processes. In trying to rapidly progress change, it has been found that the competencies associated with double loop processes need to be acquired by more employees than currently possess them, and only a handful of people currently possess positioning competencies appropriate to the future aspect of the model.

As well as balancing effort applied to service different time horizons, the aerospace company is balancing internal and external collaborative learning in supply chains (see case study 9) and in research and development (see case study 12). Whilst new competencies may be needed to operate this way, they are the same competencies needed to operate as a learning organisation. Systems thinking is being applied internationally to develop a supply
chain organisation reference architecture and the aerospace company is participating in this. Different ways of looking at things is expected of the partners at the start of a collaborative relationship, so acceptance of diversity is rapid. Developing shared visions, common languages and using negotiation skills are all required. In some respects, it has been found easier to introduce changes in supply chains than within the aerospace company. Customer – supplier relationships demand certain protocols (for example, the customer is always right), and in choosing to collaborate, interdependence is accepted from the start. In establishing a collaboration however, arrangements for continuing to learn throughout its operation have to be discussed, trialed and formalised, or these benefits will not automatically flow. It has been observed in case study 9, that changed supply chain arrangements change organisational structure. Recent research (Gerlach and Lincoln (2000), Nishiguchi and Beaudet (2000)) shows that integrating knowledge flow considerations with structure design can yield significant benefits. This is discussed in the next section of this thesis.
6. ISSUES OF STRUCTURE

6.1 Overview

The case study aerospace company has possibly seen more change in its underlying organisation structure in the past 10 years than in the previous 60 (refer Case Study 7). There have been two ownership changes. The company has changed its strategic positioning from supporting a dominant position in a specialist regional market, to supporting a niche position in a global market. The company has been re-engineered, downsized and delayered in a variety of ways. Each change has bought its own good news and bad news.

There is some suggestion in the literature (Argyris and Schon (1974), Senge et al (1994)) that the way people think and act is linked to organisational structure and vice-versa. From this background, a study of some knowledge transfer attributes of particular forms of organisation, what may drive organisation structural change, and of how best to deal with the downsides of these changes (whilst gracefully accepting the upsides) was undertaken. It is expected the rate of change will continue so a variety of ideas on better forms of organisation and on industry paradigms perceived to be appropriate in the 21st century have also been considered. An audit-like process that considers both what may be lost in changing from an existing organisation form to a new one; and what needs to be done to avoid any potential downsides of the new organisational form is discussed in this section.

6.2 The Search for “Better” Forms of Organisation

It is postulated here that an organisation's imperative and strategies for competing, particularly in a global market, can influence the size and attributes of the organisational elements of the enterprise. There are a variety of perspectives in the literature on this issue. Concepts of global networks of collaborating businesses are popular (Lipnack and Stamps (1994), Roberts (1997), Owen (1996), O'Niell and Sackett (1994), Naisbitt (1998)). A strategy of focussing on intellectual capital and outsourcing everything else, logically leading to a network of niche service operations has been put (Quinn (1993), O'Niell and Sackett (1994), Ruthven (1997)). The creation and management of knowledge is seen to be an important core competency (Dunphy and Stace (1994), Nonaka and Takeuchi (1995), von Grogh et al (2000)). Sustaining established businesses whilst fostering longer term start up ventures leads to the need for different leadership and organisational attributes in different
parts of the business and these may change with time as the business evolves (Baghai et al (1996), O’Neill and Sackett (1994), McGann (1997) Gerlach and Lincoln (2000)).

Some researchers have looked outside the business world for ideas on organisational form. Belbin (1996) is a champion of team based organisation. In contemplating a perceived trend towards small, responsive, enterprise elements, Belbin observed large complex organisations in nature, such as a hive of bees, or a nest of ants were efficient. He perceived patterns in hierarchies of teams being practised on a very large scale in these natural models.

Tuck and Earle (1996), a venture capitalist and an anthropologist, looked at the dynamics within different businesses and parts of businesses and compared them with tribal culture and political behaviour. They observed three primitive organisational elements that have counterparts in modern companies: the working group, the camp and the hierarchy, and agreed every company is a politically organised community. They saw aspects of scale at work. Small multi-skilled teams temporarily formed for a specific purpose (e.g. to hunt, to lay a section of railroad track) where the leadership role changes depending on the task at hand. Camps of about thirty people where, whilst there may be some job specialisation, most camp members have multiple skills and can participate in a range of working groups. The camp does not admit to having a leader but there is usually someone who facilitates decision making. The hierarchy encompasses several camp sized groups that form a tribe and several tribes may form a nation. There are clearly defined leaders and many strata of authority. These hierarchies evolved as a means of providing mechanisms for relations between tribes, conducting religious observances, and to allow for occupational specialisation. Whilst there are clear lines of authority, there are no inherent means of reaching consensus.

Naisbitt (1998) observes that in spite of a trend towards globalisation, as people become more independent, the more they hold onto their core identity. He suggests that the more universal we become, the more tribal we act, and highlights the emergence of global networks of small firms as a significant feature of 21st century business. Lipnack and Stamps (1994) observed that different forms of organisation have been prevalent at different times in history: small groups during the nomadic age, hierarchies during the agricultural age, bureaucracies during the industrial age and networks during the information age. Lipnack and Stamps (1994) note that each form of organisation has its own benefits and elements of all of them may be expected to co-exist in a modern organisation, provided they are tied
together by networks. Some perceived attributes of each organisation form are shown in Table 6a.

<table>
<thead>
<tr>
<th>Form</th>
<th>Application</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Networks</td>
<td>Mutual aid, professional associations, alliances, distributed sites</td>
<td>In networks, people link as they cross internal functions, geographic boundaries and even corporate lines with remarkable speed. The people in the network come from the bureaucracy and the hierarchy. Their new relationships to one another create the networks</td>
</tr>
<tr>
<td>Bureaucracies</td>
<td>Codes, inspection, accounting, payroll, maintenance</td>
<td>Although most people complain bitterly about them, bureaucracies, when appropriate and enabling, can be elegantly functional, high-performance entities. They standardise contractual agreements and develop common methods by which work gets done and paid for.</td>
</tr>
<tr>
<td>Hierarchies</td>
<td>Fire fighting, owner-executive decisions, vision, goals, strategy</td>
<td>Legitimised by owners, hierarchies provide executive functions. They set goals, maintain authority and cope with crises, while the senior employees maintain the bureaucracy.</td>
</tr>
<tr>
<td>Small Groups</td>
<td>Education, cross-functional teams, special projects, work groups</td>
<td>Traditional face-to-face small groups continue to be the basic working unit today. At the same time, information enabled virtual teams cross functions, deliver results to customers and undertake special projects, while the 100 year old hierarchy continues to set strategy.</td>
</tr>
</tbody>
</table>

Figure 6a Some attributes of different organisational forms (based on Lipnack and Stamps 1994)
Based on personal experience in a variety of Chief Executive positions, Fairtlough (1994) develops the idea of the creative compartment; a group (or clan) of several hundred people who work together in an open way so that the effectiveness of communication gives it great capability and adaptability. It is suggested that groups of this size can assemble a rich blend of skills and knowledge, giving them the potential to produce extraordinary results. Fairtlough (1994) notes that creative compartments may associate in families for a variety of reasons:

- for co-ordinated approaches in the market place
- for sharing business processes that yield economic benefits
- to establish a power bloc, or a critical mass to influence political or market opportunities
- to support world-wide associations around new technologies and research collaborations
- to cluster around a powerful resource provider (like a bank or a trading company).

O’Neill and Sackett (1994) consider the concept of an extended manufacturing enterprise that not only networks individual operations together, but seeks specific long-term benefits (see case studies 9 and 10). These are:

- compression of concept-to-customer lead time
- a just-in-time supply chain
- logistic support throughout the product/service life cycle.

Because the participants are both independent and interdependent at the same time, it is noted that power via conventional hierarchy is seriously weakened by the flat, geographically distributed and transient nature of the extended enterprise.

The drive for flat, responsive structures and new systems of operation through business process re-engineering is not without its critics. Hilmer and Donaldson (1996) observe that flat structures are not universally appropriate, for example in R&D, where senior managers may also have a key technical role. If taken to excess, flat structures can result in bottlenecks and poorly balanced decisions due to a lack of appropriate resources to facilitate responsiveness. Kovac-Kakabadse, Kovac-Kakabadse and Kouzmin (1997) have observed that downsizing and delayering can produce the survivor syndrome - low morale, lack of trust and a decline in commitment to the organisation. However, achieving commitment in a lean organisation means a more critical role for social structure, trust and personal engagement - just the opposite of what is observed.
Nonaka and Takeuchi (1995) forecast that competence in creating and managing knowledge will be a significant source of competitive advantage in the 21st century. In a study of Japanese and Western practices, they express the view that the very layer of middle management that re-engineering can delete is essential for knowledge transfer. They suggest a three layer overlay of structure and systems. Project teams operate in a network style in one layer. Hierarchial business systems operate in another layer to give strategic direction. A third layer contains a knowledge base that is accessed by individual organisation members. In their model, middle managers bridge the gap between the visionary ideas of the top and the chaotic reality of the front line, mediating between what should be and what is.

Dunphy and Stace (1994), in discussing the demolition and re-creation of organisational structures observe there is no one structure that is universally appropriate, despite any current fascination with new approaches. They list characteristics, features and vulnerabilities of a number of forms or organisation structure: machine bureaucracies, divisional structures, strategic business units, strategic networks, network divisions and horizontal work teams. Further detail is presented in Table 6b.
<table>
<thead>
<tr>
<th>FORM OF STRUCTURE</th>
<th>FEATURES</th>
<th>VULNERABILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MACHINE BUREAUCRACIES</td>
<td>• Efficiency</td>
<td>• Low adaptability and minimal innovation</td>
</tr>
<tr>
<td>• mechanistic structure</td>
<td>• Control, stability</td>
<td>• Difficulty of cross-coordination between specialist areas</td>
</tr>
<tr>
<td>• specialised departments</td>
<td>• Work specialisation</td>
<td>• Difficulty of identifying accountabilities and performance outputs</td>
</tr>
<tr>
<td></td>
<td>• Executive decision making</td>
<td></td>
</tr>
<tr>
<td>DIVISIONAL STRUCTURES</td>
<td>• Separation of strategy from operations</td>
<td>• Conflict over long term versus short term goals</td>
</tr>
<tr>
<td>• Separation of policy from</td>
<td>• Accountabilities clear for line divisions</td>
<td>• Corporate headquarters far removed from customer feedback</td>
</tr>
<tr>
<td>operating divisions</td>
<td>• Managerial decision making, Corporate policy making</td>
<td></td>
</tr>
<tr>
<td>• Product/area decentralisation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STRATEGIC BUSINESS UNITS</td>
<td>• Full delegation and autonomy to operational product divisions</td>
<td>• SBU &quot;drift&quot; from corporate thrust</td>
</tr>
<tr>
<td>• Fully accountable profit division or unit within a larger corporate structure</td>
<td>• Performance oriented, competitive</td>
<td>• Loss of cross-corporate synergies</td>
</tr>
<tr>
<td></td>
<td>• Focus on bottom line</td>
<td>• Managerial career blockages</td>
</tr>
<tr>
<td>STRATEGIC NETWORKS</td>
<td>• Ability to draw on and leverage up strategic intelligence</td>
<td>• Firm may lose &quot;intellectual&quot; technology to competitors</td>
</tr>
<tr>
<td>• Alliance partnerships</td>
<td>• Maximises cross synergies: development is co-operative rather than combative</td>
<td>• Strategic networks can be strategic and volatile</td>
</tr>
<tr>
<td>• Joint ventures</td>
<td>• Resource efficient if high development costs are shared</td>
<td></td>
</tr>
<tr>
<td>• Product/market development links</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Technology sharing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Financing consortia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NETWORK DIVISIONS</td>
<td>• Flexibility in best use of available resources, inside or outside</td>
<td>• Network resources are potentially transient</td>
</tr>
<tr>
<td>• Relationship contracting</td>
<td>• Cost-effective controls over outputs</td>
<td>• Capacity must be negotiated with outsiders, and contractually committed</td>
</tr>
<tr>
<td>• Project/venture structures with</td>
<td>• Network suppliers, distributors more responsive/relevant than comparable internal processes</td>
<td>• Network can become too stable and non-innovative</td>
</tr>
<tr>
<td>outside organisations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HORIZONTAL WORK TEAMS</td>
<td>• Work is organised around changing key goals rather than historical functions</td>
<td>• May lead to confused accountabilities</td>
</tr>
<tr>
<td>• Semi-autonomous work teams</td>
<td>• Teams complete whole tasks rather than fragments of tasks</td>
<td>• Costly, if overlaid on a functional structure</td>
</tr>
<tr>
<td>• Parallel task forces</td>
<td>• Greater work satisfaction</td>
<td>• &quot;teaminess&quot; may cloud a real output orientation</td>
</tr>
<tr>
<td>• Project teams working across</td>
<td></td>
<td></td>
</tr>
<tr>
<td>functional boundaries</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6b Features and vulnerabilities of some different forms of organisation (based on Dunphy and Stace, 1994)
So, there are a lot of different ideas, but what is actually happening. On the face of it - not much. The Consulting Company, A.T. Kerney (1995), conducted a survey of ten successful multi-national companies, whose management practices are frequently reported to be at the leading edge. They showed classical structures and functional managers still very much in evidence. Below that, they report, there is a complex evolution of traditional roles going on. Task management is gravitating from functions to process aligned teams. Traditional functional departments are re-focussing on developing and maintaining competencies. The role of middle management is evolving from control to integration. In a recently completed Australian survey of several hundred companies (Dunford and Palmer (1997), a large number said they were adopting new forms of work organisation. But most also appeared to have traditional organisation charts and standardised practices that would preserve hierarchy and bureaucracy. If the drive for new forms of organisation is so great, why do the older forms still appear prevalent? Is there a lack of innovation, or do the traditional forms have some real benefits?

6.3 The Potential Down-Sides of Structural Change

Research has shown companies that have downsized and delayered achieving short term results, but with doubtful abilities to survive in the long run (O'Neill and Sackett (1994), Kovac-Kakabadse et al (1997)). Over a number of decades, some businesses have been observed to decentralize, then recentralize a number of times over. Why? Are managers just following the latest fad or is there more to it? Are there underlying problems in going from one organisational form to another, or has the change process itself been ineffective? Certainly, there is evidence that the success rate with change programs is not high (Nutt (1992)). Dobkins (1996) has noted that the project management techniques appropriate to a change program need to be tailored according to the degree of certainty about what is desired and how it might be achieved. Howle, Nelson and Ortiz (1996) suggest that transitional organisations are useful in assuring lasting change. So, in pursuing structural change, what are the imperatives and how might change be handled?

Dunphy and Stace (1994) have noted apparent paradoxes between seemingly successful but opposing approaches to implementing strategic change:

- Strategic intent and adaptation versus rational, planned strategy development
- Cultural change versus structural change
- Continuous improvement versus radical transformation
Empowerment versus leadership and command.

They have also noted different wealth creating traditions in different parts of the world. In Western Europe, balancing multiple stake-holder concerns requires skills to manage in a complex environment. In the USA and other Western economies there is a market force, short term profit focus. In Japan/Asia there is a longer term view of developing international competitiveness via adding value/customizing products, and via domestic collaboration. They express the view it is now necessary to draw on all of these traditions and approaches to change to develop new and dynamic wealth creation models consistent with the needs of particular situations. The implied interactions suggest a range of factors need to be considered in moving to a new organisational structure. What are some of the specific issues associated primarily with structure?

Two separate operations of an Australian aerospace manufacturing company provides some insight into some of the possibilities. Originally separately owned competitors, the two operations have some cultural differences, but have both undertaken broadly similar business re-engineering through the 1990s. Both organisations are more than fifty years old and, in the past, have utilized functional bureaucracy, divisional structures and, for major new projects, cross-functional project teams. To varying degrees, both pursued a cellular work group approach on the shop floor in the early 1990s, and are still moving towards fully self-managed work groups. Functional specialisations were progressively distributed into product centred strategic business units. Due to cultural differences, workload opportunities and differences in technology specialisation, detailed implementation arrangements differ. But both sites have experienced a number of similar downsides not initially self evident. These include:

- Gradual degradation in core competencies and process excellence - manufacturing engineering and materials management were impacted at both sites, despite the fact that training and procedures were put in place at the time of devolution. The design engineering function was impacted at one site where initial reliance was put on a strategic alliance that later failed due to a change in focus of the alliance partner. Some older divisional structures were very process oriented and there is now some concern about the loss of shared knowledge relating to key manufacturing processes. The degradation took place over a number of years, so was not immediately apparent.

- Loss of corporate memory behind some of the practices and systems in use, because of the long established nature of the organisations, many of the
employees had worked together in a variety of roles for ten or twenty years. The informal understandings that had been built up about what worked and what did not, and the awareness of who knew what, had developed in the context of past structures. The total business system was people, structure and procedures. Not only is the system disrupted by people changes associated with re-engineering, but the historical, implicitly understood linkages have been changed, causing some confusion.

- Differing emphases on the progression of original change plans, as individual managers changed within the company. - This impacted both cultural perspectives and decision-making practices of different groups, sometimes degrading interfaces between the groups.

- Reduced focus on longer term initiatives due to high rate of internal change and, in one case, becoming too lean to be able to support such initiatives.

- Employee attitudes changing with variations in perceptions of stability/security - Apart from destabilizing factors associated with re-engineering, the fact that the old organisation charts helped people understand who did what, and were useful to individuals thinking about their career progression, thus was not considered in the re-design process.

- Evidence of some potential down sides, as well as benefits, of new forms of organisation:
  
  - the need to make contractual commitments and negotiate capacity with network partners. This was handled differently in previous vertically integrated or sub-contract relationships, which now have to be un-learned
  
  - Introspective team focus that may cloud a real output orientation - people enthusiastically adopting team-work, but playing their own game
  
  - The need for, and some expectations of, a wider range of decision-making processes that may cause some initial confusion, particularly with those individuals comfortable with traditional leader centred processes.

These observations are consistent with the vulnerabilities of some organisational forms identified by Dunphy and Stace (1996) and of the impact of the pace of change identified by Lipnack and Stamps (1994). The observations also illustrate that the previous forms of organisation did have some merits (e.g. in maintaining core competencies) and that some other way of compensating for the lost-beneficial
attribute must be found. On balance, the re-engineering process has made the two organisations more competitive, but the management of potential losses in moving from the old form and management of potential vulnerabilities of new forms is required. To design a new structure, both the beneficial attributes and downsides of various forms of organisation need to be understood in the context of the operating environment.

6.4 Some Attributes of Different Organisational Forms

Most re-engineering programs focus on production flow or information management flow to remove redundant activities and find better ways to do the remaining activities, perhaps with some technology input. But, it is suggested that few of these programs also look at the factors of knowledge management, decision making processes and overall organisational connectivity that are perceived to be important in the future. Here, organisational forms are looked at from these three perspectives. It has been found that it is convenient to classify the wide range of possibilities into three categories for this purpose: hierarchy based, network based and team based. Characterisations, viewed from this perspective, are shown in table 6c:
<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>KNOWLEDGE ATTRIBUTES</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIERARCHY BASED</td>
<td>• Concepts of levels and specialised purpose</td>
<td>• Functional bureaucracies to maintain excellence in core competencies and consistency of internal processes</td>
</tr>
<tr>
<td></td>
<td>• Focus on explicit knowledge</td>
<td>• Divisional structures to maintain excellence in operational processes, speed decision making</td>
</tr>
<tr>
<td></td>
<td>• Sequential decision making</td>
<td>• Strategic business units to maintain excellence in customer focus and performance orientation</td>
</tr>
<tr>
<td>NETWORK BASED</td>
<td>• Provides links across boundaries</td>
<td>• Strategic alliances to gain competitive advantage from privileged assets</td>
</tr>
<tr>
<td></td>
<td>• Focus on knowledge transfer and conversion</td>
<td>• Networked divisions to stimulate learning and synergistic opportunities</td>
</tr>
<tr>
<td></td>
<td>• Analysis of complex matters from a variety of perspectives</td>
<td>• Virtual organisations to extend the scale and scope of realisable opportunities</td>
</tr>
<tr>
<td>TEAM BASED</td>
<td>• Members define boundaries</td>
<td>• Strategic teams to share knowledge and plan for the future</td>
</tr>
<tr>
<td></td>
<td>• Focus on tacit knowledge</td>
<td>• Cross-functional teams to quickly create something new using concurrent diverse inputs</td>
</tr>
<tr>
<td></td>
<td>• Consensus decision making common</td>
<td>• Operational teams to adaptively handle day-to-day requirements</td>
</tr>
</tbody>
</table>

Table 6c Some knowledge attributes of generic form of organisation

From this characterisation and the attributes detailed by Dunphy and Stace (1996), it can be seen that each of the three forms has some distinct advantages:

- Team based organisations share know-how to adapt themselves and change in response to environmental needs
- The network based organisations support sharing of physical and intellectual assets and facilitate rapid learning to grasp opportunities
- The hierarchical based organisations promote excellence and specialisations that may sustain key competitive competencies and support the maintenance of organisational levels, consistent with span of control leadership concepts.

Looking into the actual operations, it is more common than not to find all three forms at work simultaneously, regardless of the formally stated structure of an organisation (Owen (1995), Dunford and Palmer (1997), Argyris and Schon (1978)). Whether this is driven by some primitive urge (Tuckabd Earle (1996), some natural law (Belbin (1996), Lipnack and Stamps (1994), Fairtlough (1994)) or because people find by trial and error what works and what does not is not important. Mixed forms are
evolving on both local and global scales to blend consistency of operation with organisational agility. These forms have multiple decision paths, with various forms of knowledge management that focus on converting knowledge into action. Some examples are:

- A hierarchy of teams
- Networked teams
- Larger scale networks, e.g. Kieretsu
- Franchised operations (bureaucracy, operational teams, network organisation blended together).

Never-the-less, each of the three forms has distinctive features that should make one of them predominant in a particular enterprise. From this perspective, for example, a university should be a hierarchial bureaucracy to promote excellence, focus on making knowledge explicit and available, sustain key competencies and offer an underlying stability.

### 6.5 Drivers of Organisational Structure

From the literature relating to the search for better forms of organisation, a number of drivers are suggested. And some of these drivers will change with time for any enterprise. It is considered that the forms of organisation adopted in a particular enterprise will primarily depend on:

- The organisational strategic imperatives: its reason for being
- The scale and scope of the enterprise
- The people in the enterprise and its key processes
- The enterprise’s operating environment

Each of these will be considered in turn, along with a number of sub-tier factors.

The organisational strategic imperative should influence the predominant form of the organisation, for example:

- Excellence and specialisation are best served by a functional hierarchy. So, perhaps some organisations decentralize, then recentralize in pursuit of this excellence in core competencies
- Focussed specialisation, perceived as a good competitive strategy by some (Ruthven 1997), is best served by divisions or strategic business units
- Asset sharing and rapid learning to grasp opportunities is best served by
networking practices. This is evidenced by new Internet based business that completely change market access considerations (Burgess and Wood (1997), Savage (1997))

- Sharing know-how and adapting to the operating environment is best served by team based processes that share the whole life experience, tacit knowledge and leadership capabilities of the individual members (Belbin (1996), Nonaka and Takeuchi (1995), Cope and Kalatzis (1997))

Alternatively, table 6d below illustrates some organisational models, considered from an operational strategy perspective based on the experience of the case study aerospace company.

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>ATTRIBUTES</th>
<th>IMPERATIVES OF SUCCESSFUL OPERATIONS</th>
<th>POTENTIAL DOWNSIDES</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATIONAL STRATEGY</td>
<td>DEDICATED PRODUCT/PROJECT ORGANISATION</td>
<td>• VERTICAL INTEGRATION OF KEY/COMPETITIVE PROCESSES • DEDICATED PRODUCT FACILITIES AND PEOPLE • CAPITAL INTENSIVE</td>
<td>• END CUSTOMER FOCUS • TOTAL PRODUCT EXCELLENCE • EXCELLENT SCHEDULE COMPLIANCE</td>
</tr>
<tr>
<td>DEDICATED PROCESS ORGANISATION</td>
<td>• SUB-SYSTEM OPTIMISATION OF KEY/COMPETITIVE PROCESSES • PEOPLE SHARED BETWEEN PRODUCTS/PROJECTS • CAPITAL EFFICIENT • SOME FLEXIBILITY IN HANDLING PRODUCT MIX CHANGES OR NEW PRODUCTS</td>
<td>• PROCESS EXCELLENCE • SERVICE/RESPONSIVENESS FOCUS • &quot;NEXT CUSTOMER&quot; CULTURE</td>
<td></td>
</tr>
<tr>
<td>“VIRTUAL COMPANY” ORGANISATION</td>
<td>• SOPHISTICATED COMMUNICATIONS SYSTEMS • EXPANSIVE, FLEXIBLE (GENERALLY MULTI NATIONAL) NETWORK OF PARTNERS WITH COMPLEMENTARY ASSETS • PEOPLE ASSIGNED ON PROJECT BY PROJECT BASIS • MINIMAL FACILITIES, CASH FLOW DRIVEN</td>
<td>• RAPID RESPONSE TO MARKET NEEDS FOR CUSTOMIZATION • INTELLECTUAL PROPERTY AND PROJECT MANAGEMENT DRIVEN</td>
<td>• SUSCEPTIBLE TO FAILURE OF PARTNERS • IF PARTNERS HOLD CRITICAL CAPABILITY, THEY MAY DOMINATE THE BUSINESS • MAIN ASSETS ARE PEOPLE, WHO COULD EASILY LEAVE THE ORGANISATION</td>
</tr>
</tbody>
</table>
The scale and scope of an enterprise impacts on practical forms and decision-making processes. For example, several layers of hierarchy would not be appropriate for a five person company. Geography - the extent to which an enterprise is widely dispersed impacts the nature of knowledge sharing, decision making processes and power structures (Nonaka and Takeuchi (1995), Kovac-Boisvert and Kouzmin (1997)). Size and span of control - it is suggested (Tuck and Earle (1996)) that it is difficult to sustain groups of more than fifty people without some subdivision and hierarchy. There is also some opinion that stable teams should contain eight to fifteen people. Smaller teams can carry out short-term assignments but are too fragile for long term stability. Some also argue that six or seven is the largest number of relationships a person can deal with continuously and that decision-making performance in egalitarian groups falls off rapidly as the group size exceeds six (Miller (1956)). From a numerical perspective, these arguments logically lead to some form of hierarchy in all but the smallest organisations. There are also arguments that most people are comfortable with hierarchy, as we use hierarchial information classification to simplify complexity in our every day lives (for example personal transport classified as cars/brand/type/colour) (Argyis and Schon (1978), Simon (1969)). Product/process complexity - single products made by simple processes require less specialisation, minimising the need for bureaucracy and hierarchy. Wide ranging or complex product profiles require a degree of specialisation, possibly with wider market access. Complex and expensive processes may require specialised assets and supply management arrangements that see these attributes dominate the organisation focus and critical mass. The nature of the organisational core competencies - the extent to which the organisation requires in-house product, process and service competencies will determine what organisational forms are practical for a particular scale of operation. For example, a small organisation may focus on product competencies and support the others by outsourcing and strategic alliances.

The operating environment impacts resource allocation and operating systems. The stability or turbulence of the environment (or the organisational imperative) can be assessed in terms of the need for innovation (gradual or rapid), customer demand (steady or unpredictable), competitors (unchanging or subject to sudden market shifts) and government influence (set policies or struggling for a new policy) (Lipnack and Stamps (1994)). The pace of change can be different in various parts of the business. Stability permits lower risk forms of organisation, such as hierarchial bureaucracies that can focus primarily on excellence. The need for adaptability and
flexibility to pursue new opportunities tends towards networks and teams. If access to privileged assets is needed for unique products, processes or services, then a network/alliance form of organisation would be most appropriate (O’Neill and Sackett (1994)). Alternatively, if an organisation owns some unique privileged asset, a focus on excellence (suggesting a hierarchial bureaucracy) may be appropriate. Cultural issues - if an organisation operates across cultural boundaries, either between cooperating organisations or across geographic regions, the form of organisation may be influenced by the decision-making processes that are viable. The operating systems may also be impacted. Some options include (Belbin (1996)):

- Operate the same way as at home base
- Change the local values to be consistent with those enunciated by the organisation
- Adjust all aspects of operations to local culture settings.

Some of these options may limit organisational form (e.g. the scope for bureaucracy).

The background culture and education of people in an organisation impact systems of operation and decision-making/work sharing practices in a number of ways (Bryant, Frhay and Griffiths (1994), Wineberg, Cope and Kalantzis (1997). Janus (1972)).

Power/political culture - there are four kinds of power/political culture that can influence who does what within an organisation Belbin (1996)):

- An authoritarian culture, where things get done only by finding a person with the status to make decisions
- The kinship culture, where priority is given to family members
- The consensus culture, where no one individual is empowered to make decisions. The referral process is protracted but, in the end, the decision becomes totally binding
- The bribe culture, where no one can be expected to do anything without a sweetener.

Some of these matters may have to be dealt with through an intermediary or by setting up local organisations. The latter requires distributed decision making.

Generational factors and the increasing number of knowledge workers. - As baby boomers, and now the next generation, increasingly populate any organisation, there is:

- Less acceptance or tolerance of authoritarian arrangements
• A greater focus on independence of the individual
• Growing resistance to the establishment of boundaries where work influences one’s personal life (Conger (1997))

The increasing level of general education in the workforce and the increasing impact of knowledge workers has implications for:
• People wanting more say in how work is done
• The company’s skill base walking out of the door
• In concert with modern electronic communications, divorcing the work to be done from the place of work (Drucker (1992)).

The need to maintain core competencies - some researchers (for example Hamel and Prahlad (1990)) see the long term survival of organisations closely linked to their ability to maintain core competencies that yield competitive advantage. Others such as Dunphy, Turner and Crawford (1996) have identified the need for both operational and reshaping competencies, to continually adapt the organisation to changing environments. These considerations lead to people frequently taking time out of day-to-day activities for personal renewal, re-shaping and to support innovation. An associated issue is regularly stimulating organisational superstars who need to be continuously challenged (Belbin (1996)). These requirements lead to networking and off-line taskforce/learning processes.

Decision networks and the management of knowledge have been put forward as important aspects of today’s global businesses. It has been projected that, as labour and capital become readily available in a global business, knowledge will become a primary organisational resource (Drucker (1992), Ruthven (1997)). So, the acquisition and management of knowledge, and how it is used, should be facilitated by organisational structure. Some see middle management as critical to this process, interpreting top-down strategic intent to align operational action, and promoting bottom-up ideas and issues, using their experience to understand the significance of real opportunities (Nonaka and Takeuchi ,1995).

6.6 Creating (or destroying) distinctive capacity
It is argued that companies with a track record of long term survival develop core competencies (Prahlad and Hamel, 1990) institutional skills and opportunities for growth (Baghai et al (1996)), and recognise that business rewards in the future come from intellect, not bricks and mortar (Quinn (1993), Nonaka and Takeuchi (1995)). In broad terms, this is the experience of the case study aerospace company (refer case study 7).

People need to work together in co-operative ways and it is suggested here that organisation structure can help or inhibit appropriate co-operation. The information reviewed here and case study examples illustrate that distinctive capacities in operational excellence, responsiveness to opportunities and the sharing of knowledge can be impacted by organisational form. It is apparent that any particular organisational form has its benefits and vulnerabilities so, to achieve maximum benefit, an enterprise should:

- Design a blend of organisational forms that are consistent with its underlying imperative and operating environment.
- Understand what has to be managed in moving from one organisational form to another in an environment of constant change and regularly review the current status.

It is suggested this can be facilitated by different forms of auditing processes.

6.7 Auditing Structural Performance

The concept of auditing structural performance simply parallels quality audit practices. For example, in auditing a company against the International Quality Standard ISO 9000, a checklist of questions relating to a range of expectations enunciated in that standard are drawn up. By self assessment, interview or documentary evidence, actual performance is noted and corrective actions developed to overcome any shortcomings observed. Such an approach has been developed considering the drivers of organisational structure discussed in section 6.5, and case study 8 provides an example of the attribute auditing approach used.

6.8 Discussion

The list of actions from the structural attribute audit illustrated in case study 8 is quite long. Many of them deal with non-structural matters like culture and leadership that
are important to organisational learning. Many of the actions would require an implementation program of their own and this helps us understand some of the complexities behind successful structural change. Suggesting structural change is as simple as drawing a new organisation chart, creating some new positions and announcing some new company procedures would be a mistake. Implementing structural change and declaring it to be successful without auditing its impact some time later would also be a mistake. The audit process proposed here may overcome such shortcomings.

There must be sufficient resources to manage any change. But the resource profile and competencies necessary for the knowledge age or for the extended enterprise of the future may be quite different from that proposed in lean, flat structures fashionable today. So, without considering this, we may inadvertently create an organisation that is currently competitive, but has no future.

In many enterprises, different organisational forms do, and should, co-exist, but how they interact creatively has not been considered here. For example, on the face of it, a functional bureaucracy focussed on specialisation would seem incompatible with a team based structure focussed on multi-skilling, but the two do co-exist, commonly by the use of committees and task forces.

A range of factors that might be integrated to create an organisation design tool have been identified in section 6.5 of this thesis. It is considered that examining organisational attributes utilising these factors helps provide a different view of organisation design that is consistent with a knowledge economy orientation.
7. IDENTIFYING AND SHARING CRITICAL KNOWLEDGE

7.1 Overview

Within the case study aerospace company, to build on the positive attributes of the highly skilled workforce and embrace continuous change, notions of the learning organisation and knowledge management are being explored and pursued.

Progress has been made and the organisation now has more information and ideas for improvement than it can cope with. How can this be dealt with, whilst continuing to pursue a high rate of learning? The point is also made that knowledge must support transformational action, which is enacted through the people in the organisation. The management research literature also abounds with the notion that knowledge will have become the most valuable company asset supporting competition in the 21st century (for example Drucker (1992), Sveiby (1997)). So, knowledge management will be an important organisational process. Whatever knowledge management means – again there are a variety of perspectives in the management literature.

It is argued here that:

- the learning organisation focus is on acquiring technical mastery in some particular competencies and on applying problem-solving, networking and knowledge sharing processes that lead to enduring beneficial change in the organisation. One such practice is mentoring, discussed in paper A
- knowledge management is about the management of a resource that has an intangible element, but a significant codified element; and that certain competencies and infrastructure are needed to manage and utilize this resource to achieve beneficial change. Paper B discusses an approach to how corporate knowledge of significance can be identified and classified
- both of these approaches are needed, working in concert. This is discussed in paper C

7.2 Critical knowledge

A common thread in many different approaches described in the literature is that the transfer of that knowledge regarded as critical to the competitive position of the business must take place so it can be acted on (for example O'Dell and Grayson
Such critical knowledge has both tacit and explicit components (Nonaka and Takeuchi 1995). The following observations are made from paper C:

- Knowledge is a resource made up of various tacit and explicit components
- Managing that resource has people, technology and systems aspects to it
- The learning organisation concept has a focus on people mobilization and problem solving
- The most appropriate transfer processes depend on the type of knowledge to be transferred

It has been observed in previous sections of this document (for example 4.2, 4.3) that, as organisations become more proficient at knowledge acquisition and dissemination, the volume of information and opportunities for improvement multiplies rapidly. In this environment, a need to focus on critical knowledge consistent with roadmaps or a vision of where the organisation is heading, and of rapid feedback on performance and progress to maintain that direction is identified.

Martin (1997) and others support the view that knowledge is a resource and needs to be acted on and discuss links with innovation and productivity, with an emphasis on influencing the speed of innovation and re-using knowledge to enhance operational productivity. This is discussed in Case Study 12. Lucier and Torsielli (1997) and Davenport (1996) also stress that knowledge needs to be acted on, as they have observed the failure of knowledge management schemes in many companies because the focus was only on making a resource available, and not necessarily the most influential one (for example, lets put the company manual on-line). The point is that both the focus must be right and there must be action to deliver value.

Historically the perceived value of a company has been driven by its financial and capital assets, but today, some of the worlds largest companies have a market value many times the value of their capital base. The additional value is considered to be related to customer assets and intellectual assets, with an emphasis on the latter. Some researchers (Sveiby,1997) are seeking ways to characterise and value these intangibles. Some component parts of these assets are individual competencies, internal structures and external structures. These are attributes of the model of corporate memory discussed in section 7.5 and presented in paper D.

There are efforts to identify and enhance core competencies seen as the source of a company’s sustainable competitive advantage, and considerable efforts to codify
expert knowledge to make it easier to both retain by a company and to share internally to enhance operations (eg Whyte, 1997). Legal protection of ownership of critical knowledge by patent, copyright, trademark or whatever else makes sense is a focus for many companies. Such approaches have an underlying assumption that protecting all these resources containing critical knowledge within a company will offer an advantage.

But other approaches pull together a network of companies (refer section 6.2) that between them have all of the resources to tackle a particular opportunity or task, and this involves sharing intellectual property. Some, such as Australian company Moreton Bay Ventures (Australian Business (2000)) go further, and adopt an open source approach, making new knowledge freely available on the condition that subsequent enhancements and applications will be available back to the company at no cost. Then Moreton Bay Ventures develops higher level applications using the enhanced knowledge. Here the critical information also relates to the network and knowledge application.

These quite different strategies; formalise critical knowledge to retain control of it, or formalise critical knowledge to share it and stimulate its growth, have a common objective – obtain leverage from what the company knows. Just what an organisation knows that is of value and how to characterise it will be discussed in subsequent parts of this thesis.

7.3 Knowledge creation

Creating new knowledge involves a journey of exploration and discovery, and processes to encapsulate and store what is found for later dissemination and utilisation. It is about seeing patterns in information, and about making unique connections through experiment design and observation. Processes of critical questioning can draw out new perspectives on the status quo or on deficiencies in performance being explored. Environmental scanning can detect possibilities not previously considered.

Language has a particular influence in understanding the significance of new things, and according to Bohn (1994), the maturity of a technology influences the extent to which standard processes can be applied to knowledge management. He argues that when a technology is new, few people understand it, there is a high tacit knowledge
content, and the scientific principles behind it may not be fully explored. This influences the language that is used, and has significant implications for knowledge transfer and utilisation in high technology industries.

Exploration can be via dialogue/socialisation processes, or via experimental processes. Much of the learning organisation literature suggests stimulating both. It is suggested that establishing dialogue that considers a diversity of views is more likely to yield innovative outcomes than considering consistent views. From a study of the inner workings of groups who had done extra-ordinary things, Bennis and Biederman (1997) noted that whilst greatness starts with great people, they must be specialists with broad interests and multiple frames of reference. This is consistent with the observation made in section 3.4 of this document: that a blend of people with different profiles is helpful, but that technical competence is also needed.

Encouraging experimentation in a fail-safe environment or by simulation is not only a fast learning mechanism, but exploration beyond normal boundaries can create new knowledge (Bakken, Gould and Kim (1992)).

7.4 Knowledge transfer

Recognising, that the only relevant outcome is one that leads to change, it can be observed that, in the Jarvis (1987) model of adult learning (Figure 3b), that only comes via the memorization process or by reasoning and reflective processes leading to a changed and more experienced person. People may not have well developed reasoning and reflection competencies, and may have difficulty with other pre-requisites such as language or jargon associated with learning something quite new to them. In some of the literature (for example Senge et al, 1999), and throughout the case studies presented here, the process of mentoring is seen as valuable. Some aspects of the process need to be linked to the context in which it is being applied, particularly access to specific domain knowledge. Some research undertaken to examine current applications of mentoring, and to show how the process can be better understood is presented in Paper A.

To achieve organisational learning, as compared with individual learning, other additional processes leading to embedded change in organisational practices are necessary. These changes may still be associated with people, e.g. through
changed organisational values or norms, but may also involve changing work organisation, adapting technology, or changing business support systems.

It seems that the word knowledge can be used in a multiplicity of contexts. At a recent CIO Informat conference (reported by Bushell 1999), a panel group observed that the term knowledge management had been used some 35 times throughout the conference, in contexts ranging from data storage and retrieval to people being stimulated into action. This illustrates that knowledge comes in different forms, generically considered to be either explicit knowledge that is documented and/or codified; or tacit knowledge that is in peoples heads and either consciously or subconsciously utilised.

Nonaka and Takeuchi (1995) discuss how an organisation and the people in it learn by knowledge transfer between these two different forms using a number of quite different transfer processes, as shown in Table 7a.

<table>
<thead>
<tr>
<th>DESCRIPTORS</th>
<th>FROM</th>
<th>TO TACIT KNOWLEDGE</th>
<th>TO EXPLICIT KNOWLEDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Knowledge gained from experience</td>
<td>TACIT KNOWLEDGE</td>
<td>Process: socialisation</td>
<td>Process: externalisation</td>
</tr>
<tr>
<td>• Simultaneous (here and now)</td>
<td></td>
<td>Outcome: sympathised knowledge</td>
<td>Outcome: conceptual knowledge</td>
</tr>
<tr>
<td>• &quot;Analogue&quot; (practice, gradations)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DESCRIPTORS</th>
<th>FROM</th>
<th>TO EXPLICIT KNOWLEDGE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Knowledge gained from rationality and reasoning</td>
<td>EXPLICIT KNOWLEDGE</td>
<td>Process: internalisation</td>
<td>Process: combination</td>
</tr>
<tr>
<td>• Sequential (there and then)</td>
<td></td>
<td>Outcome: operational knowledge</td>
<td>Outcome: systemic knowledge</td>
</tr>
<tr>
<td>• Digital (theory, black and white)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7a: Knowledge transfer processes (based on Nonaka and Takeuchi, 1995)

One way or another all organisational learning is through the people in it. In researching how adults learn, Jarvis (1987) noted a number of potential outcomes when people are exposed to a learning opportunity:

- New knowledge may not be acquired if the learner is not able to interpret the language or concepts presented, or if the learner perceives the knowledge simply reinforces what is already known, or if what is presented is contrary to the values of the person.
• Non-reflective learning that enhances the skill level of the person may take place
• Reflective learning (with an evaluation step) that changes the way the person acts, or memorises the learning for later action may take place.

Not surprisingly, these kinds of outcomes can be observed at the level of the organisation. In reviewing the outcomes of extensive benchmarking programs and associated knowledge transfer attempts, O’Dell and Grayson (1998), and Szulanski (1996) observed a large number of instances of non-learning. Szulanski’s research suggested a number of causes: language or interpretation issues that restricted the capacity to appreciate what was being offered; “causal ambiguity”- some difficulty with logic or values; and “tenuous connections”- some difficulty with knowledge hand-over, e.g. due distance or intermediaries between the parties. O’Dell and Grayson (1998) see knowledge transfer as the key to organisational learning and suggest a number of practices that will facilitate it. They also observed many instances where, after an extensive benchmarking exercise, best practice was identified in some other part of company undertaking the exercise. Even then, this knowledge was not necessarily acted on. Von Krogh and Grand (2000) present the view that knowledge remains as information within a company until it has been tested against the dominant logic of that company. They see that:

“Knowledge creation as the development of corporate justified true beliefs cannot be analysed adequately without considering the dynamic of “justification” since these processes essentially decide whether new knowledge is rejected, returned, or appropriated by the organisation” (von Krogh and Grand, 200, p15)

They note that corporate understandings of the business and its dominant logic will have an effect on the corporate knowledge base that evolves over time. It is suggested here that “justification” at the corporate level is equivalent to evaluation at the personal level in the Jarvis (1987) model shown in figure 3b. If that were so then other parallels might be drawn regarding corporate processes and their interactions by examining models of personal learning, however this will not be taken further here.

7.5 Knowledge utilisation

People obtain value from knowledge in various ways: by using it to stimulate innovative action, or by seeing it as a resource that can be managed and traded. The term knowledge management is in popular use, but what does it mean? Martin
(1997) observes, from a wide range of reference material, key concepts in knowledge management as follows:

- Knowledge
- Knowledge creation
- Knowledge workers
- Learning
- Knowledge culture
- Intellectual capital
- Intangibles
- Knowledge based companies
- Teams

He contends that management of knowledge assets and management of processes for creating, organizing and transferring sharing knowledge, together define knowledge management, but there currently seems to be a bias in interest toward the resource-based approach. This interest arises because knowledge is seen as a potential source of competitive advantage (e.g. Lucier and Torilleri, 1997). Vicari and Toilo (2000) have considered the link between knowledge creation and creativity, and view the firm as a cognitive system in that context. They see two research streams that place knowledge as a key element in a firms success: one where unique routines are developed from operational knowhow to support that success, and the other where unique resources support that success. This is consistent with the view that if knowledge is regarded as an asset, it must be sold or provide market leverage to deliver value. If it is regarded as a facilitator of creative practices that help a company compete, it must lead to beneficial change in a product or process.

Recent research by Soo, Devinney and Midgley (2000) tested a model of knowledge creation and innovation in a survey of three hundred and seventeen Australian and multi-national firms, followed up by case study research in six of them. Their model is shown in Figure 7a below. In the context of this model they found that specific factors that make a difference for a firm are:

- Knowledge acquisition through informal networking activities, combined with formal knowledge capture. The two were seen as interdependent.
- Creativity in problem solving was seen as a key driver of new knowledge creation (in other words, the knowledge is applied in the context of the firm).
- Adequate individual and organisational absorptive capacity must be available
- The importance of new knowledge input to innovative output and financial performance in the context of the firm and the industry

97
Figure 7a: Model of knowledge creation and innovation (Soo, Devinney and Midgley (2000))

At many conferences on knowledge management, information technology tools thought to support knowledge management are frequently presented. Olson (1997) discusses Information Technology as an enabler of knowledge management (noting it is necessary, but not sufficient), to facilitate:

- learning and the creation of new knowledge
- the management and protection of intellectual assets
- collaboration for innovation and creativity
- leveraging what is already known

A simple model for an integrated, information technology oriented solution is put forward (refer Figure 7b). The recommended approach is:

- diagnose knowledge sources, needs, gaps
- develop a classification structure, architectural principles for storage, etc
- define organizational knowledge management processes
- build facilitating infrastructure

The beginnings of this approach are reflected in reference paper B. In that paper, knowledge sources are identified via a model of corporate memory, and a generic classification structure is suggested, along with the use of a particular information technology tool. It is recognised that e-commerce is projected to change the way internal company and business-to-business transactions take place. In a recent
article in the ‘Australian’ newspaper, Howard Carney, an executive vice-president of Cisco, one of the world’s largest internet companies, was quoted as saying that e-commerce was now in the third of four stages required to obtain value from the internet (Hellaby 2000). The four stages are seen as (with added comments):

- **Stage 1**: e-mail (helping to make tacit knowledge explicit, facilitating personal networking)
- **Stage 2**: web sites to convey information (helping to facilitate knowledge transfer and organisational networking)
- **Stage 3**: commercial interaction, using the web to buy and sell, and to deliver customer services (facilitating knowledge transfer and starting to deliver value)
- **Stage 4**: using the web to actually get work done: web enabled global design and production (reflecting knowledge transactions and collaborations)

Stages three and four involve acting on knowledge, but require infrastructure that is still developing, and will require an understanding of knowledge flows and attributes, not just data flows in linked businesses. This is beyond the scope of the present research.

![Diagram](image)

**Figure 7b: Knowledge development model (from Olsen, 1997)**

Marceau et al (1997) point out that facilitating infrastructure includes things external to the organisation, such as joint industry training or marketing Boards, and go on to generalise technology capabilities as:

- **Human capital.** This includes skills developed through formal education and the tacit skills arising from training and experience
- **Physical capital.** This includes instrumentation, research and test facilities
- **Knowledge.** This includes design methodologies and test facilities
• Organisation of the productive system. This includes the strength and spread of
t networked relationships between users of a technological service and its
suppliers and the existence of joint industry-government planning forums.
It is further pointed out that this infrastructure is important in developing capacity to
absorb and diffuse externally developed knowledge and innovations, and supports
the development of generic, cutting edge technologies through co-operative efforts.
Case study 12 provides an example of this approach in the aerospace company.

With ready access to the Internet and other sophisticated information technology
enabled searches of data, the issue for many people is represented by Berreby
(1996) He notes that this situation can lead to a paradox: extra details can obscure
patterns and make it harder to get useful facts; and quotes the view of a colleague
concerned with knowledge management – that the emphasis is no longer on
information processing, storage and analysis; but on representation. He discusses
the use of a range of sensory perceptions besides words and numbers: colour,
texture, sound; to be able to rapidly assimilate “represented” information through
metaphor and analogy. A related view is expressed by Marceau et al (1997), who
notes that the increasing supply of codified knowledge is increasing the demand for
skills relating to the recognition of patterns in data and selecting relevant data for
scrutiny. The point is, that to effectively use knowledge, it must be visible, and its
context and significance understood.

7.5 Leverage from “Corporate Memory”

A review of how adults learn, some learning organisation attributes and current
perspectives in the field of knowledge management have been presented in previous
sections and reference paper C. As one outcome, a systematic notion of
organisational memory is seen as beneficial, and some of its attributes can be
gleaned from previous sections (for example section 3.2) of this thesis, but no
representation of this memory was found in the literature. As part of the research
undertaken here, a model of corporate memory was developed and is described in
Paper D that forms part of this document. Further information on its development is
presented in Case Study 11, and a schematic representation is shown in figure 7c
below.
Figure 7c: Model of corporate memory attributes (Beckett (2000b))

The model of corporate memory developed (Beckett (2000b)) focussed on where knowledge was available throughout the extended organisation. It has eight components: operations implementation strategies that are supported by a data warehouse and an operational rule set. The rule set is influenced by owners, customers and other stakeholder requirements, and evolved using intellectual assets, which in turn are supported by external contacts. From the discussion above, it is suggested that there is also a need to understand what an organisation knows in terms of domain knowledge, and what form it is in (which influences how it can be used and traded). A classification structure and attributes of knowledge representation tools to support this are presented in Paper B that forms part of this thesis.

An approach to obtaining leverage from corporate memory is also presented in Paper B and is repeated here. What does an organisation know, and how can this provide leverage? What an organisation knows is characterised using the notion of a Corporate Memory that contains different kinds of sub-tier knowledge sets (presented in paper D), but a particular company may have a strength in a particular knowledge set. From examination of the sub-tier knowledge sets described in that paper, how different kinds of leverage a particular business might develop by focussing on a particular sub-tier set can be envisaged, as shown in table 7b below. For example,
an enterprise strong in intellectual assets might adopt a patenting strategy. It might be noted however, that individual sets are part of a total system, and to realise and sustain leverage, multiple knowledge elements are involved. For example, a good franchise operation commonly has a data warehouse and business rule-set as integral parts of the operational implementation. Understanding the knowledge strengths of an organisation can help define an appropriate leverage strategy. Alternatively, the knowledge base needed to pursue a particular strategy can be appreciated, and aligned with the implementation of that strategy

<table>
<thead>
<tr>
<th>CORPORATE MEMORY SUB-TIER KNOWLEDGE SET</th>
<th>EXAMPLE OF POTENTIAL LEVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPANY INTELLECTUAL ASSETS</td>
<td>• STRENGTH IN CORE COMPETENCIES</td>
</tr>
<tr>
<td></td>
<td>• PATENTS</td>
</tr>
<tr>
<td></td>
<td>• COPYRIGHT MATERIAL</td>
</tr>
<tr>
<td>EXTERNAL KNOWLEDGE BASE</td>
<td>• EARLY TREND &amp; OPPORTUNITY SPOTTING, DEAL BROKERING</td>
</tr>
<tr>
<td></td>
<td>• POWERFUL VIRTUAL ORGANISATION</td>
</tr>
<tr>
<td>INTERNAL DATA WAREHOUSE</td>
<td>• RE-USE OF KNOWLEDGE (EG EXPERT ASSISTANTS)</td>
</tr>
<tr>
<td></td>
<td>• TARGETED MARKETING (EG READERS DIGEST APPROACH)</td>
</tr>
<tr>
<td>UNIQUE OPERATIONS/BUSINESS RULES</td>
<td>• MAKE OR CHANGE INDUSTRY NORMS</td>
</tr>
<tr>
<td>ADAPTABLE OPERATIONAL IMPLEMENTATION</td>
<td>• AGILE SYSTEM</td>
</tr>
<tr>
<td></td>
<td>• FRANCHISE OF WELL DEVELOPED, PROFITABLE BUSINESS SYSTEM</td>
</tr>
</tbody>
</table>

Table 7b: Some knowledge leverage strategies

7.7 Discussion

In earlier sections of this thesis, the focus was on stimulating learning, with the aim of creating new knowledge and further learning opportunities. In this section, the focus is on the knowledge itself, sharing it and using it. Identifying where knowledge might lie within an organisation, so that it can be accessed to provide leverage as an asset is also considered both in this section, and in reference paper B. This has started to move the research from a focus on the traditional organisation and associated knowledge processes towards, towards a knowledge view of the organisation, a
theme emerging from recent research elsewhere (von Krogh, Nonaka and Nishiguchi (2000))

Knowledge transfer is complex, involving a variety of processes (refer Table 7a), and may fail to become embedded in the company’s routines if it is not “justified” (von Gough and Grand (2000)). Sifting the critical knowledge from a flood of background information, then doing something creative with that knowledge is needed. Identifying the right filters and decision criteria are important. Two “maps” produced as a result of the present research: a model of corporate memory and a learning organisation attribute matrix (see table 7c ) are being used to develop an improved understanding of required capabilities and potential for knowledge leverage. There is substantial complexity behind these maps, and this will be discussed in the next section of this thesis.

<table>
<thead>
<tr>
<th>Exploration and DISCOVERY</th>
<th>Enabling COMPETENCIES</th>
<th>Facilitating PROCESSES</th>
<th>KNOWLEDGE Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration and DISCOVERY</td>
<td>Critical questioning</td>
<td>Dialogue / socialisation</td>
<td>Identification and acquisition of information and of knowledge sources (encapsulate / store)</td>
</tr>
<tr>
<td></td>
<td>Environmental scanning</td>
<td>experimenttion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Language” compatibility</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Freedom to CHOOSE</th>
<th>Option identification</th>
<th>Evaluation / auditing</th>
<th>Knowledge dissemination (search / sort)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freedom to CHOOSE</td>
<td>Scenario analysis</td>
<td>Decision support mechanisms</td>
<td></td>
</tr>
<tr>
<td>Freedom to CHOOSE</td>
<td>Technical mastery</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expectation to ACT</th>
<th>Negotiation</th>
<th>Change Management</th>
<th>Knowledge utilisation (re-use / leverage) resulting in innovative, unique combinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expectation to ACT</td>
<td>Communication</td>
<td>Performance measurement</td>
<td></td>
</tr>
</tbody>
</table>

Table 7c: Learning organisation attribute matrix
8. BARRIERS TO LEARNING AND KNOWLEDGE TRANSFER

8.1 Overview

In the initial literature survey, and somewhere in every section of this thesis there are references to potential barriers to the success of organisational learning and knowledge management programs. The platform of capabilities to be assembled and organised is large, as is the number of things to be balanced. The potential for failure or sub-optimal outcomes increases if this platform is not fully assembled. This situation has been taken here as another learning opportunity. What if a key capability is missing? This is discussed in paper C. What are the potential sources of knowledge flow failure? These are considered using a model of corporate memory in paper D.

Also discussed in this section of the thesis is the social context of learning. If learning is not valued in an organisation, it is difficult to sustain any kind of knowledge program.

8.2 The notion of a missing link

In pursuing organisational change over the past few years and adopting learning organisation notions, it has been observed within the aerospace company that there is a wealth of data available: from the experience of the employees, company manuals, auditing/benchmarking studies, computer systems. But dissemination and utilization are regarded as sub-optimal, particularly between geographically separated operational sites. This situation is not unique to the particular company, as it is recognised as an issue even in companies projected as epitomising best practice. Studies of best practice internal transfer in eight companies by Szulanski (1996) reports the same observation.

So even in organisations with some enthusiasm for organisational learning, there may be something missing. Figure 8a starts to explore some of the implications and intervention approaches to gaps in the whole knowledge creation and utilisation process. For example, from a focus group discussion on where a company might improve its knowledge management practices, the outcome characterisations in the top part of the table lead back to a suggested area of deficiency. The deficient area may be improved by enhancing one or more of the processes listed below that column. The choice may be influenced by the type of intervention preferred. For
example a deficiency in knowledge acquisition may be enhanced by environmental scanning using data mining techniques. Alternatively a personnel oriented intervention, such as improving critical questioning skills may be preferred.

In Paper C, a similar approach is explored, but from an organisational learning perspective using the more generic discover – choose – act learning cycle representation, shown in figure 7c. In that paper, the existence of a missing link is used to stimulate discussion of its significance, and of the options for doing something about it. In other words, it is treated as another learning opportunity, along the lines suggested by Argyris (Kurtzman (1998)): don't just seek an obvious quick fix to an apparent problem. Make sure it is the most appropriate problem to solve. There may be a better answer in changing the operating frame. Senge et al (1999) have a similar view: use measurement and variations that are observed as a source of learning, not only to assess outcomes.
IMPLICATIONS OF A "MISSING LINK" IN THE KNOWLEDGE MANAGEMENT PROCESS

<table>
<thead>
<tr>
<th>KNOWLEDGE MANAGEMENT PROCESS</th>
<th>POSSIBLE OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>KNOWLEDGE ACQUISITION + KNOWLEDGE DISTRIBUTION + KNOWLEDGE UTILISATION</td>
<td>LEARNING ORGANIZATION RE-USING AND LEVERAGING ITS INTELLECTUAL ASSETS</td>
</tr>
<tr>
<td>MISSING</td>
<td>ORGANIZATION LIMITED BY ITS CURRENT ATTRIBUTES, BUT USING THEM WELL</td>
</tr>
<tr>
<td>KNOWLEDGE ACQUISITION</td>
<td>ORGANIZATION ACQUIRING NEW KNOWLEDGE, BUT ONLY USED BY A SELECT FEW TO GIVE SOME ADVANTAGE</td>
</tr>
<tr>
<td>KNOWLEDGE ACQUISITION</td>
<td>ORGANIZATION WITH LOTS OF INFORMATION, BUT LITTLE CONVERSION INTO KNOWLEDGE AND ACTION</td>
</tr>
</tbody>
</table>

FACILITATING PROCESSES

- ENVIRONMENTAL SCANNING
- EXPERIMENTING
- CRITICAL QUESTIONING
- SOCIALIZATION PROCESSES FOR TACIT-TACIT, EXTERNALIZATION FOR TACIT-EXPLICIT, INTERNALIZATION FOR EXPLICIT-TACIT

ENCAPSULATING, STORING
SEARCHING, SORTING
PEOPLE INTERACTION
PEOPLE PROVIDED WITH MULTIMODEL "MAPS" AND DATA REPRESENTATIONS WITH A WIDE VARIETY OF ENTRY AND EXIT POINTS

LEVERAGING/RE-USING
SYSTEMIC CHANGE
"PRODUCT" INNOVATION
PEOPLE COLLABORATION
BEHAVIOURAL/VALUE CHANGE

POTENTIAL INTERVENTION TOOLS

← Scope for technology intervention support
← Scope for methodology intervention
← Scope for personnel intervention

Figure 8a: The notion of a knowledge management process missing link and possible responses

8.3 Knowledge flow barriers

There are presumptions in this thesis and in most research on learning and knowledge that the source of knowledge, whether an individual or organisation, is willing to share the knowledge, and to devote time and resources to support the transfer. However, where the knowledge is perceived as a source of competitive advantage or power, there may be no such willingness. The interplay of power,
structure and political frames can lead to subtle constraints (Gordon and Grant (1999)), resulting in a filtered flow of information through an organisation, and decision making based on flawed data (Kurtzman (1998)). Whilst information and knowledge may still flow, it will be incomplete, and its context may be altered so that it degrades the total enterprise system rather than enhancing it.

In a broader context, Marceau et al (1997) reports on studies by the OECD and others of an industrial structures knowledge distribution power, how flows of knowledge move through a national system of innovation, and what impediments to these flows reduce an economy’s capacity to learn. Knowledge distribution power is considered to be the capacity to ensure timely access by innovators to relevant stocks of knowledge. Four types of knowledge interaction were noted:

- Inter-industry flows of knowledge
- Joint industry research
- Industry/research institute/university collaborations
- Mobility of highly trained personnel

It is suggested here that failure in any of these in a particular nation or state can have a significant impact on the knowledge available to firms operating in that nation or state.

In studying knowledge transfer in and between enterprises, O’Dell and Grayson (1998) observed a number of potential cultural barriers:

- **Ignorance**: those who have the knowledge do not realise others may find it useful, those who could use it don’t know it exists
- **No absorptive capacity**: lack of resources or study time to make adaptation of an idea useful
- **Lack of pre-existing relationships**: no personal dialogue that builds confidence and shares views
- **Lack of motivation**: No clear reason for making a change perceived.

O’Dell and Grayson have also observed a number of systemic barriers that tend to dominate some companies

- **The silo company**: focussed units with no incentive to share information
- **The Not Invented Here company**: that values local knowledge creation over knowledge sharing
- **The Babel company**: with far-flung employees that lack a common purpose
• **The By-the-book company**: that considers documented knowledge is the only valid form

• **The Bolt-on company**: that considers adding knowledge transfer responsibilities to a duty statement is all that is needed.

It is suggested here that different kinds of barrier may exist within different parts of one organisation.

Issues of knowledge flows within organisations and between organisations raised here are becoming a topic of research interest as firms collaborate more and pursue potential sources of leverage of their knowledge base, but current research tools and theories seem under developed (Based on von Krogh, Nonaka and Nishiguchi (2000)).

### 8.4 Social context: is learning valued

O’Dell and Grayson (1998) see four enablers of knowledge transfer:

- **Culture**: a supportive, collaborative culture eliminating traditional rivalries is needed. The source had to be generous enough to devote the counselling and communicating time the recipient needed to really understand, adapt, and implement the practice. As a starting point, it has to be believed that people want to share, that there is a preparedness to lead by doing, external norms of capitalism and democracy are retained. Internally, collaborative relationships are encouraged, personal responsibility for knowledge creating and sharing is instilled in people, and there is a collective sense of purpose. If people want their expertise and knowledge to be used, they certainly want it recognised, both at an individual and team level. Time to use and create knowledge needs to be recognised and rewarded, not be seen as a covert activity. It is suggested here that conversely, if learning is not valued, none of this cultural infrastructure can persist.

- **Infrastructure**: even if full management support is enunciated, and sophisticated recognition systems put in place, the results may be disappointing, because people need help in understanding and transferring best practices. A knowledge services approach provides a variety of value-adding knowledge management services, networks and tools where information may be pre-processed and packaged into more digestible and applicable formats. It involves networks of people coming together, not just networks for handling data. The facilitated
approach designates specific people to act as change agents, building on elements of infrastructure. They must have the special attributes of a change agent, and be knowledgeable about best practices in their own areas. It is suggested here that if learning is not valued, adequate support will not be provided

- *Technology:* whilst communications and information technology that can help share knowledge globally has been in use for some time, the authors observe that the pervasive use of groupware and internet/intranet technologies can allow stories that were once briefly shared, say by telephone, to be searched, consulted, remembered, shared and expanded. It is suggested here that if learning is not valued there will be barriers to the acquisition of technology, and to the management of related data

- Measurement: whilst the logical arguments for investing in knowledge management may seem persuasive, to demonstrate real value, some form of measurement is required. Measurement may relate to stock prices, performance improvement, or the cost impact of not knowing something. Unfortunately, this is the least developed aspect of knowledge management, and some people feel it would be premature to expect such at this point in time. It is suggested here that if learning is not valued, then traditional measurements will be retained, and linkages to knowledge management benefits will remain obscure.

The total absence of any of these enablers can become a barrier, but according to Coleman (2000a), Culture and management support have the greatest influence, with infrastructure and technology being necessary, but not sufficient for implementing a comprehensive knowledge management program if learning is not valued.

Emphasising a different view on the cultural issue, Argyris (Kurtzman, 1998) suggested that companies fail because they have created cultures that inhibit their ability to learn. One class of company (the majority) have institutionalised a form of self censorship that is defensive, and limits real communication. People will not convey bad news, so the company works with invalid knowledge. Another class of company (the minority) manage their conversations better. Rather than censor knowledge, they have found a way to promote it and get heard. Von Krogh and Grand
(2000) also see the nature of management discourse as revealing underlying approaches to accepting or rejecting new knowledge.

Baldwin et al (1998) discuss the significance of the external environment on what is valued at a particular point in time. They suggest:

“In relatively well known or predictable markets, reference to an existing map or management model will provide managers with all the analysis a situation requires, even though the respective tools of analysis will be necessary to read the map (for example brand management, risk management and project valuation)”. Baldwin et al (1998), p55

“Many industries have been relatively predictable for many years, and are only now taking on the characteristic of high turbulence. Too dramatic a shift in learning strategies for these firms would almost certainly be received with skepticism, and might undermine any initiatives" Baldwin et al (1998), p56.

8.5 Keeping up the momentum

Grasping learning organisation and knowledge management concepts in the first place is challenging. Likewise, acquiring all of the competencies and practices that support them is challenging. Then sustaining these competencies and practices as the operating environment changes is challenging. Richards and Goh (1995) carried out a survey of a number of organisations that had enthusiastically embarked on a learning organisation implementation journey. The instrument they developed for the survey had a maximum score of seven, but the highest score for any organisation in any attribute tested was four point six. There is still some distance to go.

If one could take the experience reported by some experts in the field as an indication, it would seem about a ten year time frame is necessary to achieve a high level of capability. This was the period over which Argyris and Schon continued to refine their research. Senge launched his five discipline view of organisational learning, then a fieldbook helping with implementation, followed by advice about sustaining the momentum, all over about ten years. Motorola (Wiggenhorn, 1990) took about ten years to refine their unique training and learning practices to support the maintenance of a competitive position. Whilst the literature is full of examples of the virtues of organisational learning and knowledge management, it appears that a substantial long term commitment to the concepts is necessary, further reinforcing the need for top level management ongoing support.
8.6 Discussion

Organisational learning and knowledge management seem complex practices that have many possibilities for failure. People must see value in learning and sharing knowledge, and they should be interested in the learning topics (refer case study 2), which results in a common suggestion that learning and work be integrated. There is a lot to learn to become accomplished in these practices, regardless of the relevant domain knowledge, suggesting processes involving teams with members, each having some key elements of the total capability is the most practical strategy (compared with each team member knowing all aspects). This is consistent with the personal mastery and team learning elements of Senge’s (1990) five discipline approach.

The complexity of what has to be learned and the changes in past practices may take many years to become embedded in a particular organisation to the extent that the application of these practices is transparent. This leads to common calls for the right culture. It is suggested there that, just as a failure analysis approach results in broader learning and better outcomes in Engineering projects, the notion could be further explored in the organisational learning and knowledge fields.
9 CONCLUDING REMARKS

The topic of this research was “implementing a learning organisation in a high technology industry”. Was there anything special about the circumstances of a high technology industry? Potentially yes, but the most significant learning and knowledge issues are concerned with people or with technologies that help people in that regard rather than the learning content.

9.1 High technology industry factors

From the information presented in this thesis, it is suggested that some particular factors in a high technology industry may be that:

- If the rate of technology change is high, some prior knowledge may become redundant quite quickly (Wiggenhorn 1990)

- Introducing new technology earlier in its development life cycle as a basis of market differentiation can impact knowledge transfer processes (Bohn 1994)

- Supply chains are likely to be global, with significant opportunities to learn though collaboration with suppliers (Slater 1995a)

- The underlying level of knowledge of the workforce is likely to be higher, and structured processes related to quality assurance needs and systems thinking are more likely to be the norm, suggesting easier implementation. However, the converse has been observed by Argyris (1997)

- There may be more opportunities for learning in the product development process, where each new development may incorporate some new product or process technology that provides a direct benefit to the company, and there is an underlying change orientation (Malerba 1992).

9.2 Issues of turbulence

Of perhaps greater significance than the technology orientation of the firm is the level of turbulence and scope for the injection of discontinuities in its market place. High turbulence has two implications:

- Learning to spot trends and identify scope for discontinuities early is needed, placing emphasis on environmental scanning and scenario analysis (for example Fahey and Randall (1998))
• Having the ability to rapidly assemble a fast learning team is important, placing emphasis on mentoring (Intel example in Senge et al (1999)) as an internal process, or on collaborative networks as an external one (for example O’Neill and Sacket (1994), Naisbit (1998)).

9.3 Learning progression

The whole process reflected in this thesis can be related to Kolb’s (1984) experiential learning cycle (Figure 3a). Learning started in two places: either with concrete experiences from current practice within the aerospace company, or with observation and reflection on ideas from the literature. In some cases this lead to subsequent active experimentation (for example, the internal university, section 4.5). In other cases, experiments being conducted elsewhere were observed. It was not until all of this was generalised and new concepts formed, again in conjunction with the literature, that new possibilities for concrete experience made sense. Certainly in the first cycle, language was an issue, and this came up in some way in every section of this thesis. After the first cycle, with better language skills, the significance of the original research and the literature could be appreciated. A similar outcome was observed when a secretary in the case study aerospace company sought to learn about a new software package. Training was arranged, but the secretary was ill on that day. Prior to attending the next scheduled training session, the secretary experimented with the software, attempting a few simple applications with the aid of a manual. Whilst this was highly frustrating, at the subsequent training session, she learned much more than her peers in the earlier one. She had a better understanding of the language, and of the significance of what was being taught. Hall and Adriani (2000) report, from research into supply chain related knowledge, that the first step involved establishing a common language and perspective between the academics and the practitioners in an action learning environment, so the language was understood in an appropriate context. One potential strength of the mentoring process is that a mentor can initially act as an interpreter, speeding up the initial learning process. It is suggested here that the second learning cycle is understanding the possibilities for applying the learning. In the internal university case study (case study 6), participant utilised the learning best when they had negotiated an immediate application with their supervisor. A third learning cycle might use that application experience to create new knowledge, building on what already exists. The ideas emerging in sections seven and eight of this thesis, of taking a knowledge view of organisations and how they work, with the help of models developed here is an
example of the third learning cycle. This discussion draws out two issues noted in different ways in the literature: that organisational learning is a multiple cycle process, not a linear one; and that there are different levels of learning.

9.4 Levels of learning

From the discussion above, from a knowledge view, these levels may be characterised as foundation language, exploration of opportunities, and new perspectives. In table 9a, parallels are drawn between this view, and other views of levels of learning. Whilst the intuitive alignment of levels in the various views may be questioned, some interesting pictures emerge from examination of table 9a, and these will be discussed below.

In some previous sections of this thesis (eg section 8.5) it had been noted that some organisations embracing the learning organisation concept had not developed as far as might be anticipated. One interpretation from table 9a is that perhaps they don't have the incentive. For example, if their environmental turbulence is low, then standardising current procedures, relying on tacit knowledge and some measurement may be sufficient for survival, and the substantial effort in moving to higher levels of learning may not be justified. The next level may be characterised as really understanding what is happening in the business and the pursuit of excellence. This was a theme in the 1980's (Peters and Waterman(1982)), but many companies classified as being excellent fell on hard times. The emphasis moved to understanding the increased rate of change in the environment (Peters (1988)). The issue is that all of these attributes must be balanced to ensure long term survival (see section five), and from table 9a this implies taking knowledge, operational and technology views appropriate to the business environment. It is not uncommon for organisations to take either operational or technology views (or both), but knowledge views seem to be just emerging. This will be raised again later in this discussion.
<table>
<thead>
<tr>
<th>KNOWLEDGE VIEW</th>
<th>CONTINUOUS IMPROVEMENT (CI) VIEW</th>
<th>ENVIRONMENT VIEW</th>
<th>TECHNOLOGY MATURITY VIEW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Awareness of new methods, but continue with old ways of doing things</td>
<td>Employee development: supporting internally oriented requisite knowledge in an environment of low turbulence</td>
<td>Complete ignorance</td>
</tr>
<tr>
<td>Foundation language, understanding the concepts</td>
<td>Review and standardise current procedures to support growth, need for CI process understood</td>
<td></td>
<td>Awareness: pure art, mainly tacit knowledge</td>
</tr>
<tr>
<td>Exploration of learning opportunities, conversion to action</td>
<td>Stabilise: achievements in standardisation become mutually reinforcing, CI process and benefits understood</td>
<td>Immanent needs: supporting externally oriented innovation in current business practices in an environment of moderate to high turbulence</td>
<td>Control of mean: scientific method feasible, knowledge documented and embedded in hardware</td>
</tr>
<tr>
<td>New knowledge perspectives, new knowledge creation</td>
<td>Breakthrough: questioning current procedures, thinking differently about discovery, choosing and acting</td>
<td></td>
<td>Process capability: local recipe, hardware and operating manual</td>
</tr>
<tr>
<td></td>
<td>Dynamic: consistently repeating breakthrough stages, characterised by collective learning</td>
<td>Unknown development: business re-definition in undefined markets in an environment of high to very high turbulence</td>
<td>Complete knowledge: Nirvana</td>
</tr>
</tbody>
</table>

Table 9a: Some views of levels of learning

9.5 Individual and organisational learning

Throughout this thesis, parallels between the ways people learn (Jarvis (1987)) and the ways organisations deal with knowledge (for example von Groth and Grand (2000) can be dimly seen, consistent with the views of Senge et al (1994) that organisations are products of the ways people in them think and act. A learning journey can be stressful and draining, or it can be interesting and energising – as observed in school and university. In these environments, good teachers carefully select the language they use, frequently use metaphors to explain new concepts, and utilise a variety of media to transfer knowledge. Organisations need to do the same, but are not necessarily good at it. Worrying about language and metaphor when there are pressing needs to get value from knowledge and sustain a healthy bottom line can lead to conflicting views and priorities. Attaining competency in such aspects of communication (plus competency in negotiation) is seen as a pre-requisite to action (table 7c), suggesting that unless such conflict is dealt with, organisational
learning will be impaired. In sections four, five, and six, many issues of balance like this were noted, and it was suggested in section eight that it may take many years to assemble a full platform of learning organisation and knowledge management competencies. There is clearly a need for strong and enduring management support to maintain balance and deal with conflict during this journey.

Von Krogh and Grand (2000) also suggest that new knowledge will not be accepted by an organisation until it is justified - assessed in the light of organisational background knowledge. This is consistent with the model of corporate memory (figure 7c), where business rules are developed from a blending of company intellectual assets and a number of external requirements (from owners, customers and other stakeholders). It is suggested here that unless senior management has gone through this justification process in respect of learning organisation and knowledge management concepts, then the level of support needed for them to flourish may be lacking.

9.6 Moving forward

The list of issues to be dealt with and things to learn can seem depressingly long, but there are some positive outcomes to report. There is evidence that some parts of any large organisation may already have some of the capabilities needed, and may have a positive orientation towards change. This leads to the view that implementation should be via a succession of pilot programs in these receptive areas (for example O'Dell and Grayson (1998), Senge et al (1999)). And there is evidence that once an elemental learning organisation capability is acquired, it can be put to work quickly, supporting other company initiatives such as the application of lean manufacturing methodologies. An example using the learning-by-auditing approach described in section 4.2 relates to a management–union dispute within the aerospace company. Under an Enterprise Agreement (labour contract) that sought to increase productivity by extending the application of team based work practices, a milestone pay increase was linked to the achievement of satisfactory progress. The company claimed that progress was not satisfactory. The unions claimed any shortfall was the fault of management. An auditing approach was taken to resolve the issue. Each aspect of the Enterprise Agreement was to be assessed by joint management/union teams. First they had to agree what they thought the objective of that part of the Agreement was, and this involved surfacing different “mental models” and establishing a common language for working together. Then agreement had to be reached on how
to assess progress, then information had to be collected by interacting with more people in the company. Finally, any corrective actions had to be agreed, along with a program for their implementation. This enabled relatively rapid progress to be made in a way that dealt with conflicting views by process rather than emotion. It reinforced the intent of the agreement. It might be argued that such arrangements should have been established at the outset, however as some new practices were being established, and even though joint groups drafted the Agreement, no-one was sure of the issues that would arise. This is another example of the cyclic nature of the learning process illustrated earlier.

9.7 Maintaining perspective

In section 3.2 of this thesis, reference was made to the observation of Argyris and Schon (1974) that people relate to an organisation through “maps” that are generally incomplete, and people look for ways to complete them. The work done that is reported in this thesis a quarter of a century later reinforces this. The various matrices and diagrams presented here and in the reference papers have been an important tool for encapsulating knowledge and transferring it to colleagues in the aerospace company. Academic reports and memos may or may not be read and remembered. Concepts introduced through diagrams with a brief introduction, commonly using metaphors to explain the concept, seem to be better absorbed and remembered within the aerospace company.

This matter of how knowledge is presented also raises the matter of the link between knowledge and its context. On the one hand we see new ideas from benchmarking rejected because their original context does not match the new one (Szulanski (1996), and on the other hand we see multi national, multitier acceptance of language and structure in Toyota supply chain practices (Nishigushi and Beaudet (2000)). Utilising the corporate memory model (figure 7c) in the case study aerospace company, attempts are being made to draw out both source knowledge and context information. Techniques for estimating new product costs are being reviewed. People are being asked what is known, and where that knowledge resides. They are also being asked what influences the interpretation and application of this knowledge. In a recent cost improvement exercise, three estimates were made of the benefits of a proposed change. All estimators were of comparable experience, but three quite different estimates were obtained, one from the instigators of the change, one from an independent group, and another by the potential implementors of the
change. It is suspected that context "rules" related to the level of risk perceived by the estimators was a greater source of variance than differences in their underlying knowledge base. It is suggested here that the linkage between knowledge and context bears further study.

Another example of the context issue arose in the preparation of reports arising from this research – some for use within the case study aerospace company, and some for a broader academic audience. Whilst different reporting styles may be appropriate to the knowledge base of each audience, it is suggested here that other differences arise from the different processes for justifying new knowledge. It is suggested that, from a management perspective, new knowledge is "justified" information seen in the context of background organisational experience, and is a competitive lever leading to action. Metaphors provide a link to succinctly deal at an operational level. It is suggested that from an academic perspective, new knowledge is "justified" information seen in the context of its proof and testing against alternative views, and becomes a generic "truth" to be passed on to others. Specialist language is used to succinctly deal at the conceptual level. The same knowledge, seen in these different contexts may not be consistently accepted or rejected.

9.8 Some case study company outcomes

The definition of a learning organisation adopted at the beginning of this research was: an organisation that has created a learning environment that provides a source of competitive advantage. Has this happened in the aerospace company as a result of this research? Certainly, some surveys reflect a positive change in attitude towards life-long learning and the application of some learning organisation competencies (for example case study 6). The company has more ideas for improvement, provided from all levels in the organisation, than its current capacity can support. Networking practices, supplier integration, customer integration, and more creative product development are in evidence (refer case studies 9, 10, and 12). There is evidence of learning from action, and acting on learning. There is a different "language" in use that is consistent with learning organisation ideas, particularly in the R&D area. In Table 9b an attempt has been made to identify some drivers of competitive advantage, and tools arising from each facet of the learning organisation studied here. Collectively they could be characterised as enhancing customer focus, having a broader view of the operating environment, and beginning to explore ways to leverage knowledge. But would these outcomes have been
achieved anyway as a result of environmental forces? It has been shown that some learning organisation competencies can be acquired from participation in certain kinds of programs (eg benchmarking), but additional learning organisation competencies are needed to make these programs effective. Which comes first; the application or the capability? Because this is not clear, the perceived value of a learning organisation and knowledge management strategy may not be high.
<table>
<thead>
<tr>
<th>RESEARCH ASPECT</th>
<th>COMPETITIVE ADVANTAGE</th>
<th>PROCESS OR PRACTICE</th>
<th>SUBSEQUENT DEVELOPMENTS</th>
</tr>
</thead>
</table>
| PEOPLE AS THE AGENTS OF ORGANISATION LEARNING | • Diversity of views supporting innovation  
|                                        |                                                                              | • Acquisition of specific learning competencies  
|                                        |                                                                              | • University integrated with work  
|                                        |                                                                              | • Further investigation of mentoring processes  
|                                        |                                                                              | • Alternative R&D methodologies  
| INTEGRATION OF LEARNING AND BUSINESS ACTIVITIES | • Customer focus through audit processes  
|                                        |                                                                              | • Competitive performance through benchmarking  
|                                        |                                                                              | • Balanced decision making  
|                                        |                                                                              | • Learning-by-auditing processes  
|                                        |                                                                              | • Customer focussed vision  
|                                        |                                                                              | • Benchmarking and change  
|                                        |                                                                              | • University integrated with work  
|                                        |                                                                              | • Vision – objectives - competencies planning, supported by task - focussed change practices  
| ISSUES OF BALANCE                      | • Expanded range of competencies  
|                                        |                                                                              | • Appreciate the significance of measurement  
|                                        |                                                                              | • Environmental awareness  
|                                        |                                                                              | • Internal / external knowledge balance  
|                                        |                                                                              | • Three time horizon learning model  
|                                        |                                                                              | • Considering issues of time  
|                                        |                                                                              | • Dealing with paradox  
|                                        |                                                                              | • Learning with customers and suppliers  
|                                        |                                                                              | • Measures and learning (Senge et al (1999))  
|                                        |                                                                              | • Balanced scorecard  
|                                        |                                                                              | • Appreciation of startup company perspectives  
| ISSUES OF STRUCTURE                    | • Design for different forms of knowledge transfer  
|                                        |                                                                              | • Balance downsides of organisational change  
|                                        |                                                                              | • Some knowledge oriented organisation design criteria identified  
|                                        |                                                                              | • An attribute audit process  
|                                        |                                                                              | • Pursuit of virtual organisation strategies  
|                                        |                                                                              | • Issues of trust  
|                                        |                                                                              | • " Requisite Organisation" (Jaques (1989))  
| IDENTIFYING AND SHARING CRITICAL KNOWLEDGE | • Leverage corporate memory  
|                                        |                                                                              | • Mentor facilitation  
|                                        |                                                                              | • Corporate memory model  
|                                        |                                                                              | • Generic knowledge structure  
|                                        |                                                                              | • Evolution of knowledge identification and classification system  
| BARRIERS TO LEARNING AND KNOWLEDGE TRANSFER | • Understand sources of potential knowledge system failure  
|                                        |                                                                              | • Learning organisation capability matrix  
|                                        |                                                                              | • Corporate memory failure modes  

Table 9b: potential sources of competitive advantage arising from the research

9.9 Measuring progress

Senge et al (1999) al cite this as a common problem with learning organisation programs, and observe that using the wrong performance indicators (generally ones that only look at subsystem performance) can imply a negative rather than positive outcome. From another point of view, if the learning organisation attributes presented in table 7c become transparently embedded in the normal routines of a company, and competently facilitate specific learning or change initiatives, then benefits obtained may only be attributed to those initiatives. In case study 2, example B illustrated difficulties in the implementation of a quality improvement initiative
inhibited by a lack of such attributes. But if they were in place, this would not necessarily be evident. Senge et al (1999) also note that there is commonly a time delay between the establishment of competencies and pilot groups to the achievement of substantial bottom line benefits. They suggest strategies involving making assessment a priority, establishing measures in partnership with executive management, and accepting the principle of measuring to learn, not just to report. The matter needs further research, and it suggested here that using a diagnostic approach such as that presented in reference paper C might be an alternative.

9.10 Taking a knowledge view of an organisation

Scanning the "competitive advantage column of table 9b suggests that a knowledge view of the aerospace company is starting to emerge. This could complement the product flow or information flow views of organisations used in Business Process Reengineering programs, and perhaps help avoid some of the downsides of these programs. It is suggested here that tools for taking a "knowledge re-engineering" view of organisations are needed to effectively benefit from the "knowledge economy". For example, the knowledge based view of structure and structural change presented in section 6 and case study 8 has proven helpful in developing some assessment criteria for stimulating dialogue on issues to be managed in changing from one kind of organisation to another. In addition, it is suggested here that if the full repertoire of learning organisation attributes set out in table 7c was acquired, then an organisation could function very flexible in a multi-modal hierarchy/network/team style of operation.

9.11 The last word

Has this DBA research made a difference in some way? The intent was to pursue a program that not only yielded new knowledge, but saw that knowledge applied. From the perspective of the researcher/candidate, a better understanding of what is needed to function as a learning organisation has been acquired, an appreciation of leverage that might be obtained from taking a knowledge view of an organisation, and some knowledge capture tools have evolved. This is being applied to seek benefit from the emergence of knowledge based economies, and understand how the case study company might function in that environment.
The case study company has changed significantly over the period of the research, with progress in the four learning organisation aspects initially nominated to be pursued:

(1) Enhanced individual learning
(2) Structured problem-solving processes that become a way of life
(3) Processes to acquire, share and use knowledge as a unique source of competitive advantage.
(4) Project management of change in the way the organisation works

Win or lose, customer proposals are regarded as very innovative. The company has been successful in portraying itself as capable of larger projects than its size would suggest as a consequence of better knowledge sharing within the company, with customers, with suppliers and research partners. Some competencies associated with using new knowledge and the project management of change have been enhanced (eg risk management competencies)

These changes cannot be directly ascribed to the DBA research, but have been indirectly influenced by the candidate as an executive management member of the company. That the observed changes have happened at all might be considered remarkable, as there have been two changes of ownership during the period of the research, and whilst these have been friendly affairs, they have distracted management for up to 12 months at a time. It remains to be seen if more of the tools arising from the research will be used, but today they exist, before the research started they did not exist.
BIBLIOGRAPHY


Beckett, R.C (TBAa) “Sources of Failure in Corporate Memory” in “Deciphering Knowledge Management” Springer-Verlag LNAI 1859

Beckett, R.C (TBAb) “The Process of Mentoring as an Aid in Transfer material Learning” in Deciphering Knowledge Management Springer-Verlag LNAI 1859

"Continuous Improvement in British Manufacturing"  
Technovation, 13 (4), 241-254.

"High-involvement innovation through  
continuous improvement".  
Int J. Technology Management, Vol. 14, No. 1

"Rediscovering Continuous Improvement".  
Technovation, 14 (1), 17-29


Bakken, Bent; Gould, Janet; Kim, Daniel. (1992) "Experimentation in  
Issue 1 (May) p. 167-182

Bala, Venkatesh; Goyal, Sanjeev. (1995)"A theory of learning with  
heterogeneous agents". International Economic Review. Vol. 36  
Issue 2 (May)  
p. 303-323

Baldwin, T.T, Danielson, C and Wiggenhorn, W (1997)"The evolution of  
learning strategies for organisations; from  
employee development to business redefinition.  
Academy of Management Executive Vol 11, No.4 pp 47-58.

Barnett, William P; Greve, Henrich R; Park, Douglas Y. (1994)  
"An evolutionary model of organizational performance".  
Strategic Management Journal. Vol. 15 Issue (Special Issue)  
(winter) p. 11-28

Beard, David. (1993) "Learning to change organisations". Personnel  
Management. Vol. 25 Issue 1 (Jan) p. 32-35

approach" in Proceedings of the World Innovation and Strategy  
Conference, August, Sydney, Australia

Belbin, M (1996) "The Coming Shape of Organisation"  

Belbin, M (1997) "Changing the way we work"  

Bencivenga, Dominic (1995)  
"Learning organizations evolve in new  
directions" HRMagazine Vol: 40 Issue 10 (Oct) p. 69-73

Benoit, Carol A; Mackenzie, Kenneth D. (1995) "The science of an  
an organization. Part II: Realizing a new model of organizational  
learning". Human  

Berreby, D (1996) "Finding the knowledge needle in the data haystack"  
"Strategy and Business, Booz-Alen & Hamilton, Issue 5, pp  
84-92.


Bryant, B, Farhy, N & Griffiths, A (1994) “Self Managing Teams and Changing Supervisory Roles” Centre for Corporate Change, Australian Graduate School of Management, University of New South Wales.


Centrim (2000a) “Inter-organisational networking (ION): The new way of doing business” University of Brighton. www.bus.brighton.ac.uk/centrim

Centrim (2000b) “Research and technology organisation in the service economy (RISE)” University of Brighton. www.bus.brighton.ac.uk/centrim

Centrim (2000c) “Designing organisational learning, implementing technologies and making standards ‘stick’” University of Brighton. www.bus.brighton.ac.uk/centrim


Davenport T H (1997) “Known evils – Some pitfalls in knowledge management” CIO July


Day, Marie (1994) “Can organizations have a learning disability?” Canadian Manager. Vol. 19 Issue 2 (June) p. 21-23+


Delaney, M (1996) “Accelerated Competency acquisition research and Development project” Macsearch, University of Western Sydney, Macarthur


Dobkins, D (1998) “Project Managed Change: The Application of Project Management Techniques to Strategic Change Programs” Australian Graduate School of Management paper CCC062, UNSW


Dunphy D, Turner D & Crawford M (1996) Organisational Learning as the Creation of Corporate Competencies” Australian Graduate School of Management paper CCC 060, UNSW


Geertz, C (1975) "Common sense as a cultural system" Antioch Review Spring.


Gibson, Rowan (1998) "Rethinking the future; rethinking business, principles, competition, control, leadership, markets and the world" Nicholas Brealey Publishing, London.


Gopal, Christopher; Gagnon, Joseph. (1995) "Knowledge, information, learning and the IS manager". Computerworld Vol. 29 Issue 25 (June 19) p. SS1-SS7

Gordon, R and Grant, D (1999) " Knowledge management or the management of knowledge" Proceedings of knowledge management conference, KNOW 99, University of Technology, Sydney, November


Janus, I L (1972) “Victims of groupthink” Houghton Mifflin, Boston


Kearney, A T Journal (extract from 1995) “The Shape of Firms to Come” Global Perspectives No. 11


Koch, R & Golden, I
“The New Soul and Structure of the ‘Post Management’ Corporation"


Kovac-Boisvert and Kouzmin, A ( ) “From Captains of the Ship” to “Architects of Organisational Arks” Communications, globalisation and withering away of Leadership Steering


Miller, G (1956) “The magical number seven, plus or minus two: some limits on our capacity for processing information” Psychological Review 6, 3p.81-97


Murray, P (1997) “unpublished doctoral dissertation” University of Western Sydney, Macarthur

Murray, P and Beckett, R.C (1998) "Strategic orientations of continuous improvements and learning: a conceptual approach" 2nd International EuroNet conference on continuous improvement: mfrom idea to reality, Enschede, the Netherlands, September

Naisbit, J (1998) "From Nation States to Networks" in Gibson, R "Rethinking the future" Nichols Brealey Publishing Limited, London


Nutt, P.C (1992) "Helping Management Avoid Failure During Planned Change" Human Resources Management, Vol 34, No 4, pp 319-344

Olson, M (1997) "Information technology as an enabler of Knowledge Management" Knowledge Management Conference, Sydney, Australia. 22-23 September


O'Dell, C and Grayson C.J.Jr (1998) "If only we knew what we know - the transfer of internal knowledge and best practice", The Free Press, New York


Owen, J (1996) "A Virtual Organisation” Extract from the newsletter of the Institution of Administration, University of New South Wales, No 35, March


Pedler, M; Boydell, T and Burgoyne, J (1989) "Towards the learning company" Management Education and Development, Vol 20, No 1, pp 1-8


Riley, Richard; Feldman, Sandra; Sa, Sofie; Cooper, Bruce S; et al (1994) "Educating the workforce of the future". *Harvard Business Review*. Vol. 72 Issue 2 (Mar/Apr) p. 39-51


Savage, R (1997) "Electronic commerce and the network" *Presented at the 1997 AIM Management Conference, Sydney, September*

Schein, E (1985) "Organisational Culture and Leadership" *Jossey-Bass, San Francisco*


Senge, PeterM. (1992) "Mental Models". *Planning Review*. Vol. 20 Issue 2 (Mar/Apr) p. 4-10, 44

Senge, Peter. (1994)."The leader's new work". *Executive Excellence*. Vol. 11 Issue 11 (Nov) p. 8-9


Soo, C; Devinney, T and Midgley, D (2000) “The process of knowledge creation and innovation in organisations” Centre for Corporate Change, Australian Graduate School of Management, Sydney


Thomas, Charles W. (1994) "Learning from imagining the years ahead". *Planning Review*. Vol. 22 Issue 3 (May/June) p. 6-10+


Turner, D and Crawford, M (1995) "The impact of corporate competencies on long term performance" CCC Paper No 51, Centre for Corporate Change, Australian Graduate School of Management, University of New South Wales


University of Melbourne (1999) "Workshop on interorganisational collaboration" Department of Management, Faculty of Economics and Commerce, December 15-16


USNet (2000) "A consortium promoting competitiveness through interfirm collaboration" www.tecnet.org/usnet


Waldensee, R (1996) "Becoming a learning organisation: The transformation of the workforce" CCC Paper No 053. Centre for Corporate Change, Australina Graduate School of Management, University of New South Wales


Whyte, A (1997) "Knowledge, its creation and management as a key business driver at Morgan and Banks." Knowledge Management Conference, Sydney, Australia, September 22-23

Wick, Calhoun W; Leon, Lu Stanton (1995) "From ideas to action: Creating a learning organization". Human Resources Management Vol. 34 Issue 2 (Summer) p. 299-311


Wineberg, R (1997) "Free range leadership" Management, August, Australian Institute of Management


ATTACHMENT 1: CASE STUDY SUMMARIES

One aspect of the research methodology was to use an Australian aerospace company as source of case study material, looking at many facets of the company and its environment. In some cases, observation of the current situation was used to support theoretical views. In other cases theoretical views were derived from work done within the company. The case studies are published here in summary form to support the information presented in the main report.

Case study 1: Company training

Case study purpose
The purpose of this case study, completed in the second half of 1997, was to examine, drawing on the literature survey, ways of enhancing the organisational knowledge base and rate of learning to yield that as a source of competitive advantage. Two key questions suggested are:

- what should be learned; and
- how could this be best achieved.

Background and case study approach to what should be learned
One reference that utilised Australian company survey data (Dunphy, Turner and Crawford (1996)) suggested there were two kinds of organisational and individual competencies that need to be learned: "operational" competencies and "re-shaping" competencies. The question "what should be learned" was considered in this context.

One aspect of the Aerospace company strategic plan considered core technology areas, functions and processes, that may yield competitive advantages in various ways, however the focus was on the "operational competencies" needed, seem as:

- Intelligent manufacturing
- Aerostructures design and development
- Information technology
- Operations research
- Knowledge base management

In considering what "re-shaping" competencies should be learned and how learning should take place, the information presented in a number of literature survey references was analysed a piece at a time, noting problems or issues raised, and reflecting on the implications and opportunities arising to gain an insight into the messages conveyed. The
outcome of this process was then scanned and a number of focus areas established. These were subsequently grouped under the “what” and “how” headings that are described below:

**Outcome**

“What” to learn, under the broad heading of re-shaping competencies as perceived from the literature survey, were represented as:

- There needs to be a recognition that people will have different roles in different forums, e.g. servant in some/leader in other, support and insight into learners’ needs/fellowship with others as a learner oneself, seeking personal development assignment opportunities/mentoring others. Learning needs to take place at the individual, team and organisational level, with linkages between them to both access a broad range of competencies, and to embed the learning in the organisation. Delivery arrangements should not only broaden the mind but integrate teamwork, education and work.

- Shared visions and systems thinking should be utilised to yield a consistency of organisational purpose and process.

- The need to rapidly establish multi-discipline, multi-cultural project teams requires a broadly based but consistent framework of practices, milestones and outcomes to be identified at the start of a project and for people to interact socially to understand each other’s perspectives.

- New customers and strategic alliance partners may have different cultures and values. There may be such differences within an organisation. Learning how to benefit from diversity, not just cope with it, would be a significant advantage.

- Whether learning to maintain skills, or to acquire them in advance, a focus on “change mastery” and “inventing the future” needs to be maintained. Best practice and benchmarking techniques should be learned to pursue both individual and organisational excellence.

- Conceptual skills to complement technical and human skills should be learned and practised. Without these, an individual may not appreciate the learning opportunity presented by new information or situations, and dismiss the prospect.
Techniques for formalising knowledge, sharing it and embedding it in work practices to assure its continued application should be learned. In addition, this can preserve knowledge that could be lost through staff changes.

**Background and case study approach to how to learn**

“How” to learn ideas selected from the literature survey are described below. It should be noted that these ideas can apply to the acquisition of both operational and reshaping competencies.

- A concurrent multi-process approach is needed to stimulate a learning organisation. Processes should include:
  - helping people learn to learn, recognising that for many school may be a distant (and possibly unpleasant) memory
  - surfacing and managing mental models and dealing with conceptual change
  - utilising self evaluation processes to support individual learning
  - auditing the existing learning culture and overcoming organisational barriers to learning
  - choosing learning approaches appropriate to the stability of the organisation and to the technical improvement sought, (e.g. learning by doing/using and interaction with equipment suppliers will stimulate process yield improvements)
  - moving from adaptive training (which is about coping) to generative learning (which is about creating)
  - utilising “action learning” techniques
  - using technology to support learning
  - Change should be managed as a positive experience, utilising “practice fields” and/or “flight simulators” where people can learn from their mistakes and learn as teams.

- Seven learning characteristics should be embedded in company strategic plans and processes:
  - Appreciate how learning will contribute to competitiveness
  - aim for continuously improved learning rates
  - adopt “stretch goals”
  - establish “safe-failing” practices
  - specify that formal systems for enhancing learning be in place
  - stimulate core process knowledge development as a company strategy
  - recognise the status of knowledge workers.
• Learning should be integrated with normal business functions and seen as part of the process of managing and improving performance.
• Individual career plans should be regularly reviewed and progressed, particularly with talented individuals. “Learning and earning” should be blended in a variety of ways.
• A program of employee secondments with customers/suppliers/academic/research institutions, with specific study objectives/learning outcomes pre-specific should be implemented.
• Changes in management education arrangements should be negotiated enabling:
  • a focus on shortened but multiple educational experiences
  • modular education structures to service a variety of company specific needs
  • “consortium” approaches amongst several companies with common interests
  • making the most of and improving access to available programs through “networked” education with a number of academic institutions.
• Participating in collaborative research, including management sciences, with educational institutions.

Outcome
Twelve training program elements in use within the company were assessed against both the “what” and the “how” criteria to consider strengths and weaknesses in respect of a learning organisation approach.

The review of current practices suggested the company focus was on individual training, predominantly in manufacturing technologies. Whilst this continues to be necessary, it is not sufficient on its own. Other “operational” competencies and “reshaping” competencies were believed to require further development. Whilst some “reshaping” competencies had developed in association with strategically directed change programs, there were inconsistent linkages between the competencies of individuals and the organisation’s business strategies.

The full repertoire of learning strategies identified in the literature survey was not being utilized. Nor was there sufficient emphasis on organisation learning in concert with individual learning.

Problem solving was identified in the literature as an important source of learning, particularly when the solution leads to a change in the way the organisation works. But most of the
Aerospace Company’s problem solving is still focussed on restoring the balance to current norms. Whilst this was valuable, it was not sufficient.

Discussion
Some of the ideas from the literature survey were blended together in different ways to provide some alternative views of what could be done differently using a “compliance matrix” approach, i.e. what could be done to satisfy the two matrix requirements for each particular combination. Some examples are shown in the tables below. The first table, CS1a provides an illustration of problem solving practices/actions that could yield individual, team and organization learning by targeting different types of improvement. Themes considered to emerge from this exercise are consistent with: customer and supplier integration, collaborative R&D, development of networks, and innovative ideas arising from different views.
<table>
<thead>
<tr>
<th>Focus of Learning and Outcomes Sought</th>
<th>Individual</th>
<th>Team</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Improvement/ Generic Learning Process (Malerba, 1992)</td>
<td>Enhanced Key Competencies</td>
<td>Sharing of Tacit Knowledge</td>
<td>Consistent Direction</td>
</tr>
<tr>
<td></td>
<td>Greater Flexibility and Responsiveness to Change</td>
<td>Enriched Outcomes from Diversity of Inputs</td>
<td>&quot;Best Practice&quot; Systems of Operation</td>
</tr>
<tr>
<td></td>
<td>Study &quot;new technology demonstrators&quot;</td>
<td>Adaptable to Changed Membership or Environment</td>
<td>Unique Solutions Give Competitive Advantage</td>
</tr>
<tr>
<td></td>
<td>Brainstorm applications of equipment with suppliers</td>
<td>Integrate equipment experts in &quot;learning team&quot;</td>
<td>Unique adaptation of equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pursue excellence in application of equipment, support supplier in new customer applications</td>
<td>Unique application of equipment</td>
</tr>
<tr>
<td>Process Improvement. Learn by doing and using and interaction with equipment suppliers.</td>
<td>Use knowledge of supplier experts to enhance own competency</td>
<td>&quot;Best Practice &quot;intelligence gathering&quot; through personal networks with suppliers</td>
<td>Changed practices - supplier integration</td>
</tr>
<tr>
<td></td>
<td>Learn to understand supplier perspective in change</td>
<td>Help solve each other’s problems</td>
<td>Network across supplier base</td>
</tr>
<tr>
<td>Technical Improvement in input materials. Learning by interacting with supplier (and customers)</td>
<td>Better understand customer needs to be more responsive</td>
<td>Networking within customer organisation</td>
<td>Enhance formal communication processes for mutual advantage</td>
</tr>
<tr>
<td></td>
<td>Enhance key competencies by working on projects with customer experts</td>
<td>Pick “Best Practice” from different customers</td>
<td>Interface moved inside customer organisation</td>
</tr>
<tr>
<td>Product Differentiation. Learning by interaction with customers/users (shop-to-shop?)</td>
<td>R&amp;D assignments</td>
<td>Team based projects in R&amp;D, courses</td>
<td>Topics for R&amp;D</td>
</tr>
<tr>
<td></td>
<td>Post-trade and post-graduate courses</td>
<td>Documentation of project outcomes</td>
<td>Ask the right questions</td>
</tr>
<tr>
<td>Improvement and Differentiation through quality and performance. Learning by searching (e.g. R&amp;D)</td>
<td></td>
<td></td>
<td>Outcome changes company systems</td>
</tr>
</tbody>
</table>

Table CS1a: Generic learning area / target group matrix

Some researchers (Fulmer, 1994) have identified a number of theoretical categories of organisational learning, including:

(a) Maintenance learning, shock learning and anticipatory learning drivers that may result from environmental or strategic requirements

(b) Four modes that may be used to cope with a particular learning situation: "Because I say so", "As you like it", "Change Mastery" and "Inventing the Future".

Using these ideas as a frame of reference, examples of action in each of the three learning categories thought to be applicable to the aerospace company were nominated and application scenarios developed for each of the four modes. The outcome is shown in Table
CS1b below. By comparison with current practice, it would appear the current emphasis is on the first two modes, "because I say so" and "as you like it". It is suggested this be extended to include “change mastery” and “inventing the future” modes, which are perceived to be consistent with pursuit of excellence, earlier technology adoption, and customer value packaging.

<table>
<thead>
<tr>
<th>LEARNING DRIVER</th>
<th>EXAMPLE</th>
<th>LEARNING MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&quot;BECAUSE I SAY SO&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;AS YOU LIKE IT&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;CHANGE MASTERY&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;INVENTING THE FUTURE&quot;</td>
</tr>
<tr>
<td>MAINTENANCE LEARNING</td>
<td>EMPLOYEE INDUCTION</td>
<td>Basic skills for new starters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self-guided career development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transferring excellence standards and work culture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Balancing organisational skill needs</td>
</tr>
<tr>
<td></td>
<td>KEEPING UP WITH TECHNOLOGY</td>
<td>Pursuing organisational flexibility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self-guided career development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alliance with material and equipment suppliers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pursuing unique uses of new technology</td>
</tr>
<tr>
<td>SHOCK LEARNING</td>
<td>VALUE/CULTURE CHANGE</td>
<td>Organisational survival - just do it</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peer group compatibility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Benefit from a diversity of perspectives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Identification of potential future benefits and down sides of new paradigms</td>
</tr>
<tr>
<td></td>
<td>TECHNOLOGICAL REDUNDANCY</td>
<td>Recovering organisational competitiveness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mid-career re-training</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Utilize competitive individual and organisational attributes in a new field</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Step change to future generation technology</td>
</tr>
<tr>
<td>ANTICIPATORY LEARNING</td>
<td>BUSINESS GROWTH</td>
<td>Strategic directive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Personal opportunity creation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acquisition/start-up/risk management competency development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental scanning and impact analysis</td>
</tr>
<tr>
<td></td>
<td>TECHNICAL INNOVATION</td>
<td>R&amp;D Directive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Personal skill broadening</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Early adopter/trialer of new technology; R&amp;D &quot;test bed&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Creating market place opportunities</td>
</tr>
</tbody>
</table>

Table CS1b: Learning driver / learning mode matrix

From a strategic perspective, the outcomes sought from individual, team and organisational learning is the creation of knowledge that may be used for competitive advantage. Table CS1c below is a notional view of practices supporting such outcomes. Individual level practices depicted here are consistent with current practice in the aerospace company. The team level outcomes depicted show some similarity to the shock learning practices in the previous table, with organisation level practices showing some similarity with anticipatory level learning practices. The inference is that individual learning arrangements may be satisfactory, but team learning arrangements need rapid improvement. This is consistent with an independent study summarised in the second part of case study 2. It might also be
inferred that anticipatory learning is needed at the organisation level to better position the company.

The three different matrices considered suggest a mixture of training, problem solving integrated with day-to-day work and specific projects to change the way the company operates is necessary to achieve the learning organisation.

<table>
<thead>
<tr>
<th>KNOWLEDGE ACQUISITION</th>
<th>INDIVIDUAL LEVEL</th>
<th>TEAM LEVEL</th>
<th>ORGANISATIONAL LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Self evaluation</td>
<td>Surfacing mental models establishing benchmarks</td>
<td>External collaborative research</td>
</tr>
<tr>
<td></td>
<td>Individual learning plans</td>
<td>Problem solving for technical improvement</td>
<td>Formal change/discovery project work and reporting</td>
</tr>
<tr>
<td></td>
<td>Approved student program</td>
<td>Practice fields for discovering new ideas</td>
<td>Briefing sessions to articulate and share knowledge</td>
</tr>
<tr>
<td></td>
<td>Short, multiple educational experiences</td>
<td>Practice fields</td>
<td>Auditing existing practices</td>
</tr>
<tr>
<td></td>
<td>Practice fields</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KNOWLEDGE DISSEMINATION</th>
<th>INDIVIDUAL LEVEL</th>
<th>TEAM LEVEL</th>
<th>ORGANISATIONAL LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching/coaching</td>
<td>Action learning</td>
<td>Shared “Corporate Memory”</td>
</tr>
<tr>
<td></td>
<td>Mentor/buddy system</td>
<td>Forums to identify issues, test ideas</td>
<td>Updated systems and procedures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Application in changed practices</td>
<td>Collaborative research within company</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KNOWLEDGE UTILISATION</th>
<th>INDIVIDUAL LEVEL</th>
<th>TEAM LEVEL</th>
<th>ORGANISATIONAL LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Access to new opportunities</td>
<td>Enhanced problem solving methodology</td>
<td>Integration of strategic direction and current programs</td>
</tr>
<tr>
<td></td>
<td>Personal application on the job</td>
<td>Changed team practices that establish new benchmarks</td>
<td>Consistent application to market place competitive advantage</td>
</tr>
<tr>
<td></td>
<td>Participation in cross-functional teams</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table CS1c: Knowledge management / application level matrix

An independent perspective
An opportunity to independently audit the company's progress towards the establishment of a learning organisation (in support of an MBA post-graduate student team assignment) indicated progress was being made, but there were some particular areas that needed attention:

(a) Improved environmental scanning and business/technology competency prioritisation should be undertaken in concert with employees

(b) Improved performance management systems and related reward/recognition processes were considered necessary

8
(c) Enhanced “people” competencies and approaches to improve trust and communication between the management and the workforce was considered important.

(d) A more systematic approach to capturing knowledge was needed.

The inadequacies in the current personnel development process, problem solving practices, environmental understanding and knowledge capture practices became areas of focus in the subsequent action research program reported here. The objective was to address these inadequacies to stimulate unique actions through the organisation that made it a benchmark for others, now and in the future. This means continuous change, which can be stressful and draining. Or it can be exciting and invigorating. The positive, pro-active management of change demanded from within the organisation, not imposed on it, must consequently be a feature of the organisation.
Case study 2: Prerequisites to learning

Case study purpose
It has been observed in the case study aerospace company that learning does not always take place, even when considerable effort is put into creating the opportunity. It is suggested that being able to appreciate the learning opportunity available, and convert it into action requires some prerequisite conditions to assure satisfactory learning. Two examples of research the author participated in that highlighted this issue of pre-requisites are presented here.

Example A: Background and case study approach. Some years ago, the author participated in a school community committee that was considering new optional subjects that might be taught in the local College, and considering what might be done to improve the student success rate at these higher levels of education. The College was in a semi-rural area, and had many students from non-english speaking backgrounds with a diverse history of extent of formal education within the family. Many of these attributes are also seen in workplaces throughout Australia. As in most community programs, there were diverse views about what courses should be offered and what value extended education in the College would realistically provide.

Early agreement was reached about some generic learning outcomes:
- students should develop a sense of themselves as learners, and enjoy learning
- they should make and act on responsible decisions about their own learning, and outcomes from it
- they should benefit from learning beyond the learning environment where learning support is not available
- they should gain satisfaction and confidence from their new abilities

Outcomes similar to these have been noted as important in some workplace studies too (eg O'Dell and Grayson, 1998)

Key areas for further agreement centred around the selection of study areas considered important by the community, how to encourage a higher voluntary participation rate in extended education, and how to deal with the observation that at least some students may not have suitable pre-requisite skills to be successful. The kind of "systems thinking" approach, enunciated by Senge (1990) at a later time, was used to try and identify the issues and the linkages between them. Teachers from the College contributed their experience and drew on formal models of learning known to them, whilst other community participants
primarily drew on their tacit knowledge of learning environments outside of the College. The result was a model, shown in figure CS2a below.

**Outcome**

Some aspects of this model, such as the need to comprehend and analyse the results of study, are consistent with a model of adult learning (Jarvis 1987), however the notion of prerequisites is more strongly represented. Jarvis observes a number of potential non-learning outcomes from exposure to a learning experience that can be associated with the issue of pre-requisites, but does not pursue the matter. Some of the pre-requisites noted align with processes identified in the Jarvis model, eg the ability to conceptualise and encapsulate ideas would support reasoning and reflection processes. The issues raised by this model are that prerequisites to learning that will persist outside of the learning environment where support is not available are important in facilitating further learning, that there are a number of them (seven in this model), beginning with an incentive to learn, and concluding with communication skills. These are both key issues for a learning organisation. The MBA student survey referred in case study 1 also found some people did not want to learn. Close to retirement (don’t see relevance), no monetary gain (value system clash) were some comments. This highlights the need to integrate learning and work so that the learning component is not seen as something unique.
Figure CS2a: Student learning process and prerequisite model

Example 2: Background and case study approach. Independent of the learning organisation research being reported here, a research study was undertaken within the aerospace company in conjunction with a University (Delany, 1996) to examine existing team oriented training delivery and assessment systems, and to suggest ways of accelerating competency acquisition that integrated training and work.
Outcome

Five generic shop floor skill sets were noted, and different delivery arrangements were suggested for each kind. The generic skill sets were:

- Individual direct technical skills (eg direct production)
- Team-based technical skills (eg resource management)
- Non-direct technical skill (eg occupational health and safety)
- Information technology skills, with four level of expertise being noted (eg data input and analysis)
- Soft skills (eg people management, communication)

A detailed study of the introduction of an advanced quality system was used to explore learning about something new. The company had operated an apprenticeship scheme for many years, and a master/apprentice "buddy" system was embedded in the company culture as a knowledge transfer mechanism. But when new practices were being introduced, this approach did not seem viable, and without it there seemed to be some difficulty in translating classroom training into reality. Whilst the classroom trainers could help, they were not readily accessible because of their workload. Difficulties were also observed with formal problem analysis skills, advanced statistical process control, and acceptance of process ownership (this might be an example of people distancing themselves from a problem they could not handle, as noted in the work of Argyris (1982)). A broader look at the resources available showed that whilst an expert in the new quality system might not be available to every group, in conjunction with their extended group of support people, some-one had knowledge about some aspect of the new system. For example, engineers could understand the statistical process control aspects, so a mentoring team approach was set up.

In operating this "learning team", the soft skills referred to above became a more important pre-requisite than they had in the previous style of operation, whilst mentoring remained a very important practice.

Discussion

Just as most formal education programs have some pre-requisites aimed at supporting successful learning outcomes, this should also be recognised as a consideration in a business environment. If people do not know the “language" of the subject to be learned, they will have some difficulty as individual learners. There is some evidence that integrating learning and work may be beneficial, possibly because this supports multi-modal learning (eg
learning by doing, imitation, experimentation). It is suggested that the practice of mentoring, either through individual or team processes can minimise the impact of "language" problems and support experimentation.
Case study 3: Auditing and learning

Case study purpose
A literature review of "organisational learning" practices suggested a range of learning process possibilities not formally pursued in this context in the past, and that learning from customers could possibly be pursued further. Combined with observations from different supplier assessment approaches by the company’s customers, and from networking with other companies, the concept of “Learning by Auditing” was identified, consistent with the key role of evaluation in learning processes (after Jarvis, 1987). This case study presents three examples in support of that concept.

Background and case study approach
The company’s customers are generally pursuing a business integration approach with key suppliers. They want not only on-time delivery of flaw-free product, but they want to work collaboratively with a financially healthy, continuously improving supplier base that uses sophisticated process control techniques in every facet of its business. The review processes for assessing this range of attributes has become a source of learning for both the company and its customers.

Three specific examples chosen for discussion are:

- An audit process used by the Federal Aviation Authority (FAA) of the United States;
- An audit process used by British Aerospace (BAe) using the EFQM model for Business Excellence (EFQM (1997)) as a reference; and
- An internal audit/benchmarking process using a self assessment matrix.

Example A The FAA audit was intended to review most business functions for adequacy and reliability and to confirm that the major U.S. Aircraft manufacturers (the company’s customers) were properly controlling their suppliers. In total, about 850 features were assessed by an audit team of seven people. Prior to the audit, the FAA had developed a profile of perceived “best practice” attributes of each major business function. The audit checklist of 850 items was provided to the company prior to the audit and this was discussed with representatives of the company’s major U.S. customers.

The company set up specialist teams to collect the data needed to conduct the audit, then, during the week-long audit, these teams worked with the appropriate FAA specialists. As the
company operated in small self-contained work groups, cross-organization teams had to be formed to consider some audit matters. This was the first such audit outside of the USA and, on several occasions, the audit process paused so people could understand each other’s "mental models" of acceptable functional processes. The FAA "perceived best practice" had been based on observations of (generally large) U.S. companies. The Australian company had adopted some Japanese and European approaches to some aspects of its operations, so some of the audit questions were inappropriate. The participants learned a lot from each other on these occasions.

In spite of these differences, the audit was perceived to be successful and valuable by all participants. The audit was repeated at two sites (Melbourne and Sydney), revealing some common areas for improvement and some differences. Some 40 opportunities for enhancing and changing company processes were identified and subsequently implemented, in an enhanced, multi-site quality system. Follow-up on corrective actions was completed through U.S. customer representatives. The audit is to be repeated every few years. The U.S. manufacturers conduct at least annual audits in between.

**Example B.** The British Aerospace (BAe) supplier assessment program, considers delivery and product quality performance, the application of continuous improvement and process control techniques by the supplier and the long term business health of the supplier organisation. The latter is assessed using a model developed by the European Foundation for Quality Management in conjunction with its member organisations (EFQM, 1997). It reflects a TQM perspective of best practice, but is reviewed and updated each year. It has five elements termed "enablers" and four elements reflecting "results" achieved. Each element has a weighted score out of a total of 1000, shared equally between "enablers" and "results" as shown in the table below.

<table>
<thead>
<tr>
<th>&quot;ENABLERS&quot;</th>
<th>WEIGHTING</th>
<th>&quot;RESULTS&quot;</th>
<th>WEIGHTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>100</td>
<td>People Satisfaction</td>
<td>90</td>
</tr>
<tr>
<td>People Management</td>
<td>90</td>
<td>Customer Satisfaction</td>
<td>200</td>
</tr>
<tr>
<td>Policy and Strategy</td>
<td>80</td>
<td>Impact on Society</td>
<td>60</td>
</tr>
<tr>
<td>Resources</td>
<td>90</td>
<td>Business Results</td>
<td>150</td>
</tr>
<tr>
<td>Processes</td>
<td>140</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>&quot;RESULTS&quot;</th>
<th>WEIGHTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>People Satisfaction</td>
<td>90</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>200</td>
</tr>
<tr>
<td>Impact on Society</td>
<td>60</td>
</tr>
<tr>
<td>Business Results</td>
<td>150</td>
</tr>
</tbody>
</table>

Table CS3a: Audit element weighting factors (EFQM 1997)

British Aerospace (Bae) chose to use a pro-forma interview approach with a team of five. Two were full-time auditors and the other three were involved partly as a learning experience
for them. The Australian company had two or three people knowledgeable about each topic work with one or two BAe representatives, with some direct observation activities in between.

The process forced the company to think about its current activities from a different perspective. There were some consistencies and inconsistencies revealed. The different BAe auditors reported there was a consistent perception between various company employees interviewed of, and enthusiasm for, the direction the company was headed in and the change process being pursued at that time. The EFQM model focussed on individual performance in the discussion of people management, whilst the company was tending more towards team performance outcomes. The audit process identified about 100 specific opportunities for the Company to consider in enhancing its performance against the model. Because many organisations had been assessed against this model over a number of years, the Company could benchmark itself in terms of the nine measures that comprise the EFQM model.

**Example C.** An internal company self-assessment matrix, was developed from a book by Kobayashi (1990). Kobayashi observed 20 key behaviours/practices exhibited by leading edge manufacturing companies in Japan. Each practice was characterised at five different levels, with advice on what to do to get from one level to another. The matrix was first used in the company at the discretion of individual groups in the early 1990s, forming a kind of pilot program. In 1996, it was agreed to be one of the team performance monitors in the company/union Enterprise Industrial Agreement.

Each team reached a consensus view on their current status in each of the 20 areas. This was sometimes a difficult process, as individuals had different interpretations of the measures and different personal views of "best practice". For example, there were various perceptions of what constituted a clean, well organized work place, depending on the perspectives and habits of individuals outside the workplace. After the team reached consensus, a coloured sticker with the date on it was placed on the appropriate part of the matrix. A repetition of this process over time shows areas of progress.

There was remarkable performance variation across the company in each of the 20 keys. In some cases this was real (for example the laboratories were cleaner than the factory). In other cases, groups with similar performance scored themselves higher or lower. This variation was turned to advantage however, as the lower scoring groups are being asked to seek advice on how to improve from higher scoring groups.
There were about 60 groups using the matrix. In spite of the variation, the averages give a reasonable picture about the status of operations. Some groups in an office environment have had to get creative to interpret the matrix, as it was originally intended to assess a factory environment. Others have declared some of the twenty practices "not applicable". But there is still sufficient scope in the remaining ones to encourage continuous improvement.

Outcome: Some observations from the examples

From the learning organisation literature (for example Argyris and Schon (1978, Senge (1990), a number of desirable learning process attributes were noted: unfreezing from single loop norms and critical questioning, building shared visions and challenging mental models, listening to and learning with customers, building servant/leader communities, and acquiring future concepts from outside of the organisation. In table CS3b below, some observations from each of the three audit programs just described are presented in relation to those outcomes. Looking across the table, it can be seen that each of the three audits have produced similar or complementary outcomes, but that no single audit would assess all aspects of company learning and improvement on its own. This raises the question of achieving consistency between the different audit perspectives. If they all tiered down from, say, a company vision statement, then a series of different audits could be designed from the top down. But because some of them are externally driven, this may not be the case. So, at a higher level again, reflection on a range of possible future states, stimulated by this external perspective, is required.

At a lower level, the quantity of information, opportunities and actions that flow from these audits in a relatively short time is remarkable, but that creates a new management problem. Identifying those actions that satisfy a number of needs, prioritizing actions and pursuing them to achieve a high rate of continuous improvement, whilst sustaining current business activities, is a challenging project and knowledge management task.

Discussion

It can be seen from Table CS3b that these audits, which focussed on a desired future state, successfully embraced a number of learning organisation outcomes, and were integrated with work requirements. Two of the audits were customer driven, and would have taken place in any case, but this could have been done simply with a view to demonstrating compliance. Regarding them as a learning opportunity provided additional benefits. Of particular note was the minimisation of conflict, being replaced by active debate, even though
new mental models were being explored (this sometimes leads to rejection and conflict (Argyris and Schon, 1978)).
<table>
<thead>
<tr>
<th>OUTCOME SOUGHT</th>
<th>FAA</th>
<th>BAe</th>
<th>20 KEYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Unfreezing” from single-loop norms, critical questioning</td>
<td>Critical questioning of current business function practices</td>
<td>Critical questioning of some current strategies and outcomes</td>
<td>Concerns about change in day-to-day operations have been surfaced. Discussions of the meaning and significance of each item leads to a common view within each team</td>
</tr>
<tr>
<td>Building shared visions, surfacing and challenging mental models</td>
<td>Shared perspective with customers and airworthiness authorities on desirable attributes of business functions</td>
<td>Shared perspective with customer on organizational “health” and future prognosis</td>
<td>Having the same model used across the company provides consistency in pursuing improvement. Some groups are questioning or rejecting aspects (or all) of the model</td>
</tr>
<tr>
<td>Listening to and learning with customers</td>
<td>Alternative approaches discussed with and accepted by customer. Information used in later systems upgrades</td>
<td>Audit parameters, score weighting and assessment criteria help understand what the customer thinks is important</td>
<td></td>
</tr>
<tr>
<td>Building communities of servants/leaders, supporting adaptability and agility</td>
<td>Participation from a range of levels in small teams across the company. Tested alignment of individual views with company view</td>
<td>Participation from a range of levels in small teams across the company. Tested alignment of individual views with company view</td>
<td>Sharing the self-assessments of each group identifies opportunities to learn from each other, introduces some peer pressure for continuous improvement</td>
</tr>
<tr>
<td>Acquiring information from outside the organization and reflecting on a range of possible future states</td>
<td>Alternative perspectives raised for reflection/review. Pursuit of the list of follow-up actions acquired additional information</td>
<td>Alternative perspectives raised for reflection/review. The outcome also provides an opportunity for benchmarking against others using the EFQM model</td>
<td></td>
</tr>
</tbody>
</table>

Table CS3b: Organisational learning outcomes from audits
Case study 4: progression towards a vision

Case study purpose
This case study was about developing and assessing strategic progress towards a qualitatively defined strategic intent via a journey of incremental improvement. It is a simple concept, easily understood at an intuitive level, but which can require considerable effort in its implementation. The assessment process was via a matrix built by combining the elemental parts of the aerospace company vision with generic stages of continuous improvement capability. The University of Western Sydney (UWS) was contracted to help develop the assessment matrix, and to facilitate the audit process at two company manufacturing sites. Details of the matrix development process have been presented elsewhere (Murray and Beckett, 1998).

Background and case study approach

The vision The need for some new vision or map had been identified by both representatives of the company’s unionised workforce and in a middle management workshop following a major downsizing driven by a market downturn. Feedback from customers, industry survey research studies and general literature espousing new manufacturing paradigms were reviewed. This led to the development of some imperatives for an “ideal” Aerospace component supplier (table CS4a below). The supplier selection criteria reinforced the view that the company needed to use all the skills of its workforce in innovative ways to create and evolve unique competitive approaches. The use of terms such as a ‘company of business people’ and ‘agile manufacturing’ were used as cultural adaptations of such criteria. Through various meetings of management and staff, five elemental visions, each with a short word picture of its meaning, were developed and packaged under the banner of “Manufacturing 2000”. In summary form, these included:

- Vision 1: A company of business people pursuing continuous improvement;
- Vision 2: Rapidly adaptable, efficient teams at all levels;
- Vision 3: Investment in R&D to improve products and processes;
- Vision 4: Technology adaptation using the company’s know-how to yield innovative practices; and,
- Vision 5: Responsible corporate citizen.

Developing the assessment matrix. Some previous UWSM work had involved identifying key success factors as drivers of change in the matrix. Initially, managers at two plants were interviewed to identify these in the various program areas. To achieve a consistent relativity between the five visions (in terms of their state of progression and strategic orientation), five
stages of continuous improvement were modified from the Caffyn and Bessant (1995) capability-based model (table CS4b below). The description for each stage was based on characterising the present performance characteristic as well as alluding to the type of organisational learning that needed to occur in the future.

The five stages of continuous improvement listed in table CS4b were used as a basis for assessing the progress for each ‘manufacturing 2000’ vision. Rather than just select one of the five stages as representing current status, a degree of fit measuring scale was also added. The measuring scale used to assess the progress for each performance characteristic in each vision was based on a Likert Scale* of 1 to 5. The final measuring instrument included approximately 120 questions which were surveyed across various management levels of the company.

<table>
<thead>
<tr>
<th>Supplier Selection Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business</strong></td>
</tr>
<tr>
<td>- Fixed priced long term contracts</td>
</tr>
<tr>
<td>- Ability to take on risk-sharing programs</td>
</tr>
<tr>
<td>- Ability to manage multi-sourcing contracts</td>
</tr>
<tr>
<td>- Ability to supply a complete system or module</td>
</tr>
<tr>
<td><strong>Non-recurring activities</strong></td>
</tr>
<tr>
<td>- Right-first engineering</td>
</tr>
<tr>
<td>- Joint development programs</td>
</tr>
<tr>
<td>- Short lead time to first production unit</td>
</tr>
<tr>
<td>- Ability to provide good, low-cost technical solutions</td>
</tr>
<tr>
<td>- Technology leadership</td>
</tr>
<tr>
<td>- In-house design capability</td>
</tr>
<tr>
<td>- Low R&amp;D cost</td>
</tr>
<tr>
<td><strong>Recurring activities</strong></td>
</tr>
<tr>
<td>- Low price</td>
</tr>
<tr>
<td>- Record of excellent schedule adherence</td>
</tr>
<tr>
<td>- Short lead times for customer-specific items</td>
</tr>
<tr>
<td>- Established reputation in aerospace industry and quality track record</td>
</tr>
<tr>
<td>- In-house manufacturing capability of key process</td>
</tr>
<tr>
<td>- Ability to supply in kits, in aircraft sets, to line side</td>
</tr>
<tr>
<td>- Options engineering for short lead times</td>
</tr>
</tbody>
</table>

**Successful suppliers will meet a range of criteria in three areas, to produce world class quality and delivery performance combined with least cost**

Table CS4a Ideal aerospace component supplier attributes
**Outcome: Some observations.** The initial interview process showed that understanding of and commitment to the company vision statement, and different views about where efforts should be prioritised in different parts of the company. The survey showed varying degrees of progress in each of the five vision elements. Shortly after the first survey, the company changed ownership, and a different process for establishing a vision and strategic plan was started. In connection with this, a separate survey (by Interview) found that the manufacturing 2000 vision was not consistently understood and communicated through all company sites. The current relevance of the vision was assessed in a different forum. As part of its “internal university” activities (refer case study 6) the company supported development and delivery of a post-graduate module on the learning organisation. One group of students had an assignment to review the vision statement in the context of a learning organisation, and to consider the appropriateness of that vision for the future. An initial assessment of each of the five vision elements against some attributes suggested in a few references raised a number of questions. They carried out a limited survey (35 people interviewed with a questionnaire) of people at different levels in the organisation in one plant. People identified reasonably with the “manufacturing 2000” statements, but did not see this as a shared vision. In addition, an update of customer expectations suggested the five visions described necessary, but not necessarily sufficient capabilities compared with five years earlier. For example, customers expected a higher degree of risk sharing with suppliers in new projects, but other internal survey information suggested the aerospace company employees were risk-averse.

About two years down the track, with the aid of a consultant, an approach to implementing a new top level vision was developed. This involved the creation of compatible functional visions in the marketing, commercial, technology and innovation, manufacturing operations, finance, human resources and information technology areas. For each functional vision, an associated outcome was agreed, and a number of capabilities that would be required to achieve that outcome were identified. Not long after this arrangement was established, the company changed ownership again.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Performance Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aware</td>
<td>At the aware stage, organisations often pay 'lip service' to new and improved methods of operations. Pre-existing cultures are often deeply entrenched and people feel content with the old way of doing things. These cultures however need to be infused with management action showing the link between suggested changes and performance.</td>
</tr>
<tr>
<td>Standardise</td>
<td>When businesses are growing, there is a need to standardise current operations such that a commonality exists in operating procedures. The need to have standardisation is a long process however and people do not always see a large payback for the effort expended. Thus, continued efforts aimed at revitalizing the organisation can be short lived. The business or improvement process is structured along traditional lines in each key success area meaning that business improvement efforts are still very fragile. The necessity to grow and change however becomes the basis by which managers justify better methods to improve the way we do things.</td>
</tr>
<tr>
<td>Stabilise</td>
<td>At this stage, achievements in standardisation mean that improvements start to become mutually reinforcing. Ideas are encouraged and current systems are challenged to find better ways of conducting business. Efficiency as well as effectiveness improves because attention is given to improvements that are consistent and repeatable. People start to understand the continuous improvement process and how this can add value to business activities.</td>
</tr>
<tr>
<td>Breakthrough</td>
<td>The difference between this level and previous levels lies in expanding the way we think about discovering, acting and choosing between various decision processes. In the previous levels, if one can think of a loop or circle where these actions are linked, then we could describe this as a process of changing and improving the existing rules and procedures that already exist. Thus, in the previous three levels, we are continuously improving what already exists but not necessarily questioning the assumptions about why it exists.</td>
</tr>
<tr>
<td>Dynamic</td>
<td>When an organisation can consistently repeat breakthrough stages, then we can describe it as a dynamic one. At this level, the organisation as a whole is characterised by collective learning rather than individual learning that is more prevalent at lower levels. A dynamic organisation will be able to cope with rapid change and uncertainty far better than one operating close to certainty where decisions and actions are simply small incremental improvements.</td>
</tr>
</tbody>
</table>

Modified from Murray, P. (1997), Innovation and Continuous Improvement

Table 4b: Generic characterisation of levels of continuous improvement

**Discussion**

In any of these cases, the value of the process of testing the vision involved discussion of what the vision should be in the context of the company operating environment and its strategic response. This involved a sharing of mental models, and the establishment of some
form of measurement arrangement, both of which are seen as important learning organisation attributes. Environmental scanning preceded the process in all cases, and was itself a learning exercise.

The level of effort to set up this kind of vision and assessment framework is quite significant. In the case study company it has been done twice in recent times. This suggests there is some value in deliberately adopting an external, pre-existing framework (such as the EFQM (1997) model referred to in case study 3) that aligns with the strategic intent of the company. Whilst it would not be specifically tailored, it could represent a more stable reference, would involve less work and would permit a degree of benchmarking.
Case study 5: Internal Benchmarking

Case study purpose
A “Best Practice Club”. An internal collaboration was established (initially via an informal meeting) by the regional CEO of an international conglomerate company who had observed that some of its subsidiary companies were more innovative and successful than others. His idea behind this club was that if the reasons and practices behind this innovation could be understood, then such practices could be flowed on to lesser performing subsidiaries. The purpose of this case study is to examine this initiative as an organisational learning experience.

Background and case study approach
The regional CEO also presented a corporate view that better balancing long term strategies and continuous change against the traditional short term initiatives was needed. Some information on the findings of an international head office group charged with supporting Business Process Redesign initiatives was also provided. Examples of performance objectives (key success factors) and quantitative performance benchmarks identified by the head office group were given for each supply chain step from product research to after-sales support. Nine key activities in each program were noted:

• Establish strategic purpose
• Ensure top management direction and support
• Set stretch goals for performance improvement
• Define core processes and competencies
• Redesign core and create higher level processes
• Effective change management
• Establish cross-functional integration
• promote stakeholder involvement and ownership
• Put planning and program management in place
• Ensure sufficient scope and depth of projects

Following the first internal “show and tell” meeting of senior managers of seven innovative subsidiaries, a number of observations were made:

• Even though the companies served quite different industry sectors, they were all competing internationally either directly or indirectly, whereas the lesser performing companies were not
• The managers who met agreed that if they had been able to compare their experiences earlier, they could have substantially reduced the time taken to introduce change in their respective businesses. This resulted in an enthusiasm for them to continue to meet as a "Best Practice Club", regardless of any activities directed toward the lesser performing subsidiaries.

• Even though each subsidiary had adopted a different kind of change initiative, some common themes started to emerge. These were subsequently developed into a manufacturing good practice checklist.

An overview of the "Club" member business areas and the nature of their change initiatives is shown in table CS5a below:

<table>
<thead>
<tr>
<th>PARTICIPANT</th>
<th>PRODUCT</th>
<th>OPERATIONS</th>
<th>MARKET</th>
<th>KIND OF INITIATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPANY A</td>
<td>AEROSPACE COMPONENTS</td>
<td>REGIONAL</td>
<td>100% EXPORT</td>
<td>OPERATIONAL TEAMS</td>
</tr>
<tr>
<td>COMPANY B</td>
<td>FOOD PACKAGING</td>
<td>MULTINATIONAL</td>
<td>MULTINATIONAL REGIONS</td>
<td>GLOBAL PERFORMANCE MEASURE, INTERNAL BENCHMARKING</td>
</tr>
<tr>
<td>COMPANY C</td>
<td>BUILDING PRODUCTS</td>
<td>MULTINATIONAL</td>
<td>MULTINATIONAL REGIONS</td>
<td>BALANCED SCORECARD</td>
</tr>
<tr>
<td>COMPANY D</td>
<td>BUILDING AND CONSTRUCTION PRODUCTS</td>
<td>HIGHLY DISTRIBUTED REGIONAL</td>
<td>MULTINATIONAL REGIONS</td>
<td>LEARNING ORGANISATION</td>
</tr>
<tr>
<td>COMPANY E</td>
<td>AUTOMOTIVE INTERIORS</td>
<td>REGIONAL</td>
<td>REGIONAL</td>
<td>BEST PRACTICE, BENCHMARKING</td>
</tr>
<tr>
<td>COMPANY F</td>
<td>AUTOMOTIVE SYSTEMS</td>
<td>REGIONAL</td>
<td>REGIONAL</td>
<td>CUSTOMER SCORECARD</td>
</tr>
<tr>
<td>COMPANY G</td>
<td>AUTOMOTIVE FURNISHINGS</td>
<td>REGIONAL</td>
<td>REGIONAL</td>
<td>LEAN MANUFACTURE, PROCESS BENCHMARKING</td>
</tr>
</tbody>
</table>

Table CS5a: Best practice club members

A number of meetings were held over about a one year period. A review of the information shared at these meetings yielded the following observations:

• The nine key activities identified by the Head Office experience were being pursued in varying degrees by the club participants.
As had been noted by other researchers, some good examples of best practice existed within the participants own conglomerate enterprise, but without the intervention by the regional CEO, this would not have been known.

The significance of top level sponsorship of the intra-enterprise networking that developed was essential in ensuring that participants could make time available for their participation.

In a similar vein, having an independent facilitator kept information flowing, and by producing regular summaries he kept a degree of coherence between the participants.

The networking itself helped reinforce or adapt individual change programs as participants shared their experiences in a situation of high external turbulence, where what was now happening in one industry may have already happened in another. The significance of this mentoring at senior executive level should not be underestimated.

**Follow-on studies**

The "Best Practice club" disbanded due to structural change that resulted in sale of many of the participant organisations. It was still possible to keep track of two of the participants (company A and Company B) for another few years, and their specific experience is discussed below.

**Company A program.** One of the companies, designated Company 'A', manufactures aerospace components at a number of locations in Australia. Virtually all products are exported, and nearly all the company's competitors are outside of Australia. Work was organised around customer programs, and team-based forms of work organisation were evolving under the umbrella of a registered Industrial Relations Agreement. The products manufactured were characterised by low volume, high complexity, being relatively labour intensive to manufacture, with stringent quality requirements. An earlier international study of manufacturing "Best Practice" at the sub-tier process level had shown that best overall performance was achieved through unique combinations of sub-tier processes _plus_ associated support functions. The level of effort applied to each process was not necessarily minimised, and it was desirable to look at a number of interacting processes together. An internal benchmarking program that looked at a number of factors was subsequently initiated.

The reference model of competitive performance ultimately chosen was one that had been used within some parts of the company before. Originally developed in Japan by Kobayashi
(1990), the model had been adapted by Company A. The model has 20 areas that are assessed against 5 generic levels of performance. Level 5 is regarded as "Worlds Best Practice". A 20 X 5 assessment matrix containing a word picture characterising each level of performance for each area was used to assess current performance for each program group. An overall "score" (between 1 and 5) was developed for each group. This stimulated active debate that surfaced different views held within each group. What had to be improved was clear from the assessment matrix, and information on which group had the best score in each of the 20 areas was shared, to identify where "mentor" help might be obtained in improving performance.

Prior to the selection of this model, a study of the strengths and weaknesses of each program group was undertaken using a 5P's model that looked at people, process, price, product and plan views of each group. Whilst this process was well received by the program groups, the project management effort to characterise best practices and flow those around the organisation was beyond the capacity of the company at that time, as the volume of business had started to rapidly expand, and all available resources were needed to support that expansion. So it was agreed a simpler model would be used for the time being.

The whole program was managed by a facilitator that reported to the company CEO and another senior Executive. A "bottom up" approach was used to build on the spirit of the Industrial Agreement, and to further integrate the notion of continuous improvement with day-to-day work. In the context of a change program, this would be classified as a "developmental transition" (Dunphy and Stace, 1994), where strengths of the approach are seen as: involvement, commitment, sense of ownership, sustained energy, and individual initiatives.

The potential vulnerability's of this approach, according to Dunphy and Stace (1994), are: potential loss of control and direction, vulnerability to diversion and dissolving of a climate of trust, the time consuming nature of the participative process, and that competitors might move more quickly. Some of these downsides were observed in Company A, particularly the diversion that arose from increasing production rates during the establishment of the benchmarking program. None-the-less, measurable improvement was achieved as measured by the 5 point scoring system. Company output increased significantly with a relatively low increase in workforce numbers, although this result was the outcome of the combined effect of a number of company initiatives.
In parallel with the specific audit process, program group managers shared examples of best practice systems within their group at weekly meetings with their peers. Whilst this was considered of great interest, there was little apparent action to change things as a result of this sharing.

Company A’s operating environment subsequently changed in a number of ways, and the change strategy changed to a “task-focussed transition” one. Progress is still audited using a form of assessment matrix, but the new matrix was developed by Company A’s largest customer, and audits are carried out in conjunction with that customer. The intention is that economic benefits realised (which are now identified as part of the process) will be shared with that customer, who is also providing specialist facilitators to assist. As the new assessment matrix also has its origins in Japanese industry, it had many similarities with the original one, which has made the changeover relatively smooth. An important aspect of the revised program is the rapid implementation of a succession of simple improvements that accumulate to give a significant benefit.

Company B program. The second company, designated “company B” here, manufactures food packaging items at several locations in a number of countries around the world. Each plant is semi-autonomous, and whilst the characteristics of the marketplace in each country may be different, the products of each plant are directly comparable from a manufacturing point of view. The products may be characterised as high volume, low cost, utilising a high degree of automation in production, with quality again being a critical issue. A top management view had developed that the operational performance of the group needed to rapidly and continuously improve, and that benefits could be gained from improved interaction between different plants around the world.

Parametric performance values widely utilised in the Industry were used to target desired performance outcomes. An extensive audit program was developed internally by a special project, multi-disciplinary group with the aim of examining every aspect of plant operations that might impact productivity and quality. During the first round of audits, a number of internal “best practices” were identified, as were some subject matter experts who could help solve problems that were common across a number of different plants. At each plant the audit process revealed a very large number of opportunities for improvement. The approach taken was to focus on a small number, selected by the plant participants, for immediate action. When they were implemented, another opportunity was selected. Subject matter experts from other plants could be called on for assistance if necessary.
The whole program was administered by the audit team, under the direct authority of the CEO. Visits by the audit team were also used to deliver various messages, related to competitive performance, from the CEO. The audit team checked the progress of each improvement program at each plant against a series of agreed milestones. In the context of a change program, this was a top-down "task-focussed transition" (Dunphy and Stace, 1994), where strengths of the approach are seen as: clear focus on task related issues, clarity of communication, clear role definition, steady and relentless approach to change.

The potential vulnerability's of this approach, according to Dunphy and Stace, are: limitations of rational means of persuasion in emotive circumstances, reduced commitment from lack of participation and involvement, and the possibility of change tapering off to fine tuning. Some of these downsides were observed in Company B, and in the early days, some staff changes were necessary to keep the program moving forward. Significant improvements were made, and the program has been continuously enhanced over a number of years to meet a number of challenges arising from its success. The tendency towards fine tuning noted by Dunphy and Stace has been observed, and now that change process arrangements are well established, there are plans to move to external benchmarking.

As indicated earlier, one of the original aims was to document internal best practices for implementation across all plants. But as enthusiasm for the whole program grew, so did the number of best practices. The effort in sustaining each individual improvement project in each plant, and the large amount of information available to be shared required continuous improvement in the way the program worked. To deal with this issue, and only concentrate on the critical few outcomes and "Best Practices", those that had the strongest links with overall Company Key Performance Indicators were identified.

**Outcomes: some similarities.** Both organisations had an initial focus on data capture and information sharing. This later moved toward an emphasis on project managing change and prioritising actions. Linking actions with performance measures important to the business seemed to be the next evolutionary stage.

This is consistent with the observations of Dunphy, Turner and Crawford (1996), who surveyed over 100 companies looking at the attributes of “learning organisations”. They found that change competencies were as important as business and technical competencies, but that performance measurement was also important in both monitoring current operations and in seeing the benefits of change programs.
Both organisations used audit processes of some sort to assess current status and identify opportunities for improvement. The audit focus was on a future goal beyond current norms, not just on maintaining efficiency in current practices. It is suggested that this sits relatively comfortably with many manufacturing operations, particularly those with ISO 9000 or 14000 certification, where employees are familiar with audit tools and techniques.

Very soon after the start of their programs, both organisations were somewhat overwhelmed by the number of opportunities for improvement. Clearly, the data capture process was starting to work, but organising for easy dissemination was an issue. The need for formal knowledge management emerged.

Albeit in different ways, both organisations sought to codify best practice. Company A pointed to a generic descriptor in their assessment matrix, linked to specific groups who had achieved the best performance in each of the 20 areas audited. Company B documented specific practices in different functional aspects of the business. Both companies also encouraged person-to-person contact to share tacit knowledge.

Both Companies established a team reporting to the CEO and separate from day-to-day operations to progress the initiatives undertaken. To some extent, Company A had modelled their approach on that of Company B in this respect, but the approach also reflected a failure to make progress through the normal functional organisation in previous initiatives.

In both Companies, the internal audit process was not static, but continued to evolve, both in response to experience gained using the process, and in response to changing operational circumstances. There was learning associated with the internal benchmarking process itself (eg, learning to focus on critical information) as well as from the outcomes of following the process.

Outcomes: some differences. The two Companies initially pursued different change mechanisms; one utilising a “developmental transition” approach, and the other a “task-focussed transition” approach. According to Dunphy and Stace (1994), the former is appropriate when markets are growing, and product/market innovation is required; whilst the latter is appropriate when markets are under-going major change, and ‘niche’ exploratory strategies are prevalent. The reasons behind Company A later changing its approach are consistent with this view.
Company A tended to focus on refining work organisation practices, whilst Company B tended to focus on refining automated processes. This possibly reflected differences in the kinds of products manufactured by each company.

Whilst internal audit programs have now been running in each company for some years, external factors have also influenced the way the programs have evolved. A change in the market environment of Company A from growth to major re-shaping, plus some other factors, caused Company A to alter its change strategy. Both companies also changed ownership through the period of the study.

Company B began to link the outcomes of specific actions to the “bottom line” some time in advance of Company A, who initially saw building certain competencies and values as important.

**Discussion**
The nine key activities identified by the conglomerate company head office from interaction with consultants and experience with a number of earlier business process redesign programs were also observed by the Best Practice Club participants, who had learned them more from personal experience. These activities would develop some, but not all of the learning organisation attributes subsequently identified in this research. The linkage of benchmarking and a change process consistent with the operating circumstances of the company seems to be essential to achieve useful outcomes. When they are successfully combined however, many opportunities for improvement are presented, and a process for prioritising them is essential.
Case study 6: An internal University

Case study purpose
Over a period of nearly 5 years a significant number of technology oriented employees in an Australian Aerospace Company were exposed to a variety of post-graduate coursework modules intended to add a business and technology management perspective to the technology background of those employees.

Not all of the students had prior experience with University education, but some of these people completed Masters degrees. Their experience is also discussed. Over the duration of the program the company was in a constant state of significant change. The number of employees initially increased, adding a further training load, but later on the number of employees decreased, and the program was wound back.

At the midpoint of the program, an initial review of benefits and experiences took place, and this has been reported separately (Sloan et al. 1999). This case study looks at how the program was integrated with work, the perceived upsides and downsides several years down the track, and the influence of organisational culture on the learning styles of the participants.

Background and case study approach
The Master of Technology Management program was offered to employees on-site and during business hours. Altogether about 100 employees completed at least one module, and about 20 have or will graduate with a Master of Technology Management award. At the same time as the Masters program was offered employees were able to take part in a program from Swinburne University of Technology. A significant number of participants have graduated with post-graduate certificates from Swinburne University of Technology. Whilst several Universities provided specialist modules, the University of Western Sydney undertook to project manage formal accreditation possibilities for the students, as one aspect of a Memorandum of Agreement relating to the whole program. The flexible nature of the Masters program enabled participants to undertake core subjects from UWS and electives from Swinburne, or other universities, and as long as the subjects were at postgraduate level and relevant to a technology management qualification they counted towards academic credit.

All lectures were delivered on the company premises, in Company time, and an intensive delivery mode was utilised. The virtues or otherwise of this are discussed in the results section. Later in the program, some employees from other companies also participated, as
the intensive delivery mode was also suited their personal circumstances. Observations from this experience are also discussed.

**A Survey.** For this case study participants in the program were surveyed using a mail questionnaire. Respondents were asked questions regarding their background, length of service with company, and courses undertaken to determine the similarities and differences in their experiences. The remaining questions asked participants about the outcomes of the programs for themselves and the firm; their opinion of the subject materials and delivery; if they had encountered any obstacles during the program; and if there were barriers to using new skills experienced after completing the program. In addition, there was a telephone survey of many of the students supervisors of the day.

The respondent's experience with the company ranged from less than 5 to more than 20 years, with the “average respondent” having been with the company between 11 and 15 years. The majority of the respondents so far have completed one or more of the University awards offered. The detailed results have been reported elsewhere (Beckett, Hyland and Sloan (2000). The survey results indicate that the majority of respondents have had a positive experience in the program, and they believed that they had personally benefited, and that the company also gained competitive advantages from staff participation.

The quantitative results of the survey were reinforced by the participant's comments on the program. Participants reported "using new skills & knowledge in (their) day to day activities" and that the program had "...made me understand the way to deal with people of all types". Many participants reported that their "...focus has changed from technical aspects of the job to more appropriate approach, taking into account both technical and business issues", and that "The experiences gained have assisted by providing a greater awareness & understanding of business process & particularly provided me (with) the ability to assess situations from broader perspective's".

The outcomes for the participants and the company may best be summarised by the following comment: "In presentations to & discussions with (the company's) customers & suppliers the background information gained on project management & people interactions was invaluable in allowing me to confidently & usually successfully steer the conclusion on various issues toward an outcome beneficial to (the company). I believe the improved level of confidence, self assurance, people and presentation skills gained from the course was partly responsible for (the company) winning the ... project due to me being able to present a more professional style and outlook to the customer during negotiations."
The participants also had a very positive response to the program’s content and deliverers. These responses were mirrored by a strong preference being expressed by the participants for the in-industry mode of program delivery, with less than 10% of the respondents expressing a preference for the course to be delivered in a standard mode (as outlined above). Over 90% of respondents agreed or strongly agreed that the company should continue to offer the program. It is also significant to note that over 75% of respondents indicated they would continue with the subjects if they had to complete them in their own time (as opposed to in company time) approximately half of these respondents indicated that they would wish to continue with the program if the company ceased it’s financial support.

Outcomes

University staff observations: The benefits described above to the company participants were also reported by students from other organizations who studied subjects with the company’s participants. These students were Master of Technology Management or MBA students who would normally have completed subjects on-campus in the normal mode, but who were able to elect to study with the company’s personnel. All such students reported that the subjects studied in the in-industry mode utilising examples from the companies operations added significantly to their understanding of the course material. The majority of students given this opportunity elected to undertake as many subjects as possible in the in-industry mode.

This mode of delivery enabled the university deliverers to adopt a more interactive style of subject delivery. Freed of the constraints of a fixed weekly timeslot lecturers were able to design interactive exercises requiring extended delivery sessions, or fully utilise seminar discussions to extend students understanding of the course material. Ready access to the company’s workplace enabled immediate implementation of textbook exercises (eg workplace safety audits). It also lead to the design of assessment tasks that not only tested the students understanding of theoretical concepts, but also provided solutions that were valuable to the company. Extensive utilization of team based assessment tasks were particularly valuable where company participants and students from outside the company worked together. It also provided a number of students who had no previous experience of university, but substantial work experience, a mentored introduction to study leading to their successful completion of either individual subjects or the entire course. The utilization of extended final group reporting, including individual questioning, overcame the problems usually associated with team-based assessment of individuals.
This customization of the presentation of existing subjects, along with the development of new elective subjects directly aligned with the company’s training objectives, added significant value to the participants experiences. This is reflected in the participants response to the course delivery (see Figure 5 above) which is significantly better than that which would normally be expected to such course material presented in a traditional delivery.

**Some company observations.** An initial review of Company perceptions of the program was obtained from a series of telephone interviews with nine managers, some of whom participated in the program and some who did not.

Some of the course topics were seen as immediately relevant, others were seen as useful background, or “nice to have” but not immediately essential. *The level of effort applied by the participants, compared with that observed in short courses and conferences/workshops, was very high. It is suspected that Company visibility and peer pressure had something to do with this, as well as the fact that there were clear deliverables and an assessment process (although participants were not obliged to complete this step)*

Whilst a significant number of reports and assessments of company issues were produced as part of the course, this material and the enhanced skills of the participants have not always been utilised. The courses were run during a period of extreme turbulence in the company (not that there is ever likely to be a calm period). This meant *that participation by some people was limited, people taking time to participate put pressure on their workmates to cope without them, and introducing further change to implement ideas from the course was difficult. In some cases however, participants and their managers did “deals” to compensate for lost time, and to use each module to find ways to enhance the operation of their area. This approach was very successful.*

*It was generally agreed that the collaboration competencies of the participants were greatly improved in a number of ways. Presentation skills and negotiation capabilities have been an asset in customer and supplier interactions. During the course, participants worked with company employees they had not met before, enhancing their overall knowledge of company operations and creating an environment for future cooperative working. Participants were seen as more open to critical questioning and exploration of options than their non-participant peers.***

Discussion
The course participants exhibited enhanced goodwill towards the company, and it was felt this helped retain staff in some cases. Conversely, the added experience and qualification may make it easier for participants to get a job elsewhere. There was thought to be some ill feeling towards course participants on occasions, either because they were seen as privileged in some way, or because they started to behave differently. Certainly, participants were reported as having a broader view of the world, and in many cases, able to take on broader roles within the company middle management. In hindsight, this was a beneficial outcome, as years of business re-engineering had compromised the traditional shop leader—foreman—middle manager career path.

A number of managers had concerns about the impact on the bottom line of the company and the timing of the courses. The program was relatively expensive in time, cost and disruption, and whilst the company level of competency overall has been enhanced, and some participants believe they have delivered benefits, there is no clear-cut picture of the net financial outcome. Some felt that the program should have been phased over a longer time. In one year, 10 modules were delivered, and this was thought to be too much.

Managers raised questions of participant selection. There were questions of capability and attitude. Not having done a university course before did not seem to be an issue if the participant had current learning skills (eg from TAFE) and significant work experience, as the level of peer group support and mentoring between course participants was exemplary. But not being able to apply the learnings was of greater concern. Some people clearly did the course with the prime aim of obtaining an accreditation, and it was felt that this focus detracted from the potential benefits flowing to the company, at least in the short term.

Some barriers or constraints were noted. The level of senior management support for the program was variable across the company, and this influenced the ability to deliver benefits in some areas. Examples of best practice identified in the course materials were inconsistent with the management paradigms existing in some areas of the company, causing frustration for both the participants and the managers, even where the managers supported the course in principle. In a number of cases, particularly with production employees, the scope of their current job did not allow implementation of some of the learnings.
Case study 7: Long and short term issues

Case study purpose
The case study considers the experience and recent practices of the authors 70 year old Australian Aerospace Company. Throughout its history, the company has experienced many cycles where its focus changed from surviving for today, changing to consolidate a competitive position and reflecting on “where to next?”, as the literature observes in other organisations. It clearly had to learn new things many times over. Were any common threads identifiable?

Background and case study approach
A snapshot of various time periods was derived from company documents and interviews with company historians.

Through the 1930s, the company focussed on establishing a capability for aircraft marketing, assembly and service support. The aviation industry was in an early growth stage, with a multitude of companies worldwide, and substantial product diversity. There was a focus on long term growth and developing a range of competencies.

Through the 1940s, there was initially dramatic growth in technical capability and capacity to support military aircraft manufacture, followed by an equally dramatic fall in market need. A diverse range of non aerospace products that utilized the company's recently established new technologies was pursued as a means of survival, rather than to establish new businesses. There was a high rate of change, but with little opportunity to plan the long term approach to the new product portfolio.

Through the 1950s and 1960s, the global “cold war” stimulated military activities again, albeit with some ups and downs. The product technology base started to mature. Both military and commercial aircraft markets grew dramatically worldwide. The company had developed a kind of “strategic alliance” with the Australian Department of Defence through this period, that saw a focus on core competency retention for national defence reasons.

The early 1970s saw a dramatic reduction in the Australian Government emphasis on Defence. Defence policy favoured specialisation by different Australian Defence contractors. The company expanded its aircraft and engine maintenance activities. With the support of an Australian Government offset policy, the company began manufacturing components for American commercial airliners. The company again ventured into a number of non-
aerospace product lines. Some commercial aviation sales and service activities were spun off into a separate company. World-wide, the industry was still growing. The company was reshaping again, but driven also by long term re-positioning in recognition of irreversible changes taking place in the industry.

Through the 1980s, the Australian Department of Defence undertook a number of military aircraft replacement programs, where the offset policy established the company as a global aircraft component supplier of military, as well as commercial, aircraft components. The company grew through acquisition and diversification into a number of aerospace market sectors. Strategic decisions to focus on some new materials technologies and to establish a major component design capability were implemented. Some "seed" projects (e.g. the design and manufacture of space-craft components) were established. The business portfolio and core competencies were reshaped.

In the early 1990s, the company's majority shareholder was acquired by another business. The new owners operated a very diverse global business as a series of lean "mini-businesses", each focussing on a niche market. The Australian Aerospace company was effectively split up and, in the late 1990s, sold as a series of separate businesses. The focus of this study is the aircraft component manufacturing business. By the 1990s, this business had developed an emphasis on making components for large airliners. In the early 1990s, there was a major downturn in that market, causing downsizing and restructuring for survival. Progressively, the company secured a number of contracts to both design and manufacture major components, resulting in a much larger product range than ever before. The industry had reached a mature phase. Price competition was intense and the number of aircraft manufacturers reduced progressively through industry consolidation and rationalisation. Government offset support for commercial airliner programs had been removed.

The 1990s had thus seen an initial emphasis on survival, re-engineering and delaying. In earlier decades, the company had tended to operate as a small version of a large aircraft company, retaining a portfolio of related business activities that allowed strategic management for growth. In the 1990s, the emphasis changed towards operating as a large version of a network of smaller, customer specialised businesses. This brought with it an environment of continuous change in the day-to-day manufacturing operations. With the flatter organisation structure dictated by economic factors, techniques for managing this change had become an area of management focus. Practices that had worked in the past were not necessarily viable. In a similar way, with the ever-changing industry and operating environment, finding ways to consider "where to next?" presented a challenge.
Outcomes
It can be seen from this history that the company has been substantially impacted by external factors over the years: international politics and wars, changes in government policy, changes of ownership; and, progressively, the aircraft industry reaching maturity in its life cycle. This is consistent with the general observations of Hosley et al (1994) that external turbulence stimulates learning.

Whilst it may not be evident from the brief foregoing history, from interviews with long-serving personnel, it seems the company’s survival in difficult times has been enhanced by an ability to flexibly use a range of core competencies and by strategic decisions taken from time to time relating to these competencies (this is consistent with observations of a range of researchers). These strategic decisions giving long term direction have been essential to the company’s ability to deal with shorter term turbulence.

Discussion
Whilst the company has clearly been adaptable, it is perceived that change in the organisation has not necessarily been natural and easy. The Quality Assurance requirements of the industry, for example, require the workforce to be very focussed on following key processes and continuously making informed judgements about detailed quality assurance matters, within specific guidelines. A survey of a significant proportion of the workforce showed a remarkable bias towards one temperament type-one that focusses on process and structure. This is appropriate to the nature of the business, but the focus on efficiently maintaining the status quo needs to be taken into account when implementing change. For example, in the mid 1990s both management and employees understood, in principle, the need for change, but both sought some understanding of where the organisation was heading. There was a need to review and re-establish a clear strategic intent. This was later recognised to be an issue world-wide for the company’s ownership conglomerate organisation.

People were seeking to understand competencies and processes needed for the future. This is discussed in case study four, and reported in more detail by Murray and Beckett (1998).

Discussions with customers, industry research studies and general literature espousing new manufacturing programs were reviewed. Some imperatives for an “ideal” aerospace component suppliers were deduced and used, along with the notion of using all the skills of the workforce, to yield five “visions”, each having its own word picture. A series of strategic
change initiatives spread over three time horizons was subsequently identified to pursue these visions.

The current business is run consistent with the plan-do-check-act cycle. Detailed annual business plans are made and rigorously reviewed for evidence of continuous improvement. Once approved by the company owners, management is expected to achieve all aspects of the plan. Progress is audited in some detail every month and corrective actions identified as necessary. A similar process is carried out with customers several times a year, reviewing each product line in detail. A company level Quality Assurance review takes place every month, in addition to regular internal and customer audit programs. These practices provide the necessary efficiency focus to ensure the company has the economic capacity to support its long term needs.

In the context of this environment, the value of the three loop learning model presented in section five of the thesis is that these diverse programs (involving continuously improving current operations, introducing change, and exploring future positioning) can be seen in a total business context. Consistency with and understanding of past experience can be appreciated, consistent with the progressing of initiatives appropriate to today, tomorrow and the future.

To bring the history up to date, in the late 1990’s, the company changed ownership twice, being ultimately bought by its largest customer in pursuit of that customers’ global strategic plan.
Case study 8: Structural change

Case study purpose
The author is a manager in a 70 year old business Enterprise that has possibly seen more change in its underlying organisation structure in the past 10 years than in the previous 60. There have been two ownership changes. The company has changed its strategic positioning from supporting a dominant position in a specialist regional market, to supporting a niche position in a global market. The company has been re-engineered, downsized and delayered in a variety of ways. Each change has bought its own good news and bad news.

From this background, a study of what may drive organisation structural change and how best to deal with the downsides of these changes (whilst gracefully accepting the upsides) was undertaken. It is expected the rate of change will continue so a variety of ideas on "better" forms of organisation and on industry paradigms perceived to be appropriate in the 21st century have also been considered. A kind of audit process that considers the research questions: what may be lost in changing from an existing organisation form to a new one; and what needs to be done to avoid any potential downsides inherent in the new organisational form are discussed. An example relevant to the current position of an Australian Aerospace company is shown below. Within the company, other kinds of structural change options have been considered by the same process. The purpose of this case study is to provide practical examples of this process.

Background and case study method
At the time of the study, the company was extending the application of team based work practices and encouraging multiskilling in the workforce. As the company moved away from a functional hierarchy; from the information presented in section 6 of the thesis, it must create new mechanisms to preserve lost benefits, including:

- The maintenance of excellence in core competencies
- The consistency of operation provided by bureaucracy
- A performance orientation at the Enterprise level
- The consistency of direction previously provided through top-down control.

As the company moves into team based structures, it must understand some new operating norms:
- That team members define how things are done (but not necessarily what needs to be done)
• Consensus decision making may be common (depending on the cultural make-up of the team)
• Team leadership may change, depending on circumstances
• The object is to be focussed and adaptive, not to create an introspective, self centred entity.

As improved practices develop, and the company utilizes networking approaches to share them and to pursue new opportunities, some new skills will be required:
• To create and get leverage from privileged assets
• To benefit from diversity in the analysis of complex problems and knowledge transfer/conversion
• To stimulate learning and synergistic opportunities
• To transparently deal with “team members” inside and outside of the company.

A procedure that tabulated each issue related to an aspect of structural change, and from focus group activities suggested possible responses was followed

Outcomes
The results are presented in the following tables. The list of actions to cope with the three aspects of structural change proposed is quite long. Many of them deal with non-structural matters like culture and leadership. Many of the actions would require an implementation program of their own and this helps us understand some of the complexities behind successful structural change. Suggesting structural change is as simple as drawing a new organisation chart, creating some new positions and announcing some new company procedures would be a mistake. Implementing structural change and declaring it to be successful without assessing its impact some time later would also be a mistake, as experience within the case study aerospace company suggests that some problems do not emerge immediately (eg degradation of core technical competencies). The audit process described may overcome such shortcomings by stimulating discussion about a wider range of possibilities at the outset, and by providing a basis for follow-up audit.

Discussion
Using the criteria developed by considering structural change from a learning perspective in the thesis, combined with a focus group required to identify at least one solution to the issues, raised provides a powerful way of examining the impact of structural change. Many of
the actions suggested are consistent with learning organisation and knowledge management practices identified in the thesis, suggesting that if a company is well advanced in these practices, structural change is easier to cope with.
<table>
<thead>
<tr>
<th>STRUCTURAL CONSIDERATION</th>
<th>ISSUE</th>
<th>POSSIBLE ACTION</th>
</tr>
</thead>
</table>
| Change from functional hierarchy | Maintenance of excellence in core competencies | • Nominate "Keeper of the Ethic" to progress people and systems development across the organisation  
• Provide alternative learning opportunities (cf. Tacit knowledge transfer in functional groups)  
  - by research  
  - by rotation through a range of internal and external assignments  
  - by post-qualification coursework |
| Maintenance of consistent systems of operation | Establish a published "Enterprise model", outlining the systems at work  
• Establish strategic level functional requirements, consistent with the model  
• Identify critical information systems and mandate their use |
| Preservation of organisational alignment | Establish a strategically appropriate shared organisational "vision"  
• Enunciate and enact simple cultural norms consistent with the operating environment and the vision  
• Develop and evolve multi-tiered strategic plans to provide consistent approaches in a devolved environment |
| Determining process for developing and enunciating policy | Establish documented policy framework that tiers down from strategic plans  
• Establish forums for people to consider the impact of strategies and policy |

Table CS8a: Preserving the benefits in a change from functional hierarchy
<table>
<thead>
<tr>
<th>STRUCTURAL CONSIDERATION</th>
<th>ISSUE</th>
<th>POSSIBLE ACTION</th>
</tr>
</thead>
</table>
| Move to team based structures | Processes for team members to define how things are done, consistent with achieving short and long term enterprise objectives | • Clearly define what teams are expected to do and how their performance will be assessed  
• Have the team establish key performance indicators and use them to help continuously improve  
• Provide facilitators to help with structured analysis approaches to continuous improvement and problem solving |
| Establishment of processes to facilitate consensus/participative decision making | | • Provide sufficient information to support informed decision making  
• Provide expert help when the team does not have all the skills or experience to make informed decisions, or needs help with appropriate processes  
• Integrate risk management and risk management processes with the decision implementation process, so the concerns of those managers who do not want to “let go” can be addressed |
| Achieving benefits from team leadership changes if the team adopts a team leader rotation practice | | • Note that leadership of different types of teams (strategic, cross functional and operational) requires different types of leader.  
• Provide leadership training for many team members  
• Ensure the team is aware of the skills of all members that can be drawn on to provide leadership in different circumstances  
• Avoid a “blame” mentality. Use failures as learning opportunities, but learn fast. Establish a culture of positive reinforcement and recognition of contributions. |
| Avoid teams becoming introspective and self centred | | • Provide information on total enterprise performance and the impact of the team on it  
• Maintain focus on team mission and benchmark performance  
• Regularly provide new opportunities for the team to exceed their “customers” expectations  
• Have some team members operate outside the team from time to time (as a participant in a cross-enterprise network, or a multi-functional task force)  
• Routinely swap a small number of team members to provide new perspectives |

Table CS8b: Actions to obtain benefits from change to team-based structures
<table>
<thead>
<tr>
<th>STRUCTURAL CONSIDERATION</th>
<th>ISSUE</th>
<th>POSSIBLE ACTION</th>
</tr>
</thead>
</table>
| Move toward networked and “virtual” enterprise operations | How to create and get leverage from “privileged assets” whilst protecting intellectual property | • Identify and creatively brainstorm opportunities associated with internal privileged assets  
• Use fore-sight/strategic scenario analysis to identify privileged assets that would give unique growth opportunities. Then look for them in potential partners or create them  
• Establish the unifying purpose, the degree of independence and inter-dependence desired up front with potential partners. Initial planning brings people into sync.  
• Remember, network linkages should be voluntary, so as more interactions occur, relationships and trust develop. |
| How to benefit from cultural and experiential diversity in the analysis of complex problems and knowledge transfer/conversion | | • Establish a “common dictionary” to avoid communication misunderstandings  
• Share information on the background, expertise and interests of network partners  
• Establish formal processes for documenting and sharing data and knowledge  
• Provide a forum for face-to-face interaction from time to time. |
| How to stimulate learning, synergistic opportunities and sustain innovation in the network | | • Develop the key questions related to mutual advantage; then consider options for solutions by lateral thinking processes  
• Establish cross-functional/cross cultural focus groups of 10-15 people who address the same series of questions, then share their different perspectives  
• Exploit, anticipate or create break points in the status quo. Work out how to turn weaknesses into strengths, threats into opportunities |
| How to transparently deal with “team members” inside and outside the company where resource access may be transient and capacity/ priorities inconsistent with ours. | | • Establish formal work practices using electronic networking technology, so people can make their contributions anywhere, anytime  
• Have redundancy in network links, so alternative paths and resources can be accessed. |

Table CS8c: Actions needed to obtain benefits from network forms of organisation
Case study 9: Supply chain issues

Case study purpose
This case study examines supply chain redesign as an agent for change in organisation structure and business process in the context of learning from and with suppliers. A paper incorporating this material was presented at a workshop on strategic issues in supply chain management at the University of Newcastle on the 17th of November, 1999

Background and case study approach
The aerospace company has moved from a strategy of vertical integration to one of core competency focus with global alliances. The company’s procurement organisation has moved from a highly centralised function to a decentralised one with a small central core that sets policies and negotiates supplier strategic alliances. In a similar way, some services have been out-sourced. These strategies have also changed the management competencies needed within the organisation, and changed who is responsible for managing some of these activities, with different inter-dependencies and risks emerging.

The nature of the relationship with customers and suppliers also continues to change as the industry matures, with a gradual shift from a contract being the primary basis of the relationship, towards equally important supplementary agreements that develop a much greater degree of inter-dependency. The aerospace company’s customers want to reduce their supply base and deal only with the best in more like a team style. So it must remain amongst the best, and enhance its capacity to manage lower tier suppliers in many countries as well as be a team member at a higher level. Some examples, derived from interviews with relevant company personnel, are given below.

Traditionally, the aerospace company has manufactured its products to an existing design owned by the customer. Through the 1990’s, it was invited to participate in Concurrent Engineering Development Teams to influence designs in ways that would reduce the subsequent manufacturing cost, and then subsequently, with British Aerospace, it took over the design and manufacturing of sub-assemblies it would make for some Airbus Industrie aircraft. Challenging production prices were set before the design started, based on innovative concepts and market-driven costs. Fast-track concurrent engineering practices were used by the company, improving the start-up economics for the customer. On the basis of this work, the company has been awarded a British Aerospace Chairman’s Award for supplier excellence.
In the late 1990’s, the company negotiated a strategic alliance with Hoogovens (the Mill) and Apollo Metals (the distributor) to provide virtually all of the aluminium plate material used by the company. The objective was to reduce cost and inventory, and as part of the arrangement finally established, Apollo now do some of the plate cutting and preliminary machining work previously undertaken by the company, utilising the company’s manufacturing works order system and a JIT delivery strategy. Apollo has gained access to more value adding work, and has used this approach to win new business. The Company has reduced its internal costs and freed floor space now used for higher value adding activities.

The Company also has a form of strategic alliance with a Major composite material supplier that allows it to tap into the suppliers production control computer system to check progress of orders, and quickly respond to changes as they arise. This is mutually beneficial to both parties. The two organisations also share information about their research activities twice a year, and have one joint research project.

Outcomes
As the global relationships with the aerospace company’s small number of key customers and suppliers change in the ways described, there are concerns on all sides about the potential for the players to become so dependent on each other that the relationship can become restrictive. Lucas (1998) discusses this kind of issue in his book on the balance and sharing of power within organisations. He proposes a style of intelligent interdependence where both leaders and subordinates will sometimes lead, and sometimes follow. In broad terms, this is the kind of relationship the company’s customers are trying to evolve as they focus on refining their own core competencies to improve their competitive position. The view of one customer (also typical of others) is that a partner supplier will:

- Invest and get a return based on the success of the enterprise
- Have defined behaviours grounded in shared principles
- Use standard, agreed upon, metrics for performance
- Have equal responsibility for success
- Be trusted and viewed as an equal

This issue of dependency is not new to the Company. In its early years, it was totally dependent on the Australian Military for its existence. But the context today is different, as
characterised by a customer colleague "in the past we have been a powerful family, but today we must be a winning team. To stay on the team you have to be very good".

As the Company's customers introduce change initiatives into their own operations, they seek to flow these into their supplier partners organisation. In parallel with this, the Company is normally formulating its own business re-design agenda. Rationalising these initiatives can be a significant task, requiring the adoption of different emphases and language with different customers. But it is being recognised that the number of opportunities to learn from each other's successes and failures is substantial. To minimise disruption to regular production activities, and to maximise the benefits available, the aerospace company has established a special facilitation and coaching team that operates in parallel with day-to-day activities, but on whom operations functions are dependent to help meet their continuous improvement objectives.

**Discussion**

In managing overseas relationships, the Company is mostly dealing with global players who all appreciate to varying extents the issues of working closely whilst being physically separated. A mixture of electronic communication and personal turn-about face to face meetings is becoming the norm. Australian customers and most Australian suppliers are still very traditional in their contract oriented, risk-averse approach. Some out-source and smaller strategic alliance partners are proving to be very creative however, and are better prepared to operate in the same kind of environment as the aerospace company. Its customers are not only driving the company to reduce its internal costs, but are driving it to work with its suppliers to reduce their costs. This again changes the nature of the relationship with the company's supplier base.

The interaction between action and learning, learning and action can be seen at work here. Key competencies in negotiation and communication are evident in realising mutual benefit and interdependence, whilst retaining independence. In all three examples given, the existence of these new relationships has formed a basis for accessing an extended knowledge network and considering additional business opportunities.
Case study 10: Application of networks

Case study purpose
The definition of a learning organisation adopted for the purposes of this research was: an organisation that has created a learning environment that provides a source of competitive advantage. Some researchers (e.g., Lipnack and Stamps, 1994) see networks as providing such advantage. Others (e.g., Naisbit, 1998) see this as the dominant form of business model for smaller companies in the future. This study examines the experience of the case study Australian aerospace company in establishing network relationships.

Background and study approach
For its size and political situation, the Australian Aerospace company is considered by some to have a disproportionate share of the Aerospace structures market. This can be used to advantage if it is perceived to be associated with reliability, innovation and efficiency in the context of customers working only with the best (the image the company portrays). But this size and the Australian political environment can be a disadvantage in trying to win large chunks of any new opportunity, both in terms of the resources required and the politics of where work is placed. To improve its chances of success, the Company must work as a part of the customer's organisation at the conceptual stage of any new opportunity, and add real value in terms of technical contribution, even though some of the ideas put forward and accepted may be ultimately utilised by others. And in parallel with this technical activity, the company must be assembling a supply chain that will subsequently add value for the customer in other ways. This has lead to a closer examination of extended network relationships and virtual organisation strategies from a variety of published and unpublished sources.

Studies of inter-organisational networks (CENTRIM, 2000a) suggest they are formed for a number of generic purposes:

- To establish supply chains working to add value to, and speed the delivery of, products and services
- Collaborative innovation networks creating new products and services
- Learning networks to help increase the knowledge of their members within a specific technology or management practice

Networks generally focus on establishing a portfolio of strategically important, value adding partner competencies, excluding freely available products and services. Having said that, the
strength of a particular partner may be in providing these things efficiently to the network through pre-existing supply chain alliances.

Networks associated with the virtual organisation strategy require collaborative work practices. Such practices are becoming more common in a variety of contexts, and are the subject of research in many parts of the world. Some observations arising from a recent workshop (University of Melbourne, 1999) are:

- Understand if a collaboration is market driven or value driven. Differences between collaborators must be surfaced and respected, but an overarching common agenda must be wholeheartedly agreed.
- The skillset for managing in a collaborative environment is different from the skillset for managing in a competitive environment, even though the objective may be for the partners to compete as a group. New kinds of risks need to be surfaced and managed. There is a need for active “bridging” between the participants.
- There are significant costs in managing the interdependencies. Be sure that there is a benefit that more than offsets these costs.
- Unexpected conflicts can arise within the participating organisations as collaborations can cream off the best people from an organisation, making it difficult to sustain the “home base”. There is evidence that people within the collaboration may identify with it rather than with the “home base”, and that people within the home base may regard collaborators as distant and elitist.
- Successful collaborations rely on relationships between key individuals, and can only be set up quickly if these relationships pre-exist.
- Recognise that the nature of learning within a collaboration can change with time, eg initially establishing a common “language”, later on establishing common decision-making practices.
- The arrangements and tools for implementing a particular venture and monitoring progress will depend on the nature of the venture.

Throughout the world, networking is being promoted by Governments and Industry Associations as a way for smaller enterprises to compete in larger markets. In this regard, “small” is a relative term. In the context of local competition, it might characteristically be an enterprise employing less than a few hundred people, but in a global context, an operation employing a few thousand people would be “small”.

53
In Australia, AusIndustry supported a “Business Networks Program” (Ausindustry, 2000) for several years. Whilst it is no longer directly supported, some information about it, and some of the infrastructure established (eg the network of facilitators) is still available. The Australian Government has also supported learning networks to share best practice, and is currently supporting supply chain networking to improve operational efficiency. Some regional business network programs are active too, such as those in the Hunter Valley (IDC-Hunter, 2000).

There is continuing support for network initiatives in other countries, such as New Zealand (Trade NZ, 2000) and the USA (US Net, 2000).

Access to the web-sites referenced above provides background on the network idea and some examples of significant successes.

There are some recurring themes in considering collaborative work and the establishment of networks that have been characterised by Lipnack and Stamps (1994) in terms of five key principles:

- **Unifying purpose** – purpose is the glue and the driver. Common views, values and goals hold a network together. A shared focus on desired results keeps a network in synch and on track

- **Independent members** – independence is a pre-requisite for inter-dependence. Each member of a network, whether a person, a company or a country, can stand on its own, while benefiting from being part of a whole

- **Voluntary links** – just add links. The distinguishing feature of networks is their links, far more profuse and omnidirectional than other types of organisation. As communication pathways increase, people and groups interact more often. As more relationships develop, trust strengthens, which reduces the cost of doing business and generates greater opportunities.

- **Multiple leaders** – fewer bosses, more leaders. Networks are leaderful, not leaderless. Each person or group in a network has something unique to contribute at some point in the process. With more than one leader, the network as a whole has great resilience.

- **Integrated levels** – networks are multi-level, not flat. Lumpy, with small groups and clustered with coalitions, networks involve both hierarchy and team processes which leads them to action rather than simply making recommendations to others.
It is further suggested that those who get things done, plan. But the plan itself is not the primary benefit. It is the participatory process that brings people into sync to get things done across boundaries.

The establishment of networks and virtual organisations offers alternative ways of competing and of growing a business. Some examples are given below:

- Growth without radical transformation – many smaller businesses are faced with a position where they must radically change their structure and style of operation if they are to grow. This may be beyond the capacity and capability of the current owners. Getting together with a number of similar businesses can result in a more competitive group with minimal change to the way the businesses operate.

- Expanded market access and more comprehensive market intelligence – by sharing information from the extended network of the combined group, particularly if the members or their customers are geographically dispersed, can identify opportunities and strategic directions that would not normally be identified by an individual participant.

- Core competency extension and faster learning – by maintaining focus on what each participant is good at rather than trying to do everything in-house can enable the total group to be more competitive, and to learn from each other.

- Access to unique assets – in many technology oriented businesses substantial plant and equipment is frequently required, but a particular business may not fully utilise this on its own. Networking with others can improve the economics of use of such facilities. This kind of practice is common in high technology “precincts” such as Silicon Valley in the USA.

Outcomes

The following notes provide examples of the three different kinds of network mentioned earlier. Supply chain networks are illustrated though ATI and Austmine. The case study Aerospace Company provides some insight into a collaborative innovation network, and the Western Sydney Innovation Technology Network (ITN) provides an example of a learning network.

ATI (Australian Toolmaking Innovation Pty Ltd) (ATI, 2000) is a company with no resources of its own that markets the capabilities of a number of smaller toolmaking companies operating in Western Sydney. It was initially stimulated through the AusIndustry Business Networks scheme to pursue export opportunities that the individual participants (who would normally be competitors) accepted they could not pursue on their own. Over a number of
years, benefits from collaboration in maintaining a higher workload in each participant enterprise became apparent, and now ATI also project manages local contracts where the work is distributed between a number of participants. The participants still continue to compete for work that each one could do individually.

Austmine (Austmine, 2000) is a national marketing company that brings together the capabilities of more than 120 companies with expertise in supporting the mining industry to offer turn-key packages to overseas customers. It has been steadily growing over about 8 years. In 1999 it is understood that in excess of $1BN worth of export business was generated. Austmine has a Board with membership drawn from the participants and with support from AusTrade. It undertakes major marketing projects, but does not manage contracts itself. Some project-specific arrangement between the members involved is established for that purpose. The internet is used to both represent the network, and to provide market intelligence information through a “member only” facility.

The case study Aerospace company designs and manufactures major structural components for airliners and for some military aircraft. Over the last decade or so it has evolved a practice of keeping some key design activities in-house, whilst undertaking some specialist activities collaboratively. It is considered that this practice enhances opportunities for innovation. This is consistent with the research of Lei, 1997, who contends that “Technology fusion is the blending of older, current and emerging technologies to create higher order products and competencies. Firms that work with an array of partners from related and unrelated industries may be able to learn and apply technological breakthroughs to create new kinds of products whose underlying “fused” technologies represent a blend of diverse knowledge streams”. Similar approaches have been observed in a six-country study still under way in Europe (CENTRIM, 2000b) where the multiple knowledge flows from a range of network connections greatly enhance the traditional approach. This is illustrated in figure CS10a below.
The Aerospace company is also considering extending the scope of its network relationship to include a joint marketing component along the lines of the Austmine example.

The ITN learning network was established in 1997 as a joint University of Western Sydney – Government initiatives with a technology diffusion focus. It was noted that within the western Sydney region there were a number of companies in different industries that could be regarded as examples of best practice in some part of their operation. The network draws these companies together, provides site visits and arranges presentations on hot topics of common interest.

Discussion
There are clearly some different kinds of networks that have some different intended purposes, with a variety of drivers behind their formation. The Australian examples given indicate clear benefits from participation, and balancing interdependence and independence is a capability that emerges. The range of capabilities needed to form and operate networks seem similar to those found within learning organisation, such as “language” compatibility, negotiation and communication.
Case study 11: What is corporate memory

Case study purpose
The retention of corporate memory is frequently cited as an issue for many company in times of change. Argysis and Schon suggest that the role of individuals in organisational learning is to embed their discoveries, interventions and evaluations in “the organisational memory”. They, and others characterise corporate memory as some blend of what people in an organisation “know”, documents, computer programs and organisational norms and rituals. The purpose of this case study was to explore a more specific representation of corporate memory.

Background and case study approach
Within the authors organisation there was a perceived loss of corporate memory associated with the retirement of some long serving employees and downsizing. It was thought that in some areas, the evolution of sophisticated software over more than a decade would moderate the effect of these changes, but the new employees did not seem completely competent in using the software. The software was updated to make its interface more friendly. During presentations on the new software, questions were asked about why certain transactions were implemented a particular way, and what was the use of certain reports. Pursuing this line of critical questioning further, it became apparent that the software reflected some “rules” that made sense to the earlier generation of employees, but were not enunciated. In addition, it became apparent that the software was only part of a total system that also included some personally held decision making “rules”. There were clearly some tacit and some explicit knowledge parts to the whole system.

Where did these “rules” come from, and what was the total system that they were part of? As part of the research activity reported here, a succession of focus group activities was used to solicit opinions about corporate knowledge repositories, rules, and things that might influence them. Models of where knowledge might reside (eg in a data warehouse, or in some form of intellectual asset) were progressively refined, as were views about knowledge flows between these repositories.

Outcome
The result of this activity was a model that consisted of four kinds of information repository and four sources of rules that together influenced how the organisation operated. In the development of the model, it became clear that some of the sources of influence and
knowledge were outside of the company, for example with customers or collaboration partners. However knowing how knowledge flows from these sources and who are the key contacts within them was regarded as an important element of the company’s corporate memory.

Discussion

The model is presented in paper D, and utilised in paper B. Its attributes are discussed in detail in those references, so will not be discussed here.
Case study 12: Fast-track R&D

Case study purpose
An objective of organisational learning and knowledge management initiatives is to enhance the case study aerospace company’s competitive position. This is to be achieved through both improving operational effectiveness, and offering innovative value packages to customers. The author’s company could not match most of its competitors in terms of scale, and has pursued a collaborative research strategy, frequently in conjunction with partners from other industries. The objective is to use a diversity of views of both product attributes and manufacturing processes to identify unique approaches. Another source of advantage being sought is fast time to market. Again, as mentioned in case study 9, collaboration through a network approach is being pursued. This study considers some of the links between innovation and company learning practices.

Background and case study approach
Winning new business in Aerospace (and most other markets) is about Price, Product, Process and Politics. In order to compete, companies must continue to search for innovative options in all of these areas, which impacts both technology and supply chain arrangements.

It is argued here that innovation is about creative outcomes, and R&D can provide significant inputs, so the search for innovation should consider options available from research at the earliest possible time. Spending a lot of time refining and consolidating research that may only impact part of a total solution, may not be helpful if this compromises getting early market access, even though it might be considered that technical risk is reduced by the additional work, or that the solution will be more refined. The point is, that the technology is only one of the risks to be managed.

To consider all influences on the decision to adopt new technology earlier; research, marketing, manufacturing and finance perspectives must be combined. At the aerospace company, many engineers are rotated through research, product development and manufacturing assignments to help provide balanced views, and a particular engineer may follow a particular new technology introduction through the whole cycle over a period of a few years. In addition, external research partners are encouraged to interact directly with customers in conjunction with the aerospace company marketing and technical staff. This helps in maintaining an appropriate focus on the research activities. Financial models are developed in considering options that might be offered to a customer.
The outcomes of methodology research that can enhance the product development management process are also introduced for trial by the aerospace company at an early stage of their development.

Most of the company research is carried out collaboratively, through two Co-operative Research Centres in Australia, and an International Intelligent Manufacturing Systems program (refer Jackson (1999)). The objective is to capture a diversity of views and opportunities, and to tap into a broader network of contacts.

These approaches are similar to some suggested in the literature on organisational learning. Overall, there are a number of parallel research initiatives that are only considered practical to pursue through collaborative efforts. Such initiatives are consistent with the management studies of Malerba (1992), who found that organisations learn new things in a number of ways:

- Learning by searching (eg R&D) to stimulate differentiation and improvements through performance and quality
- Learning by interaction with users to stimulate horizontal product differentiation
- Learning by doing and interaction with equipment suppliers to stimulate process yield improvements
- Learning by interacting with suppliers to stimulate technical improvements in input materials

Malerba (1992) also noted that a different scientific and technical base may lie behind each approach. This is consistent with the multi discipline team approaches that are now more common.

**Outcomes**

Faster product development time is a competitive requirement in most industries, putting pressure on the development process, the supply chain, and manufacturing changeover times. As mentioned earlier, development time-frames are now targeted in weeks, not months. What has evolved at the aerospace company in response to this environment is a network of three overlapping Concurrent Engineering activities:

- One concerned with concept development involving research, design, marketing, manufacturing supply chain and finance option development. New approaches to tooling, and rapid prototyping techniques are also considered
• One concerned with product development with the customer to introduce a specific product into manufacture. Supply chain partners are an integral part of this activity
• One concerned with ongoing support systems and ongoing technology or supply chain option development to facilitate the other two. For example, there may be an IT support function integrated with a product development team. Lessons learned are also incorporated in underlying practices

As Blackmore (1998) points out, there is constant change in the background to any new product development process that may offer new options and new ways of doing things, and business processes of marketing, operations, innovation and finance continuously interact. In addition, there is little time, if any, between projects to introduce changes that improve the development process, so this must be linked with running projects. This approach is an attempt to deal with these issues, whilst accessing technology earlier.

In the past, there has more frequently than not been a separation between product development and manufacturing process development. But it is suggested that today, just making the same product a new way, or making a new product the same way, may not yield a competitive result. This leads to the parallel development of new products and new processes that adds an interaction dynamic and risk management aspect to projects requiring a re-think of how things are done. Research, and development, and production startup activities start to significantly overlap. And the traditional approach to each of those separate activities has to be modified, with knowledge transfer through reassignment of people, as well as through the use of information and communication technologies.

Discussion
With so many things happening in parallel, especially where some participants may be remote from each other, maintaining visibility and control can become an issue, and focus on the desired outcomes must be maintained. Complex military programs have utilized a sequence of formal reviews to assure goals are met. A commercial product development Stage-Gate technique is favored by many (Frost (1998)) to integrate product development with business needs. Others argue (Buisson et al (1998)) that such approaches are too cumbersome, and that maintaining a close association with a lead customer can achieve better results faster. The aerospace company utilizes aspects of both these approaches.

Whilst some projects are initiated to achieve a strategic outcome (eg put a man on the moon), today, even in Military projects where performance is critical, cost is also a significant factor. For example, the use of carbon-reinforced composite materials in aerospace initially
focussed on superior performance and life cycle benefits. But today the capital cost of an aircraft is just as important as those attributes, and there is a need to focus research on ways to reduce cost. Understanding cost/product feature tradeoffs is a universal concern, and some systematic ways of seeking and appropriate balance continue to evolve (eg Burkert (1998) proposes a variant of the Quality Function Deployment technique to draw out tacit knowledge and then leverage it). In most Aerospace applications, because production rates are low, the product and process setup costs must also be minimised as they are a significant part of the final price. To achieve this, knowledge developed in one project must be re-used in the next one, and information developed in any development stage must be re-used in later stages, not re-invented in some slightly different form.

In recognition of all of these factors, the company changed its approach to the development of proposals for customers. A “Customer Creativity Centre” was established to rapidly consider options that might be put to a customer. Research, marketing, engineering, manufacturing and finance functions are all represented in some way according to project needs. Risk management approaches and critical questioning practices are used to assess different proposals. Standard information is re-used in successive proposals, and where a particular proposal is successful, some of the people involved in its development move on to the next stage, minimising knowledge transfer problems. A knowledge base of competitive performance is maintained and costs estimated by a variety of processes to provide cross checks. This can also lead to the setting of “stretch” targets for manufacturing operations. A systems representation of the whole process is shown in the following diagram. The process can be regarded as a knowledge system supporting bidding for new work, new product development, and ongoing improvement during the product life, given minor adaptation for each phase.
ATTACHMENT 2: REFERENCE PAPERS

Whilst a number of papers were produced during the progression of the DBA research described in this document, four have been selected as representing the outcome of the study. A short background to each one is given below, and the papers follow as attachments. The format of each paper is different in response to particular publishing requirements, however, they have all been adapted to a common page layout and font to provide a degree of consistency with the rest of this document.

Paper A: “The process of Mentoring as an Aid to Transformational Learning”
To be published in “Deciphering Knowledge Management” Springer-Verlag LNIA1859
This started with evidence of the value of mentoring within the authors, organisation, and regular reference to the practice in some way in the business press. How widely the practice was being implemented was explored, and compared with some models arising from current or past research. It is considered important in the current context as an effective way of mobilising the tacit part of corporate memory.

Paper B: “Accessing Corporate Memory: Some Knowledge Structure Concepts”
(This was also a keynote paper)
This paper flowed from research into corporate memory, and considers how to best access and get value out of that memory. Where that memory lies as organisations outsource functions and pursue network relationships is briefly discussed. Using this research, techniques for rapidly and simply enunciating what the authors’ organisation “knows” are being trialed.

Paper C: “A Diagnostic Tool for Identifying Barriers to Organisational Learning”
Proceedings of the Eighth Asia Pacific Researchers in Organisational Studies Colloquium on “Organising Knowledge Economies and Societies” (APROS 2000), 14 – 17 December, 2000
The research undertaken showed that a repertoire of competencies, processes and knowledge management practices were required to become a comprehensive learning organisation. But what if some elements were missing? Taking this line, a diagnostic approach to progressive organisational learning is presented.

Paper D: “Sources of Failure in the “Corporate Memory””
To be published in “Deciphering Knowledge Management” Springer-Verlag LNIA1859
The model of corporate memory as a knowledge system developed through this research has eight underlying processes and fourteen knowledge flows between them. There are tacit and explicit knowledge components associated with the processes and the flows. The number of opportunities for system failure, particularly in times of operational turbulence, is quite large. The model is examined from this perspective to help understand what happens in organisations that become dysfunctional following some kind of change.
The Process of Mentoring as an aid to Transformational Learning

Ronald C Beckett

1General Manager, Technology & Innovation, Hawker de Havilland Ltd, Australia

Abstract. Deciphering knowledge and managing it to achieve new and creative outcomes is achieved through people. When people venture into unfamiliar territory, it is suggested here that mentoring processes can facilitate beneficial transformational learning. It is observed that mentoring is cited in a number of quite different contexts, and that arranging a successful mentor/protégé relationship can be problematical. The possible reasons for this are explored. It is concluded that relationship management, generic learning processes, and the identification of appropriate domain knowledge all need to be competently handled in obtaining value from a mentoring program.

Introduction

It is argued here that the process of mentoring can facilitate the deciphering knowledge and managing it to achieve new and creative outcomes for an individual or for an organisation. The paper discusses the apparent re-invention of mentoring practices in community programs, and in large and small enterprises. Quietly practised in the background by experienced people for centuries, the process is receiving publicity in a variety of contexts that suggests that it is now being re-discovered and formalised.

A quick tour through the Encyclopedia Brittanica shows that various kinds of mentoring processes have been practiced throughout history. Ancient Greek and Roman Rulers had formally recognised trusted advisors known as Mentors. Many famous people developed their personal skills through Mentor – Protégé relationships, and in a similar vein, formalisation of the Master – Apprentice relationship began before the Industrial Age as a practical knowledge transfer arrangement.

Today, in Australia, mentoring is being promoted in a variety of ways. From May 2000, the Australian Institute of Management has offered training in mentoring practices. There is a group operating as “Mentoring Resources of Tasmania” [5] supported by the Rotary Club that offers assistance to small business. One part of a competition prize offered by Telstra’s Yellow Pages through the Australian Channel Nine “Small Business Show” is 12 months Mentor assistance.

A search through the Internet highlights a variety of mentoring practices that are in current use; some aimed at personal development, particularly of disadvantaged groups; some aimed at career development within organisations, and some aimed at an aspect of business development.
This business context is the main area of interest in this paper, but some brief
discussion of other contexts will note their potential impact on a business. For further
background, an overview of mentoring, finding a mentor, and becoming a mentor can
be found in internet references [2], [3] and [4].

The Personal Mentor

According to a report in the Toronto Star Newspaper [22] there are thought to be over
100,000 “mentors” across Canada providing assistance to young people through
informal and occasional one-to-one relationships. In some parts of the USA,
employers are being asked to support their workers in mentoring disadvantaged young
people in the community at large [33]. In Australia, a Sydney-based Agency “Aunties
and Uncles” has matched 600 children and mentors to provide support to single parent
families [34].

In a kind of role reversal, it has been reported [32] that in the “Silicon Valley”, USA,
young employees familiar with the current leading edge technology may coach their
CEO to keep him or her up to date in a rapidly changing environment. In this setting,
mentoring may be a two-way learning experience.

There are, in fact, many reports that two-way learning is the norm, rather than the
exception (see for example reference [4], and community programs can certainly
provide this benefit.

The Career Mentor

Today, fewer people see their career development being catered for by a single
organisation that they might work in for most of their working life. There is
encouragement in some industries (e.g. Information Technology) to regularly swap
jobs, and to handle one’s own career development through a network of contacts.
Some of those contacts can provide an informal mentoring function. Professional
Associations can also be a source of such contacts, and some people feel greater
personal loyalty to their profession these days than to the current employer. The Film
Industry, (De Fillippi and Arthur, [20]) where a company may only exist for one
project (the film) provides an example of this network behaviour. Here knowledge is
retained at an industry cluster level (e.g. Hollywood) rather than within an individual
firm and is transferred to new participants through mentoring in parallel with the
process of filmmaking. In this environment, many employers are establishing formal
mentoring programs to aid in staff retention, enabling employees to develop
personally whilst retaining access to their knowledge within the firm.

Employers are embarking on formal mentoring programs for other reasons too: to
pro-actively support disadvantaged groups, to supplement traditional succession
planning, and to promote cross-divisional communications. It is estimated [25] that
more than 70% of the “Fortune 500” companies now have some form of mentoring
program in place.
Whilst mentoring is about matching up individuals, the outcome can be enhanced if mentoring is established as a formalised, long term process, not just a series of short term associations (which are a necessary part of the process). There is commonly some diversity in these associations that supplement enhancement of professional competencies: some enhancing corporate navigation and networking competencies [25], some enhancing observational and interaction competencies [24], and some enhancing business multitasking competencies [10]. These different associations may be regarded as transferring the different kinds of knowledge, characterised by Lundvall and Johnson [27] as:

- **Know-what**, which is knowledge about facts. Know-what is information that can be broken down into bits and easily codified (a mentor can suggest where to find such knowledge)
- **Know-why**, which is knowledge about principles and laws – it reduces the frequency of errors in technological trials (a mentor can help interpret such knowledge)
- **Know-how**, which is skills, the capability to undertake a given task successfully (a mentor can help transfer such knowledge)
- **Know-who**, which is information about who knows what and who knows how to do what (a mentor can help establish an expanded network of contacts)

Various Internet references claim that formal mentoring programs are substantially more successful than informal ones [10], [12], [13]. The Management Mentors web page provides a range of references on the subject [12].

Other references cite some potential downsides to formal programs, where constrained matching has not worked out [25], or where generational factors ("don't trust anyone over 30") may have an impact [28]. Matches that have the potential for workplace harassment or favouritism backlash must be carefully considered too. Rowland [30] refers to a range of mentoring models that make sense in particular circumstances. She notes that having freedom to choose the most appropriate model may be of benefit, but that a downside of informal programs can be difficulty in connecting a mentee with a mentor at all.

Formal programs have however been found to have benefits beyond those originally sought. Formal mentor training can enhance the effectiveness of informal mentoring carried out by those trained. Inviting a person to become a mentor can lift the morale of an experienced employee who may have been routinely doing a particular job for many years, but knows it well [28].

When looking for a mentor, many people have the view that the type of position held or the type of work done is important in providing the most relevant background experience. This can lead to mentor relationships outside of the enterprise the protégé (sometimes referred to as a “mentee”) is involved with, for example through a Community, Trade or Professional Association [28].
People who have been involved in mentor programs for some time have observed some consistent patterns. There is a flow-on effect; “because someone took time to help me, I take time to help others” [22]. There are three common benefits for mentors: personal satisfaction – seeing other people grow; validation that what they do know is useful and important; and learning something from the other person. Finding time can be an issue. The Mentoring Group [13] has the following tips for mentors and protégés. For mentors:

- Even though there may not be much time, make your mentoring relationship a priority
- Meet over breakfast or lunch
- Have your protege attend a meeting with you
- Have your protege help you on a project
- Introduce your protege to others
- Recommend other resources to your protege

For protégés:

- Managing the relationship is as important as the kind of help you get: it’s your development and your career
- Maintain regular contact
- Respect your mentors time
- Internalise and apply what you learn
- Follow through
- Show appreciation
- Give back information or expertise you may have

**The Business Mentor**

Whilst personal and career mentoring may indirectly enhance the long-term performance of a business, similar processes can be used to directly stimulate beneficial change at the Enterprise level. Mentoring assistance can be provided to Executives, or to an operations team in an established business, or to the participants in a startup business.

**Executive Mentoring**

It can be argued that executive mentoring is the original application of the process, as it was practiced by various leaders and rulers in ancient Greece and Rome. Particularly in times of transformational change, leaders must balance a number of paradoxical factors, actively stimulating proponents of change, whilst recognising that the sceptics may have some valid concerns. In this circumstance, simply being able to share ideas with some one who can take a broader view can be very helpful.

From a study of organisations that had remained in business and grown over many decades, Baghai et al [18] observed a number of common success factors. One factor was a long running association between the CEO and another senior Executive, where one person was oriented toward the long term view, and towards change, whilst the
other was oriented towards stability and short term performance. It did not seem to matter which role the CEO favoured, as long as there was mutual respect of both perspectives. A similar view is expressed in studies of organisational learning and change by Senge et al [31], where it is recommended “don’t go it alone – work with partners. We all have blind spots that limit our credibility and ability to generate safety and trust in others.” The need for some arrangement to facilitate reflection on the issues to be confronted is also noted.

Sometimes however, particularly in smaller organisations, the CEO may not have internal access to a suitable partner. To support this need, a variety of CEO networks have been utilised. Mentor Networks, USA [29], for example organise monthly CEO group meetings (up to 8 in a group), and a facilitator meets with each CEO for two hours each month to promote discussion of current issues and ideas in a non-threatening environment. From the author’s personal experience, independent facilitation of such groups is necessary to stimulate reflection, to draw out underlying assumptions and attitudes, and to develop common ground and language for the group. Given these conditions, a Manufacturing Industry group the author had participated in felt that they could have implemented more effective change within their respective organisations up to 2 or 3 years earlier than they had achieved on their own by sharing their experiences.

The Mentoring Institute [10] maintains that, from studies of over 100 researchers, no one makes it to the top and is successful there without being mentored along the way. They have developed a mentor – protégé model (involving more than 10,000 participants to date) that requires both protégé’s and mentor-protégé partner training to enhance the success rate of the partnerships. The training and facilitation also aims to help protégé’s and their mentors see the bigger picture, and to help more effectively pass on the mentor’s experience to the next generation.

There are also suggestions that senior executives become proteges themselves, as two-way benefits arise from different views of the operating environment and from generational differences, as pointed out by Switskowski [32], where “reverse mentoring” can keep a CEO abreast of new technologies.

**Operational Mentoring**

Some organisations have made mentoring an integral part of running their business. Class technology [6], an Australian Information Technology company provides mentoring as part of its new technology introduction services, and this is very well received by customers. Such a practice is consistent with the management research of Bohn [19] who noted that different forms of knowledge were dominant at different stages of technology introduction, and that tacit knowledge transfer is predominant early on. Bohn’s stages of knowledge are shown in Table 1 below.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Name</th>
<th>Comment</th>
<th>Typical Form of Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Complete Ignorance</td>
<td></td>
<td>Nowhere</td>
</tr>
<tr>
<td>2</td>
<td>Awareness</td>
<td>Pure Art</td>
<td>Tacit</td>
</tr>
<tr>
<td>3</td>
<td>Measure</td>
<td>Pre-Technological</td>
<td>Written</td>
</tr>
<tr>
<td>4</td>
<td>Control of Mean</td>
<td>Scientific Method</td>
<td>Written and Embodied in Hardware</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feasible</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Process Capability</td>
<td>Local Recipe</td>
<td>Hardware and Operating Manual</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Process Characterization</td>
<td>Trade-offs to Reduce Cost</td>
<td>Empirical Equations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(numerical)</td>
</tr>
<tr>
<td>7</td>
<td>Know-Why</td>
<td>Science</td>
<td>Scientific Formulas and Algorithms</td>
</tr>
<tr>
<td>8</td>
<td>Complete Knowledge</td>
<td>Nirvima</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: stages of knowledge evolution [21]

In a recent study of organisational learning and change [31], some interesting examples of team mentoring within the Covenant Insurance Group, and within Intel are described. These examples are summarised below.

The Covenant Insurance group was formed by a group of experienced people who had previously worked in large Insurance Companies. Included in their core values was the idea of helping people reach their full potential; and in establishing a culture of self-direction and team building, they learned the value of having people mentor one another. There were reduced stress levels, particularly for claims employees, and it was observed that even having 20% of the people mentoring each other raised the quality of thought and conversation in the other 80%. Some observations made from experience over several years were:

- Nearly anyone can become a mentor
- Mentoring relationships must be voluntary on both sides
- Mentors don’t provide solutions, they facilitate learning
- Mentors can only exist in an organisation imbued with integrity
- Mentoring relationships are not permanent
- Mentoring fast-growth people is a high leverage strategy: the corollary is to also look for mentoring skills when filling high level positions (mentoring capability is also noted as a desirable leadership attribute by others, eg Hasselbein and Cohen [23])
- Beware of pseudo-mentoring, where people are only seeking political connections
- Mentoring is “love”: helping others to complete themselves
From experience in various manufacturing and technology roles, a senior Manager at Intel, David Marsing, developed an approach of engaging Executive levels and mentoring and developing other Managers. His objective was to "develop future managers of future factories". Because new technologies were being introduced at a high rate at Intel, creative teams had to resolve new issues rapidly, and an ability to work in this environment was just as important as a knowledge of the new technologies. He began "promoting people who would experiment and give good (and critical) feedback". The outcome was the ability for a newly formed team to perform together at a level that might take five or more years to achieve in conventional environments. As with the previous example, the objective was to enable people to realise their full potential, and to recognise them when they are motivated to try.

In the USA, the Federal Government’s Small Business Administration supports a Mentor-Protégé relationship between firms respected and knowledgeable about Government contracting and disadvantaged firms, to help the latter win Government contracts [8]. A number of criteria have been developed to help ensure that the Mentor firm can offer genuine assistance.

In a study of 17 successful Small-Medium Enterprises in Australia [21], mentoring from experienced business people was found helpful in transition stages of the growing firm where the mentors had relevant experiences of similar transitions. In other cases, just being experienced in running larger businesses was not necessarily helpful in trying to mentor a growing firm if the mentor’s operational experience was significantly different.

**Startup Mentoring**

In a number of countries, Governments support Start-Up businesses through help from retired business people. The idea is to reduce the failure rate and to stimulate business growth and employment. A program of this sort (called SCORE) has been running in the USA for several decades. It now has more than 11,000 volunteer members and is supported by the U.S. Small Business Administration [9]. A similar program, but on a smaller scale has been running in Ireland since 1988 [7]. The websites for both these programs have a number of interesting case study success stories. In Canada, mentoring help is available by telephone and fax [14].

At a more local level, some community organisations encourage and support new small business ventures. An example is Mentor Resources of Tasmania [5], which is supported by local Rotary Clubs.

For many start-up businesses, funding is an issue, and it is not uncommon for mentoring and initial funding support to be linked. Some organisations approach this from the mentoring perspective (eg Rohrbach, [29]), others from a financial perspective. A recent study of sources of informal funding in Australia [1] suggested that “Business Angels” frequently want to actively participate in the business they are investing in. The same study suggested that the ratio of deals made to opportunities
considered was low, and that both people and business opportunity compatibility needs was the cause of this. The Australian Stock Exchange has recently launched an innovative informal money market matching facility [16] that seeks to make such match-making more efficient. Again, many of the investors want some level of direct participation in the business they are investing in, and indeed, have a lot to offer a new startup or management buy-out operation. The Australian Government has also recognised that startup funding can be an issue, and a new program (COMET) is aimed at helping business to become “investment ready” [17] by funding some expert assistance.

There are a variety of programs around the world aimed at stimulating entrepreneurial activities by young people. The Canadian Youth Foundation [11] is one example. Also in Canada, the Business Bank of Canada links winner’s of it’s “Young Entrepreneur of the Year Award” with mentoring services as part of that award [22]. The University of Utah, David Eccles School of Business has a program called “SMART Start” that pairs students with Alumni mentors to support the transition from the educational community to the business community [15]. It allows the students to explore business opportunities, and helps the mentors to see what today’s students are learning.

Discussion

The term “Mentoring” is clearly used in a number of different contexts in the examples presented above. Personal needs or business needs may drive a mentoring program, and the program may be based in a community environment or in a particular enterprise. Table 1 below shows some of the objectives of different driver/environment combinations.

In spite of the different contexts, there are some common themes:

• Whilst nearly anyone can become a mentor, formalisation of the process and training can greatly enhance the outcomes
• Mentors don’t provide solutions, they facilitate transformational learning and improve peoples capabilities to manage themselves
• Another outcome is better balanced decisions to enhance personal or business success, and an additional mechanism for passing on “Corporate Memory”
• Experience suggests that managing the mentor – protege relationship is just as important as the kind of help obtained, and it must be voluntary on both sides. With no personal “chemistry”, there is likely to be only limited benefit.
• Selective mentoring gives the best leverage; selecting fast-growth people, selecting opinion drivers or role models in community programs, or picking winners in business programs.
• Both proteges and mentors learn something from the relationship
<table>
<thead>
<tr>
<th>DRIVER</th>
<th>PERSONAL</th>
<th>BUSINESS</th>
</tr>
</thead>
</table>
| COMMUNITY | • Directly engage disadvantaged or minority groups  
• Utilise the experience of a pool of retirees | • Enhance small business success rate  
• Stimulate economic growth for general community benefit  
• Support young entrepreneurs and entrepreneurial attitudes | |
| ENTERPRISE | • Formal process for supporting equal opportunity  
• Job enrichment opportunity for mentors  
• Alternative or complementary to succession planning  
• Early identification of exceptional talent  
• Peer support from outside the business (Professional or other)  
• Supports staff retention and being an employer of choice. | • Peer group support for CEO/Change Agents  
• Management team and multi-skilling development process  
• Promotion of cross-department communication and a variety of organisation perspectives  
• Support for significant transitions in concert with people outside of the business | |

Table 2: Some Outcomes Sought from Mentoring

One issue for communities or organisations is how to assess results from programs such as mentoring. Whilst the performance of a person or an organisation may improve, it may not be possible to measure this by conventional parametrics, or to attribute improvements to a specific activity such as mentoring. In a recent study of organisational change [31], it was suggested that the objective should be to measure to learn, not just measure to report, by asking the right questions. “No-body has to wait for an external measurement system to know that something is amiss”. “People inform one another, not through numbers, but through stories – describing where a piece of work came from, what happened to it, and why it might not be ‘right’. It took years to build the mutual understanding necessary to tell, and to listen to, these stories.”
Two issues are raised here:
- Experience teaches us to ask the right questions, even if we do not know the answers, and
- Story-telling is a powerful way of sharing knowledge as it provides relevance and context to the underlying message.

These are both attributes of good mentoring practices.

At any given time in a community or organisation, there will be people who want to maintain the status quo, or fine tune current practices, and people who want to radically change current practices. Senge et al [31] suggest that people who are going to lead change (in themselves or in their organisations) need to become “bi-cultural” – operating and communicating in both an innovative subculture world, and in the mainstream culture of the larger organisation. It is suggested here that an important aspect of mentoring is teaching this bi-cultural perspective.

The mentoring process helps people to learn, and from that point of view, reference to a model of adult learning evolved by Jarvis [26] helps understand the underlying processes. The model is shown in diagrammatic form below.
The Jarvis model has a variety of elements, and the learning response characteristics can be quite different, depending on the elements that are active and on their sequence. Little change is observed when people do not understand the learning being offered, or have felt it just re-inforced what they already knew, or if they assigned little value to it. Non-reflective learning could result in indirectly acquiring a particular culture, an increased skill level in an occupation or language, or the commitment of "correct" information to memory. Reflective learning, which produces
the most powerful outcomes, could result in; contemplation, developing a new belief system; reflective practice, raising problem solving skills; and experimental learning, supporting pragmatic knowledge that has been shown to be close to reality.

In the context of this model, it is suggested here that mentoring can help minimise non-learning outcomes by addressing language and context difficulties. From the observations of Bohn [19] referred to earlier, this may be very important in learning about a new technology that has its own jargon to be mastered. It is further suggested here that mentoring supports transformational learning through stimulation of “evaluation” and “reasoning/reflection” processes.

In some discussions on learning, references to coaching and mentoring seem to be used interchangeably. It is suggested here that, in the context of the Jarvis model, that coaching has a greater emphasis on non-reflective learning benefits such as skill enhancement through “memorisation” of important information and routines. This may lead to transformational change at a later time when environmental circumstances change or in concert with a “reasoning/reflection” process. It may be noted also that both coaching and mentoring practices may utilise “experimentation” and “evaluation” processes. This leads to the suggestion here that if an individual has mastery of all these processes, that person may be good at both coaching and mentoring. But a strength in just some of them may lead to a strength in just coaching or just mentoring.

Thus the discussion utilising the Jarvis model starts to draw out some of the process competencies that a mentor will need, consistent with empirical observations presented earlier in this paper.

From the perspective of the person being mentored, if there are differences in language or communication style between that person and the intended mentor, then assistance may be ineffective. Similarly, if greatly different reasoning and reflection processes are the norm with each participant, the assistance may also be ineffective. Such observations, and an overview of the processes involved in transformational learning, may be of benefit if shared with the person to be mentored, to help understand the processes at work from the outset.

In all applications of mentoring it is observed that people will seek a number of different mentors over time, and that just having access to an experienced person may not be enough if that person does not have the knowledge being sought (eg Gwynne, [21]. Mentors have historically been expected to support leadership development in some form, such as technical leadership or change process leadership. An example arose during discussion of the value of diversity within the authors’ organisation a few years ago. An expert on Affirmative Action programs for women in the workforce had suggested that women should find a successful female mentor to help learn how to progress their careers. A young female engineer took exception to this, suggesting that she wanted to learn from “the best”, regardless of gender. One view focussed on learning about process, the other on technical leadership. The young engineer would probably need both in the long run.
From observation of a wide variety of projects in Engineering and Manufacturing environments over 30 years, the author has noted that different kinds of leadership emphasis can be equally effective, depending on the current competencies of a particular group. Generic attributes observed have been: the ability to project a vision, the ability to mobilise people, and the ability to set appropriate standards. This can be achieved in different circumstances by the application of conceptual, or of people, or of technical competencies. Examples of each combination are shown in the “Leadership Matrix” below.

It had been observed through the previous sections of this paper that mentoring can take place at many levels within an organisation or community. In a similar way, leadership is practiced at many levels, and the “Leadership Matrix” presented below has been used at all levels by interpreting it in an appropriate time horizon context. A daily/weekly time horizon is appropriate for people at the “coal face”, whilst a multi-year time horizon is appropriate for people at senior executive levels.

In the context of mentoring, the “Leadership Matrix” has been used to help people at all levels identify where they see their strengths and weaknesses by “mapping” themselves on the matrix. This can help identify the kind of mentor needed for their personal development at a particular time: is it someone with appropriate technical, or people, or conceptual competencies. The exercise can also identify where an individuals strengths may support them in becoming a mentor.
<table>
<thead>
<tr>
<th>GENERIC COMPETENCY</th>
<th>CONCEPTUAL</th>
<th>HUMAN</th>
<th>TECHNICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>VISION</td>
<td>Assess and advise where we are going and how we will get there</td>
<td>Assess and define what kind of people and attributes we will need for the future</td>
<td>Identify what tools and techniques will be needed for the future. Apply problem solving techniques to road blocks</td>
</tr>
<tr>
<td>MOBILISING PEOPLE</td>
<td>Translate concepts into action plans, involving people</td>
<td>Communicate, motivate, and resolve conflict</td>
<td>Provide career / discipline counselling. Develop and train peers and subordinates</td>
</tr>
<tr>
<td>STANDARD SETTING</td>
<td>Define competitive performance targets. Enunciate long and short term goals and practices</td>
<td>Maintain discipline of people and processes. Set ethical standards.</td>
<td>Define standards of workmanship that satisfy customer needs and company objectives that support getting the job done effectively</td>
</tr>
</tbody>
</table>

Table 3: A Leadership Process Matrix

Conclusions

The application of mentoring principles seems to be growing in a number of different contexts, but the practice has been utilised in various ways for centuries. Some things have changed, and some have not.
Mentoring is no longer predominantly identified with the rulers of a kingdom or masters of a profession. It is now formally practiced at both personal and enterprise levels within the community and within business with differing outcomes sought from each combination.

Whatever the level, this paper suggests that formalisation of the process has distinct advantages. Understanding the context of a particular program: what knowledge is intended to be transferred and what outcomes are sought, need to be accepted by both the mentor and the protege. And training related to the mentoring process can benefit both parties. There is evidence that participation in a formal program by some members of an organisation flows on to improved informal mentoring within that organisation.
It is suggested that the strength of the mentoring approach is in supporting transformational learning that changes the person or the organisation involved (as compared with learning to make current practices more efficient). Some approaches focus on acquiring generic transformational learning competencies, whilst others focus on acquiring technical, people or conceptual competencies to either pass on "corporate memory" or to prepare for significant change. Another strength is in helping to make better balanced decisions, from improvement in evaluation and reasoning/reflection competencies, and from the broader world-view available.

It is noted that managing the relationship is as important as the kind of help provided (no chemistry, no result), and that any particular relationship has a limited life as the mentee / protégé person or organisation develops new needs.

It is suggested here that in a situation of rapid environmental change or new technology introduction or innovation, where transformational learning is required, mentoring can be a very powerful facilitating process, as both the protégé and the mentor learn from the experience.

It is further suggested that whilst there is growing interest in and application of the mentoring process, the process itself is not widely understood, as it has some generic process, and some knowledge domain-specific components that are commonly confused.

However, there are some clear mentoring functions that facilitate knowledge transfer and transformational learning:

- Deciphering and interpreting new knowledge can help individuals and organisations more rapidly adopt new practices
- Supporting evaluation of, and reflection on opportunities for significant change can enhance decision-making in relation to these opportunities
- Passing on important domain knowledge, either directly drawing on personal experience, or indirectly by drawing on a network of contacts, can stimulate innovation

Understanding each of these functions and the knowledge to be transferred can support the design of a mentoring program appropriate to a particular application and its context.

References

www.management.about.com/smallbusiness/management/library/weekly/aa012098.htm
www.management.about.com/smallbusiness/management/library/weekly/aa012798.htm
www.forbait.ie/mentor
www.score.org/counselors/
www.business.utah.edu/event/smartstart/index.htm
www.em.asx.com.au


32. Switskowski, Z (2000) *Presentation to Australian National Innovation Summit, Melbourne, February*

33. Tacke, L (1997) “Should your company catch mentoring mania? – Yes, but make sure the program is structured so it benefits workers, kids” *Minneapolis Star Tribune, May 19*

34. Walker, V (2000) “Late male: more than one kind of dad” *The Australian Newspaper, August 11*
ACCESSING CORPORATE MEMORY – SOME KNOWLEDGE STRUCTURE CONCEPTS

Ronald C Beckett
Hawker de Havilland, Australia
Beckett.ronald@hdh.com.au

Abstract

A model of a “Corporate Memory” that influences an organisation in carrying out its purpose, and is a repository of information and knowledge beneficial to the future operation of the organisation is used to suggest ways of deriving value from different components of that “Corporate Memory”.

The model is combined with a generic representation of key organisation functions (in this case, representative of a manufacturing organisation) to provide a basis for knowledge “maps” that reflect what an organisation knows and where that knowledge is located.

Key words: knowledge structures, corporate memory, knowledge management

BACKGROUND

If, as many argue, intellectual assets are more important than tangible assets in effectively achieving the purpose of an organisation in the 21st century, serious effort must be put into using these intellectual assets efficiently, in the same way that efficient use of tangible assets is the norm today. But what are these assets, how do we retain them, and how do we know if they are being used efficiently.

For a particular organisation, there will be internal and external aspects to the knowledge important to it that will contribute to a distinctive “corporate memory”. And it is suggested here that the balance is changing, and will continue to change, with external knowledge becoming more important. For example, in a “virtual organisation”, the bulk of the knowledge accessed will be outside of the notional “organisation”. So in discussing “Corporate Memory” in this paper, whilst internal and external elements are featured, one needs to think flexibly about where the boundaries might be.

If a representation of corporate memory is to be of value, then a number of issues have to be addressed:
What aspects of corporate memory might be of most value (is it the company policy manual, or is it something else)? How is this memory made visible and accessed (particularly if significant components of it are outside of the organisation)?

The approach taken to considering these issues is to use a model as a framework for discussion, but consider ways that knowledge sets may be presented and structured to simply provide visibility of different facets of knowledge.

\textbf{INTELLECTUAL ASSETS PERSPECTIVE}

Historically the perceived value of a company has been driven by its financial capital assets. But today, some of the world's largest companies have a market value many times the value of their capital base. The additional value is considered to be related to "customer assets" and "intellectual assets", with an emphasis on the latter. Some researchers [14] are seeking ways to characterise value these intangibles. Some component parts of these assets are individual competencies, internal structures (eg unique practices and systems) and external structures (eg networks of contacts).

Here are efforts to identify and enhance core competencies seen as the source a company's sustainable competitive advantage, and considerable efforts to diffuse expert knowledge to make it easier to both retain by a company and to draw internally to enhance operations (eg Whyte [16]). Legal protection of ownership by patent, copyright, trademark or whatever else makes sense as a "cost" for many companies. Such approaches have an underlying assumption that drawing all these resources within a company will offer an advantage.

But other approaches pull together a network of companies that between them make all the resources to tackle a particular opportunity or task, and this solves sharing intellectual property. Some, such as Australian company Orenton Bay Ventures, go further, and adopt an open source approach, making knowledge freely available on the condition that subsequent enhancements or applications will be available back to the company at no cost. Then Orenton Bay Ventures develops higher level applications using the enhanced knowledge.

These quite different strategies, \textit{formalise knowledge to retain control of it, or formalise knowledge to share it and stimulate its growth, have a common objective – obtain leverage from what the company "knows".} Just what an
organisation “knows” and how to characterise it will be discussed in subsequent sections of this paper.

OBTAINING LEVERAGE FROM A REPRESENTATION OF CORPORATE MEMORY

What does an organisation “know”, and how can this provide leverage. What an organisation “knows” can be characterised using the notion of a “Corporate Memory” that influences the organisation in carrying out its purpose, and is a repository of information and knowledge beneficial to the future operation of that organisation. It will be reflected in the repertoire of practices and routines that are the norm for the organisation, and will have both tacit (vested in people) and explicit (documented and codified) components [12]. It will have both internal (e.g. company computer systems) and external (e.g. a network of contacts) aspects.

In Europe, some information technology researchers are exploring possible codified corporate memory attributes [17]. In broad terms, they have identified the following:

- Different kinds of interfaces that might suggest decisions to the user, or explain results, or critique input decisions
- An administration function that inserts rules, finds redundancies and contradictions
- A database that has case-specific information, general information on external rules and data attributes, and an ontological or meta-information layer that controls the evolution of the information repository

Another group trying to establish a knowledge reference model [18] is focusing on several key design objectives:

- Ease of use, building on experience with book referencing, library science and such-like existing analogues
- Semantic precision, with information relationships and descriptors
- Freedom from buzzwords
- Portability of content, such that the system is not dependant on a specific technology solution
- Adaptability to continuous change and growth that can benefit from the cumulative judgements of multiple experts.

Bearing all of this in mind, a high level systems engineering style model was evolved over a period of a year or so with contributions and critique from some
colleagues [2]. The corporate memory model is made up of a mixture of knowledge sets (some of which may be outside of the business) that could be treated like sub-systems of a total system, with information or knowledge flows between them. The model, which is shown in Figure 1, has eight sub-tier knowledge sets:

- Various kinds of external contacts (generally a "know who" knowledge set)
- An internal know - how knowledge set (commonly thought of as "intellectual assets")
- Owner influences and rules
- Employee/Community influences and rules (eg through union intervention)
- Customer influences and rules
- Company data warehousing of different sorts
- Operational/Business rule sets and routines
- Operations implementation strategies that determine how the knowledge flows will interact with the firms primary business.

![MODEL OF CORPORATE KNOWLEDGE ATTRIBUTES]

**Figure 1: "Corporate Memory" model**
Potential sources of leverage

From examination of the sub-tier knowledge sets described above, different kinds of leverage a particular business might develop by focussing on a particular sub-tier set can be envisaged, as shown in Table 1 below. It might be noted however, that individual sets are part of a total system, and to realise and sustain leverage, multiple knowledge elements are involved. For example, a good Franchise Operation commonly has a Data Warehouse and Business Rule-set as integral parts of the Operational Implementation.

<table>
<thead>
<tr>
<th>SUB-TIER KNOWLEDGE SET</th>
<th>EXAMPLE OF POTENTIAL LEVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPANY INTELLECTUAL ASSETS</td>
<td>• STRENGTH IN CORE COMPETENCIES</td>
</tr>
<tr>
<td></td>
<td>• PATENTS</td>
</tr>
<tr>
<td></td>
<td>• COPYRIGHT MATERIAL</td>
</tr>
<tr>
<td>EXTERNAL KNOWLEDGE BASE</td>
<td>• EARLY TREND &amp; OPPORTUNITY SPOTTING, DEAL BROKERING</td>
</tr>
<tr>
<td></td>
<td>• POWERFUL &quot;VIRTUAL&quot; ORGANISATION</td>
</tr>
<tr>
<td>DATA WAREHOUSE</td>
<td>• RE-USE OF KNOWLEDGE (EG EXPERT ASSISTANTS)</td>
</tr>
<tr>
<td></td>
<td>• TARGETED MARKETING (EG READERS DIGEST APPROACH)</td>
</tr>
<tr>
<td>OPERATIONS/BUSINESS RULES</td>
<td>• MAKE OR CHANGE INDUSTRY NORMS</td>
</tr>
<tr>
<td>OPERATIONAL IMPLEMENTATION</td>
<td>• AGILE SYSTEM</td>
</tr>
<tr>
<td></td>
<td>• FRANCHISE OF WELL DEVELOPED, PROFITABLE BUSINESS SYSTEM</td>
</tr>
</tbody>
</table>

Table 1: Some Knowledge Leverage Strategies

DESIRABLE KNOWLEDGE REPRESENTATION ATTRIBUTES

So we have a model, and we can see ways of potentially obtaining leverage from our knowledge assets, but how can the “knowledge” within each sub-tier set be represented so it can be shared and enhanced?

Lundvall and Johnson [10], noted four kinds of knowledge:
- Know-what, which is knowledge about facts. Know-what is information that can be broken down into bits and easily codified
- Know-why, which is knowledge about principles and laws – it reduces the frequency of errors in technological trials
- Know-how, which is skills, the capability to undertake a given task successfully
- Know-who, which is information about who knows what and who knows how to do what

They also suggested that in most organisations, these types of knowledge must cover at least three distinct domains: technical competencies and capabilities, organization capabilities and “system” capabilities in terms of interactive links.

It was noted that know-what and know-why are closest to the traditional concepts of science that can be readily transmitted as information. Know-how and know-who are not so easily transmitted, requiring personal contact, observation opportunities and social interaction with an extended network.

In considering ways to exchange knowledge in a recent international research program, knowledge to be transferred was classified as available in Documentary form (reports, e-mail), or in Procedural form (models, processes) or as Background knowledge (personal or organisational tacit knowledge). In the same project, management roles of co-ordinator, collaborator and communicator were formalised to facilitate operations in a “virtual” project environment. In broad terms, they dealt with technical, organisational, and systems knowledge domains respectively, and were thus consistent with the observations of Lundvall and Johnson [10] mentioned earlier.

There is also the issue of volume to be addressed. With ready access to the Internet and other sophisticated data search possibilities, the issue for many people is represented by Berreby [3] in his paper “Finding the knowledge needle in the data haystack”. He notes that this situation can lead to a paradox: extra details can obscure patterns and make it harder to get useful facts; and quotes the view of a colleague concerned with knowledge management – that the emphasis is no longer on information processing, storage and analysis; but on representation. He discusses the use of a range of sensory perceptions besides words and numbers: colour, texture, sound; to be able to rapidly assimilate “represented” information through metaphor and analogy. A related view is expressed by Marceau [11], who noted that the expanding supply of codified knowledge is increasing the demand for skills relating to the recognition of patterns in data and selecting relevant data for scrutiny.
In dealing with large volumes of information in the past, people have developed special “maps” (eg a street directory) and “Indexes” (eg library indexing systems). Such devices enable information to be organised in a hierarchical way that enables big-picture visibility and top-down searching, or using supplementary information, detailed visibility and bottom-up searching. They also have a relatively stable structures and a small number of attributes (eg the standard symbols for roads, railway lines etc on a map) that provide semantic precision, but which combined together provide a large amount of information at a glance.

Some of the notions discussed above are put together in Table 2 to suggest a knowledge classification and representation approach. The notion of “maps will be considered again later in this paper.

<table>
<thead>
<tr>
<th>KNOWLEDGE TYPE</th>
<th>CLASSIFICATION APPROACH</th>
<th>REPRESENTATION APPROACH</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>KNOW-WHAT</td>
<td>DOCUMENTARY (eg reports)</td>
<td>ANALOGUE MAP PLUS ASSOCIATED DIGITAL DATA</td>
<td>• Street directory using standardised symbols</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Document framework with standard software (eg Microsoft Word)</td>
</tr>
<tr>
<td>KNOW-WHY</td>
<td>PROCEDURAL (eg models)</td>
<td>ANALOGUE MAP PLUS ASSOCIATED DIGITAL DATA</td>
<td>• Street directory using standardised symbols</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Model framework with exchange standards (eg STEP)</td>
</tr>
<tr>
<td>KNOW-WHO</td>
<td>BACKGROUND (eg experience unique to an individual or organisation)</td>
<td>SHARED PERSONAL INFORMATION WITHIN A CLASSIFICATION STRUCTURE PLUS PERSONAL CONTACT PROCESSES</td>
<td>• “Who,s –Who” indexes</td>
</tr>
<tr>
<td>KNOW-HOW</td>
<td></td>
<td></td>
<td>• White pages / yellow pages telephone directories</td>
</tr>
</tbody>
</table>

Table 2: Some Knowledge Classification Views

DIFFERENT VIEWS OF ORGANISATIONAL KNOWLEDGE

The approaches to knowledge representation discussed so far require a stable framework within which the representation resides. The model of corporate memory presented earlier is considered to be stable, and is useful in understanding where knowledge may be found, and how different knowledge flows lead to action, but it does not address the issue of different knowledge domains. This could be accomplished by having parallel corporate memory
views, each representing a different domain. But what is an appropriate set of
domains in this context?

It can be argued that at some level of abstraction, all organisations are the
same, for example, as noted earlier, all will have technological, organisational
and systems aspects to their operations. All manufacturing operations buy
things, work on them, and package and sell things. All organisations have some
kind of Human Resources management system.

Here are some illustrative examples of models used within some parts of an
Aerospace company, Hawker de Havilland, over a number of years to provide a
systems framework for corporate knowledge.

The first was used in the early 1990’s during a period of intensive Business
Process Re-engineering. It was derived from work done in an associated
company to try and develop a coherent computer systems approach between
disparate divisions of a recently agglomerated business. The business process
was defined as a number of functional systems linked by information flows.
The systems were: Operations research, Engineering design, Manufacturing
engineering, Materials management, Shop floor management, Customer order
support, Quality management, Personnel and administration, Financial control
and accounting, Production scheduling and control, and Project management

Each functional system and sub-system had a brief description, and a data
dictionary provided a consistent terminology for information that flowed
within and between functional systems.

This model was used for a number of purposes:
1. as a framework to collect information about a myriad of mainframe,
   personal computer and manual systems used by individuals within the
   organisation to carry out their daily tasks
2. as a checklist to confirm that all activities had been assigned to someone
   after a substantial re-organisation
3. as a benchmarking framework to compare resource utilisation in different
   Operating Divisions of the organisation

A second model, currently in use in some parts of the business was developed
by a colleague, Ross Penfold, building on his experience with such modeling in
another industry. This model defines, at a very general level, systems that it is
considered any business must have as:
• **Leadership and management systems**: including vision, mission, strategic planning and strategic change elements

• **Customer and commercial systems**: including marketing, financial management, information technology and procurement elements

• **Human resources systems**: including employee and labour relations, people and organisational development, performance measurement and remuneration system elements

• **Technology systems**: including production processes, process capability development and process control elements

• **Innovation systems**: including research and development, and continuous improvement methodologies

• **Quality systems**: including quality assurance systems and quality control processes elements

• **Asset management systems**: including maintenance, OH&S assurance and environmental management elements

As with the previous model there are sub-systems that are probably company or industry unique. There are three views available of each system; a daily operations view, a tactical planning and organising view, and a longer term strategic view. The model can be accessed from the company intranet system, with hyperlinks to existing documents, procedures, computer programs or web-based information. At this stage, the full representation is only available for some systems.

It is noted that how useful particular knowledge is depends on environment and context. If this changes with time, then maintaining an up-to-date knowledge system can be a significant task. For example, a Company may retain copies of some particular legislation to keep up to date, but if the rate of change is too high, or the company does not have some-one who can interpret the significance of changes, this information will not be useful. The company may choose to take expert advice from a consultant instead, moving from an internal knowledge set to an external one. Examples like this highlight the need for a stable reference architecture that is kept relevant by some simple process.

Another issue relates to the opportunity to convert new knowledge to action within a particular organisation. Acquiring new knowledge that cannot be used may not be regarded as value adding. In studying knowledge transfer within and between enterprises, O'Dell and Grayson [13] observed a number of potential cultural barriers: Ignorance, No absorptive capacity, Lack of pre-existing relationships, Lack of motivation,
O’Dell and Grayson [13] have also observed a number of systemic barriers that tend to dominate some companies

- The silo company: focussed units with no incentive to share information
- The NIH company: that values local knowledge creation over knowledge sharing
- The Babel company: with far-flung employees that lack a common purpose
- The By-the-book company: that considers documented knowledge is the only valid form
- The Bolt-on company: that considers adding knowledge transfer responsibilities to a duty statement is all that is needed.

It is suggested that different forms may exist within one organisation.

SOME PARTICULAR ISSUES IN THE “VIRTUAL ORGANISATION”

In considering a conventional organisation using the model of corporate memory described earlier, there were four internal knowledge sets that influenced the working of the organisation, and four external ones.

It is suggested here that in a “Virtual Enterprise”, there is only one internal knowledge set: that related to a negotiated set of business rules, with an implementation strategy knowledge set being evolved as the work of the enterprise proceeds. This may be illustrated by drawing on a case study of a Film-making Enterprise [8], where an Enterprise is established for the project, then completely disbanded when the project is finished. The project starts with an idea by one or a few individuals plus some shareholders who determine artistic and financial “rules”. The project accesses knowledge through clusters of industry specialists and resources (e.g. around Hollywood) who help develop an implementation strategy, then do the work. Knowledge transfer is primarily through socialisation processes occurring in parallel with film production, and some elements of “corporate memory” are held at an Industry level, not at the level of an individual firm.

Today, the expression “Virtual Enterprise” tends to be associated with electronically connected, remote participants (but as the example above illustrates, this need not necessarily be the case). Where a team is separated in time and/or place of work, it may be considered that “rules” and “intellectual assets” are being represented in terms of information exchange standards and software. Considerable effort is being put into the development of these tools, which facilitate transfer of documentary and procedural knowledge. But it
seems that tools to facilitate exchange of background knowledge are less developed.

Coleman [4] has recently presented some views on electronic collaboration and the evolution of "community". Several definitions of electronic collaboration are offered, but the one selected to support discussion here is "intentional group processes plus software to support them", where collaboration is seen as many-to-many and goal oriented, whereas communication is seen as one-to-one and unstructured. A kind of scorecard is presented to help people think about the readiness of their organisation to pursue full scale electronic collaboration, with the following factors being rated out of 10:

- Technology (provides everything needed to collaborate) – weighting factor = 1
- Culture (trust, common goals, acceptance of risk-taking and sharing) – weighting factor = 2
- Economics (is it economically critical to collaborate) – weighting factor = 3
- Politics (management believes it is important) – weighting factor = 4

It is interesting to note that technology is not the main driver. Coleman has also observed that the weighting factors may be different in different countries, depending on the national disposition towards teamwork. The factors shown above are for North America. The evolution of "community" is seen as developing from network applications such as e-mail and groupware in the early 1990's through knowledge management in the late 1990's. Whilst real-time collaboration tools (audio, visual and data) are rapidly evolving, there is considerable turbulence in the product range available.

There are suggestions that a virtual enterprise be treated like a project, with a finite life. This is effectively the approach supported by the GERAM architecture referred to earlier. Many conventional firms are becoming more project oriented as product life cycles decrease and as more work is outsourced, but there are special issues associated with distributed project management. Coleman [5] sees some of these issues as:

- Project norms moving from same-time, same-place to any-time, any-place
- Readiness for collaboration, as previously discussed
- Selecting from alternative facilitating technologies, grouped as:
  - Traditional project control (eg Artemis)
  - Portal centred task management (eg)
  - Hybrid solutions (eg)
  - ASP’s offering applications and services at a distance (eg)
• The availability of project managers capable of working in this environment

DISCUSSION

This paper set out to explore some knowledge structure concepts for accessing corporate memory. A representation of that memory, characterised as a number of interlinked generic knowledge sets has been presented. It has been noted that all knowledge sets will have both explicit and tacit knowledge components. In further discussing approaches to structure, it appears that a multiplicity of views, each with sub-tier components is needed. A particular organisation’s operating environment and infrastructure may help or hinder knowledge transfer. The diversity represented in these different perspectives is possibly what makes the concept of knowledge management complex and fuzzy when it comes to implementation of a program of some sort.

Allee [1] observes this fuzziness and contends knowledge is “too complex and fluid to be designed, processed and managed from an old thinking perspective”. She observes twelve qualities of knowledge supporting that view.

Particular organisations have tried to deal with this complexity by focussing on a subset thought important to the organisation, but this has not always been successful. Lucier and Torsilieri [9] noted that some initiatives taken in the name of knowledge management (eg putting a company manual on-line) may not lead to improvement unless there is associated action to beneficially change some current practices. Similarly, Davenport [7] observes that just building a framework, without content that will make business sense and stimulate its use, may be wasteful.

In this paper, the intention is to establish a multi-tier framework that is relatively simple. Earlier discussion had suggested primary links between particular corporate memory knowledge sets and the way they might provide leverage to deliver value to a particular firm, eg franchising might build on well developed implementation strategies. This kind of view might be used to make business sense of the content of a corporate memory representation. Taking this approach, for each knowledge set, documentary, procedural and background knowledge elements would be identified for each domain relevant to a particular business. And for each domain an application area would be identified (eg strategic, tactical or operational). This would yield the kind of
framework element illustrated in Figure 2 below, and could provide the basis of Knowledge “maps” of an organisation.

Figure 2: Sub-tier Knowledge Structure

For example, if the 8 knowledge sets of the corporate memory model described earlier were combined with the 7 business systems identified by Hawker de Havilland, then there would be 56 framework elements of the type represented in the diagram above. Current knowledge access status could be readily appreciated by scanning a 8 X 7 matrix representation where each entry contained a symbol (eg tick / cross) representing status (eg substantial knowledge accessible; or some knowledge accessible; or little knowledge accessible or status unknown). This would enable scanning of the matrix to see where gaps exist, for comparison with the Enterprise’s strategic needs, as there might be some framework elements less important than others in particular circumstances (eg individual employee career development may not be a key issue in a virtual enterprise). A similar approach could be taken within each framework element. Whilst most businesses may require a number of sub-tier domains (eg project management as a subset of Leadership and Management
systems) to be identified to provide adequate visibility, (substantially increasing the number of elements), this relatively simple pictorial overview is still considered to be useful.

It was noted in the figure above that each knowledge type / knowledge application area combination should have both an analogue and a digital representation. An example of this would be a “mindmap” created utilising MindManager software that can flexibly represent knowledge artifacts, with access to more detail via sub-tier maps and hyperlinks (refer www.mindjet.com For further details).

The notion of knowledge “maps” described here is consistent with the views of Davenport [6] who felt that knowing where knowledge can be simply accessed is important to the success of a knowledge program.

CONCLUSIONS

A model of “corporate memory “has been used to indicate how different internal and external facets of that memory might deliver value to a particular organisation. It is suggested that a “Virtual Enterprise” has a larger number of external components to its “corporate memory”, and has some special knowledge transfer needs.

The model plus its characteristic components (documentary, procedural and background knowledge) has been used in conjunction with generic knowledge domain and knowledge application views to suggest a stable framework that assists in “mapping” organisational knowledge.

A number of success factors and potential barriers to be considered in any knowledge program have been noted. These indicate that whilst technology and culture aspects are important to the successful operation of a knowledge program, sound economics and a supportive Enterprise political climate are critical in the establishment phase.

REFERENCES

17. Anonymous (1997:1) Product knowledge sharing – Building a corporate memory. AI Watch, Published by AI Intelligence, Oxford, July
“A DIAGNOSTIC TOOL FOR IDENTIFYING BARRIERS TO ORGANISATIONAL LEARNING”

by

Ronald C Beckett
Hawker de Havilland
361 Milperra Rd, Bankstown
Australia 2200
beckett.ronald@hdh.com.au

ABSTRACT

The author has been exploring and experimenting with various aspects of organisational learning within his own organisation. It is argued that, in order to remain competitive or relevant in a turbulent operating environment, organisations must not only excel at what they do, but must continuously learn and adopt new approaches consistent with that operating environment. The new approaches must not only lead to internal benefits, but must ultimately provide improved value propositions for the organisation’s customers. This paper considers what stimulates or constrains both internal and external aspects of organisational learning, and what barriers might predominate in a particular organisation.

From a review of some literature related to the “Learning Organisation” and “Knowledge Management”, it is suggested that recurring themes of enabling competencies, facilitating processes and facets of knowledge management emerge. Combining these themes with a Discover-Choose-Act representation of learning, a matrix of organisational learning attributes is developed. A diagnostic tool that considers deficiencies in these attributes is presented.

INTRODUCTION

It is argued that, in order to remain competitive or relevant in a turbulent operating environment, organisations must not only excel at what they do today, but must continuously learn and adopt new approaches consistent with that operating environment. Such views are, for example attributed to Shell’s strategic planning group, and to the CEO of General Electric, Jack Welch (Senge et al, 1999).

In recent years within the author’s organisation there have been relatively rapid, multifaceted changes: an internal program to emphasise team-based work, changes of ownership, some changes of management, market volume changes and increased competition related to global political changes. Looking at the future, there is no reason to suppose that turbulence will moderate in terms of technological change, changing social values, demographics and International relations. This organisation simply cannot avoid learning new things and adopting new practices if it is to survive.

It is also argued here that any new approaches adopted must not only lead to internal benefits, but must ultimately lead to innovations that provide better value propositions for the organisation’s customers. Otherwise, even though the learning may be beneficial for the individuals within the organisation, the organisation itself is in danger of becoming irrelevant. For customers of the author’s organisation, good pricing,
delivery and quality reliability are a necessary, but not sufficient basis of competition. These attributes must be maintained and improved, but other sources of value (e.g. faster time-to-market for new products) must be identified and aggressively pursued. Not embracing concepts of this sort will simply lead to a steady decline in the business.

For the authors' organisation (and many others probably), such environmental factors may require "re-invention" of the business within a current framework of Industry restructuring, recognising the Company's current positioning. It operates in a relatively high labour cost region of the world, so must leverage benefits arising from the evolution of the knowledge economy. Working smarter is an imperative. There is now also a new willingness by its customers to introduce technology and product change earlier in its evolutionary life cycle, so the business will have to operate with less mature technologies than may have been the traditional norm. At a minimum, therefore, continuous and rapid adaptation of the business is needed. And whilst there may be considerable capacity to draw on the current knowledge of the organisation, it is suggested that ultimately, the rate of beneficial change will be linked to the rate of learning things new to the organisation and applying this knowledge. Current knowledge must be shared and re-used, not re-invented in different parts of the organisation. Current knowledge and new knowledge must be utilised to yield innovative combinations. So there are issues of organisational learning and knowledge management that should be linked to maximise benefits.

From such perspective's, this paper considers what stimulates or constrains both internal and external aspects of organisational learning, and what barriers predominate in a particular organisation or parts of it. A representation of key Learning Organisation attributes, and a diagnostic approach to potential failure areas is presented.

SOME ATTRIBUTES ASSOCIATED WITH ORGANISATIONAL LEARNING

Can organisations learn? Whilst organisations only function through people, and people may be the agents of organisational learning, what the organisation "knows" can have a degree of independence from individuals. An example would be an Army, where rituals, procedures, culture and a clear mission provide a consistency of purpose, and formalise organisational knowledge that is retained as individuals join and leave the Army. Such an organisation also maintains learning processes and competencies to manage this flow of knowledge to individuals in an appropriate context. As Marceau (1997) points out, "knowledge in contrast to information) involves understanding the significance of the information and its re-organisation into useful applications. Because of this, the concept of knowledge includes a skills component as a central element."

A logical flow of knowledge acquisition, knowledge dissemination and knowledge utilisation can be seen in action in an Army, both in its training mode and in operational mode. Intelligence gathering and its targeted, rapid distribution, subsequent action and feedback on lessons learned are all part of the operational norm. These three generic knowledge management processes and a range of sub-tier processes have been adopted by a number of researchers (e.g. Nevis, DiBella and Gould, 1995) to characterise organisational learning (refer Table 1 below).

Other researchers also describe attributes or competencies that stimulate organisation learning. Senge (1990) focuses on systems thinking, personal mastery, mental models, shared vision and team learning, and in later research (Senge et al, 1999), identifies a range of processes that sustain organisational learning. From a study of about 140 Australian and New Zealand companies, Dunphy, Turner and Crawford (1996) suggested that certain competencies were needed to implement change arising
from organisational learning. They focus on Engagement (commitment formation, motivating and enthusing, enaction, integration, communication and path finding) and performance measurement competencies as facilitating learning and change. In addition, they found that business and technology competencies had a powerful effect on present performance, but not on an organisation's ability to learn new things and change.

There are views that the appropriate learning processes are contingent on the maturity of the organisation, its operating environment and what needs to be learned. For example, a start-up Company may be trying to improve its management competencies, whilst an established company may be trying to improve its innovation competencies. In addition, Fulmer (1994) has observed environmental factors may cause "maintenance learning", "shock learning" or "anticipatory learning" to dominate as the norm in a particular enterprise. And that, in coping with the environment, an organisation may choose one of four drivers of learning, characterised by "Because I say so", "As you like it", "change mastery" and "inventing the future". Research by Malerba (1992) has suggested that the choice of the most appropriate learning process is related to the strategic outcome sought. Process improvement is supported by learning, by doing and using and interacting with equipment suppliers. Technical improvement in input materials is supported through learning by interacting — with suppliers and customers. Product differentiation is supported by interaction with customers/users; improvement and differentiation through quality and performance being supported by learning by searching (eg through research and development).

There are specific learning domains that are important in different parts of the organisation, that have different functions and different operating environments (eg strategic planning compared with day-to-day operations). And there are views that action learning in teams with some diversity in the participants backgrounds an important practice (eg Belbin, 1996). This leads to the perspective that individual learning, team learning and organisational learning are all important to the holistic processes of knowledge acquisition, dissemination and utilisation, but each may need a different emphasis in the sub-processes utilised. This multi-level learning is well illustrated in a study by Leonard-Barton (1992) describing "the factory as a learning laboratory". Marceau (1997) takes this multi-level observation further, referring to the "learning economy" at a National level where processes of the use of knowledge and its incorporation into innovation provide a basis for global competition. The importance of networking and shared knowledge are further emphasised in this context.

In summary, it is argued the "learning organisation" focus is on acquiring technical mastery in some particular competencies and on applying problem solving, networking and knowledge sharing processes that lead to enduring beneficial change in the organisation.
<table>
<thead>
<tr>
<th>LEARNING SYSTEM ELEMENT</th>
<th>LEARNING ORIENTATION: CHOICES OF PRACTICE</th>
<th>FACILITATING FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORE COMPETENCIES</td>
<td>SKILL DEVELOPMENT FOCUS</td>
<td>INVOLVED LEADERSHIP</td>
</tr>
<tr>
<td></td>
<td>Individual or group? Development</td>
<td>Leaders articulate vision are engaged in its implementation, frequently interact with members, are actively involved in educational programs</td>
</tr>
<tr>
<td></td>
<td>of individual skills versus team or group skills, or a balanced mix?</td>
<td></td>
</tr>
<tr>
<td>ACQUISITION</td>
<td>KNOWLEDGE SOURCE</td>
<td>SYSTEMS PERSPECTIVE</td>
</tr>
<tr>
<td></td>
<td>Internal or external? Is there a preference for developing knowledge internally, or a preference for externally developed knowledge, innovation/adaptation or imitation?</td>
<td>Interdependence of organisational units understood, problems and solutions seen in terms of systematic relationships among processes. Systematic connection between units needs and goals and those of the enterprise</td>
</tr>
<tr>
<td>DISSEMINATION</td>
<td>PRODUCT-PROCESS FOCUS</td>
<td>SCANNING IMPERITIVE</td>
</tr>
<tr>
<td></td>
<td>What? How? Emphasis on accumulation of knowledge about products/services versus on how these things are developed, made and delivered</td>
<td>External information gathering, curiosity of and awareness about the external environment</td>
</tr>
<tr>
<td>DISSEMINATION</td>
<td>DOCUMENTATION MODE</td>
<td>CONCERN FOR MEASUREMENT</td>
</tr>
<tr>
<td></td>
<td>Is knowledge something individuals possess versus publicly available know-how</td>
<td>Considerable effort spent on defining key factors when venturing into new areas, metric analysts seen as a learning activity</td>
</tr>
<tr>
<td>UTILISATION</td>
<td>DISSEMINATION MODE</td>
<td>EXPERIMENTAL MIND-SET</td>
</tr>
<tr>
<td></td>
<td>Formal or informal? Prescribed organisation wide methods of learning versus informal methods, such as role modelling and casual daily interaction. Explicit versus tacit knowledge</td>
<td>Support for trying out new things, understanding how things work. Ability to &quot;play&quot;, with &quot;failures&quot; accepted as highlighting new learning opportunities</td>
</tr>
<tr>
<td></td>
<td>LEARNING FOCUS</td>
<td>CLIMATE OF OPENNESS</td>
</tr>
<tr>
<td></td>
<td>Incremental/corrective learning versus transformative or radical learning. Single loop or double loop emphasis?</td>
<td>Accessibility of information, open communication within the organisation. Problems/issues/lessons shared, not hidden. Debate and conflict are acceptable ways to solve problems</td>
</tr>
<tr>
<td></td>
<td>VALUE CHAIN FOCUS</td>
<td>CONTINUOUS EDUCATION</td>
</tr>
<tr>
<td></td>
<td>Emphasis on learning investments in engineering/production (design and make) versus sales/service (market and deliver)</td>
<td>Ongoing commitment at all organisational levels, clear support for all members growth and development</td>
</tr>
</tbody>
</table>

(Derived from Nevis, DiBella and Gould, 1995)

**TABLE 1 PRACTICES ASSOCIATED WITH ORGANISATIONAL LEARNING**
EMBEDDING LEARNING IN THE ORGANISATION

Having competently acquired new knowledge, this knowledge must be shared and utilised for the benefit of the organisation and its customers to obtain maximum leverage. And judiciously focussing on critical knowledge is essential to avoid being swamped by inappropriate detail. There is a clear "Knowledge Management" function to be established.

In presenting the opening paper at a knowledge management conference, Martin (1997) raised the question "was the recent enthusiasm for knowledge management unique, or just a facet of general management that had always been practiced? Is it valid to regard knowledge as a unique resource and is knowledge management simply some form of intensive management process?" He contends that all these perspective's are valid and that management of knowledge assets and management of processes for creating, organising and transferring sharing knowledge, together define knowledge management, but there currently seems to be a bias in interest toward the asset/resource-based approach. This interest arises because knowledge is seen as a source of competitive advantage (e.g. Lucier and Torsilleri, 1997).

Martin and others indicate knowledge needs to be acted on and discuss links with innovation and productivity, with an emphasis on influencing the speed of innovation and re-using knowledge to enhance operational productivity. In broad terms, this is also the view of Lucier and Torsilleri (1997) and Davenport (1996, 1997) who have observed the failure of knowledge management schemes in many companies because the focus was only on making the resource available. The former notes that organisational change management capability and capacity is also required, the latter notes some pitfalls expressed as:

- "If we build it ...... they will come" (just setting up a great tool kit is not enough)
- Let's put the personnel manual on-line" (not focussing on the most valuable knowledge will provide limited leverage)
- "None dare call it knowledge" (concern about perceptions of academic, not practical use)
- "Every man is a knowledge manager" (so we don't have to set up any special systems or processes)
- "Justification by faith" (need to have real reasons for establishing knowledge systems and examples of real beneficial outcomes to justify them)
- "Restricted access" (improving accessibility in isolation will not yield significant benefits. People must want and use information)
- "Bottoms up" (this is not just sharing all information available with all employees – be aware of the political or competitive restrictions on sharing some information)

This may be interpreted as sustaining a need to identify and focus only on critical information, as implied by Davenport (1996, 1997). And what is "critical" may vary with time. For example, perhaps putting company manuals on the Intranet is not the first priority when your business is shrinking and survival is at stake, although it may be helpful in improving efficiency at some other time. It is suggested that the above observations imply the need for a number of inter-linked knowledge acquisition, dissemination and utilisation building blocks to be in place to get effective outcomes from a "Knowledge Management System".

5
Olson (1997) discusses Information Technology as an enabler of knowledge management (noting it is necessary, but not sufficient), to facilitate:

- learning and the creation of new knowledge
- the management and protection of intellectual assets
- collaboration for innovation and creativity
- leveraging what is already known

The recommended approach is:

- diagnose knowledge sources, needs, gaps
- develop a classification structure, architectural principles for storage, etc
- define organisational knowledge management processes
- build facilitating infrastructure

On the latter recommendation, Marceau (1997) points out that facilitating infrastructure includes things external to the organisation, such as joint industry training or marketing Boards, and goes on to generalise technology capabilities as, to quote:

- "Human capital. This includes skills developed through formal education and the tacit skills arising from training and experience
- Physical capital. This includes instrumentation, research and test facilities
- Knowledge. This includes design methodologies and test facilities
- Organisation of the productive system. This includes the strength and spread of networked relationships between users of a technological service and its suppliers and the existence of joint industry-government planning forums."

It is further pointed out that this infrastructure is important in developing capacity to absorb and diffuse externally developed knowledge and innovations, and supports the development of generic, cutting edge technologies through co-operative efforts.

Returning to a discussion of Information Technology, Marceau (1997) also reports on the observation in an OECD study that learning firms are obsessed by building non-price competitive advantage from creative use of information, whose cost is rapidly decreasing with the on-going technology revolution.

The wide range of information technology initiatives being promoted may be aligned with the knowledge characterisations of Lundvall and Johnson (1994), who noted four kinds of knowledge:

- **Know-what,** which is knowledge about facts. **Know-what** is information that can be broken down into bits and easily codified (e.g. in software or data-bases)
- **Know-why,** which is knowledge about principles and laws – it reduces the frequency of errors in technological trials (and can be represented in models and simulations)
- **Know-how,** which is skills, the capability to undertake a given task successfully (that may be enhanced with computer assisted learning)
- **Know-who,** which is information about who knows what and who knows how to do what (that may be enhanced using databases and search agent technology)

It is also suggested that these types of knowledge must cover at least three distinct domains: technical competencies and capabilities, organisation capabilities and "system" capabilities in terms of interactive links.

It is noted that know-what and know-why are closest to the traditional concepts of science that can be readily transmitted as information that can be subsequently internalised. Know-how and know-who are not so easily transmitted, requiring
personal contact, observation opportunities and social interaction with an extended network.

With ready access to the Internet and other sophisticated information technology enabled data search techniques, the issue for many people is represented by Berreby (1996) in his paper "Finding the knowledge needle in the data haystack". He notes that this situation can lead to a paradox: extra details can obscure patterns and make it harder to get useful facts; and quotes the view of a colleague concerned with knowledge management – that the emphasis is no longer on information processing, storage and analysis; but on representation. A related view is expressed by Marceau (1997), who notes that the increasing supply of codified knowledge is increasing the demand for skills relating to the recognition of patterns in data and selecting relevant data for scrutiny. So whilst knowledge dissemination is important, sorting through it and utilising that which provides the most leverage is also an important practice.

In a broader context, Marceau (1997) reports on studies by the EOCD and others of an industrial structures' "knowledge distribution power": how flows of knowledge move through a national system of innovation, and what impediments to these flows reduce an economy’s capacity to learn. Knowledge distribution power is the capacity to "ensure timely access by innovators to relevant stocks of knowledge". Four types of knowledge interaction were noted:

- Inter-industry flows of knowledge
- Joint industry research
- Industry/research institute/university collaborations
- Mobility of highly trained personnel

There are presumptions here that the source of knowledge, whether that be an individual or an organisation, is willing to share the knowledge, and to devote time and resources to support the transfer. However, where the knowledge is perceived as a source of competitive advantage, there may be no such willingness.

In studies of internal best practice transfer, Szulanski (1996) found that willingness to share knowledge was not a major issue, but he identified some pre-requisites to the success of that process:

- Compatible language; that recipients be able to understand what is being offered in order to exploit the new knowledge;
- Casual ambiguity – there should be no confusion about what factors really make the knowledge useful, and how it relates to the transferee’s environment;
- And another contextual issue described as "arduous relationship", where there may be numerous individual exchanges and/or communication may be a problem, resulting in a distorted message being sent.

In summary, it is argued that knowledge management is about the management of a resource that has an intangible element, but a significant codified element; and that certain competencies are needed to manage and utilise this resource to achieve beneficial change.

AN APPLIED LEARNING CYCLE /ATTRIBUTE MATRIX

There is clearly a complex range of things that could be considered to characterise organisational learning that leads to action. In this section of the paper, the objective is to create a form of map that puts those attributes considered to be most significant (from the authors viewpoint) into a learning cycle context.
requires structured processes and go/no-go criteria. All learning and improvement opportunities need to be dealt with in a similar way.

- Management processes to search and sort critical knowledge for dissemination. This requires some understanding of which information is critical (eg Davenport, 1996, 1997) and an ability to work with both tacit and explicit knowledge (eg Nevis et al, 1995)

Expectation to Act attribute are;

- Competency in communications. A number of researchers have identified shared vision (eg Senge, 1990), involved leadership (eg Nevis et al, 1995) and engagement (eg Dunphy et al, 1996) as important factors in achieving change. Others have highlighted the use of “images” and “maps” to help employees relate to an organisation (eg Argyris and Schon, 1978)
- Competency in negotiation is needed to transform the mental models of people implementing new and diverse ways of working (eg Senge, 1990; Cope and Kalantzis, 1997)
- Established change management processes. Dunphy et al, 1996, highlight that organisational learning must lead to change to be effective. Lucier et al, 1997 make the same observation about knowledge management programs. A repertoire of change programs is needed to suit the environment associated with a particular organisation at a particular time.
- Balanced measurement processes are needed to understand how the learning journey is progressing, and to provide systematic feedback, reinforcement, and further learning opportunities (eg Kaplan and Norton, 1992; Dunphy et al, 1996 and Senge et al, 1999)
- Management processes to re-use and leverage knowledge, resulting in unique, innovative combinations. Processes involve both tacit and explicit knowledge (eg Nonaka and Takeuchi, 1995), with knowledge transfer practices being critical (eg O'Dell and Grayson, 1998) in supporting enhanced internal and external collaboration. I.T. infrastructure both supports this process and facilitates re-use of knowledge.
<table>
<thead>
<tr>
<th>Exploration and DISCOVERY</th>
<th>Enabling COMPETENCIES</th>
<th>Facilitating PROCESSES</th>
<th>KNOWLEDGE Management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Critical questioning</td>
<td>• Dialogue / socialisation</td>
<td>• Indentification and acquisition of information and of knowledge sources (encapsulate / store)</td>
</tr>
<tr>
<td></td>
<td>• Environmental scanning</td>
<td>• experimentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• “Language” compatibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freedom to CHOOSE</td>
<td>• Option identification</td>
<td>• Evaluation / auditing</td>
<td>• Knowledge dissemination (search / sort)</td>
</tr>
<tr>
<td></td>
<td>• Scenario analysis</td>
<td>• Decision support mechanisms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Technical mastery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expectation to ACT</td>
<td>• Negotiation</td>
<td>• Change Management</td>
<td>• Knowledge utilisation (re-use / leverage) resulting in innovative, unique combinations</td>
</tr>
<tr>
<td></td>
<td>• Communication</td>
<td>• Performance measurement</td>
<td></td>
</tr>
</tbody>
</table>

TABLE 2 LEARNING ORGANISATION ATTRIBUTE MATRIX

STIMULATING ORGANISATIONAL LEARNING

As mentioned in earlier discussion, the participants (both internal and external) in an organisational learning program must be willing to share their knowledge, and to devote time and resources to its transfer. Given this willingness, are the appropriate learning mechanisms and the required capabilities in place? And how is learning flowed through the organisation?

Dunphy, Turner and Crawford (1996) observed from reviews of various organisational learning perspectives that some authors argue that only individuals can learn, others argue that organisations are systems that can learn. They further observe that the
most quoted contributions to the field, Argyris and Schön and Senge, both focus on teaching individuals how to acquire new perspective’s on problem solving. They argue that any definition of organisation learning should “include both the notion of process, i.e. the learning activity, and the notion of organisation performance, i.e. the outcome of the learning process”. “This is not achieved by learning itself, but by action. They contend that the learning underpins and provides quality, consistency and replicability to the action”. In a similar vein, earlier discussion highlighted that just establishing a “knowledge management system” that made information or people accessible, without a process for subsequent action to use the knowledge, has lead to the failure of some programs. It is suggested here that action stimulates learning, and that learning needs to stimulate action.

Some way of assessing progress or benefits is also needed to focus on the most appropriate learning areas. Selecting the key measures and assessing them the right way is seen as important by a number of management researchers (Dunphy et al, 1996, Kaplan, 1992, Senge et al, 1999) in providing feedback on progress, and through a process of critical questioning, providing further learning opportunities.

So, whilst there may be much more to effective organisational learning than just having people experience new things, the view taken here is that people start the process as the agents of organisational learning. In this context, it is instructive to consider a model of how people learn, and how that might relate to organisational processes leading to action. From an organisational perspective, we are concerned with adult learning. The learning model chosen here is one developed by Jarvis (1987) from research into how adults learn and is illustrated in figure 1 below. It was selected because it has a number of attributes consistent with the author’s observations:

- That learning outcomes are contingent on some prerequisites being achieved and on the learning environment
- That the outcome of a learning situation may be that no learning takes place
- That learning is eventually reflected in a changed and more experienced person but, that outcome and any actions arising from it, may be significantly separated in time from the experience itself.
The Jarvis model has a variety of elements and the learning response characteristics can be quite different, depending on the elements that are active and their sequence. Little change may be observed when people do not understand the learning being offered, or felt it just re-inforced what they already know, or if they assigned little value to it. Non-reflective learning could result in indirectly acquiring a particular culture, an increased skill level in an occupation or language, or the commitment of "correct" information to memory. Reflective learning, which produces the most powerful outcomes, could result in; contemplation developing a new belief system, reflective practice raising problem solving skills, and experimental learning supporting pragmatic knowledge that has been shown to be close to reality.

In the context of operating in a turbulent environment, transformational learning is required, so repeating the perspective presented earlier, that the only relevant outcome is one that leads to change. It can be observed that, in the Jarvis model, that only comes via the memorialization of the learning experience, and commonly via an outcome after some evaluation step. Or alternatively by the reasoning and reflective processes from a number of inputs leading to a changed and more experienced person. These process paths need to be stimulated, and it is speculated that these two processes might align with knowledge management and organisational learning respectively at the level of the enterprise. It is suggested here that memorization can be enhanced by knowledge management processes, and that stimulation of reasoning and reflection
through problem solving can be enhanced utilising the competencies and processes previously identified in Table 2.

In discussing the challenges of initiating and sustaining organisational learning, Senge et al (1999) identify a number of predominantly people factors that are consistent with the Jarvis (1987) model. They suggest "not enough time", "no help (coaching and support)", "not relevant" need to be overcome by Executive Leaders "walking the talk" at the initiating stage. Issues of "fear and anxiety", assessment and measurement", and balancing the perspective's of "true believers and nonbelievers" need to be confronted to sustain the transformation.

However to achieve organisational learning, as compared with individual learning, processes leading to embedded change in organisational practices are necessary. These changes may still be associated with people, e.g. through changed organisational values or norms, but should also involve changing work organisation, adapting technology, or changing business support systems for the knowledge to stay with the organisation as people come and go. So a failure to learn can result from a failure at the individual level or at the organisational level.

From studies of how benefits flowed (or didn't flow) from knowledge transfer programs, the American Productivity and Quality Center noted some personal and some systemic barriers (O'Dell et al, 1998)

The personal barriers (that may be reflected at various levels across an organisation) were:
- Ignorance: those who have the knowledge don't realise others may find it useful, those who could use it don't know it exists
- No absorptive capacity: lack of resources or study time to make adaptation of an idea useful
- Lack of pre-existing relationships: no personal dialogue that builds confidence and shares views
- Lack of motivation: No clear reason for making a change perceived.

The systemic barriers that tend to dominate some companies (or parts of them) were:
- The silo company: focussed units with no incentive to share information
- The NIH company: that values local knowledge creation over knowledge sharing
- The Babel company: with far-flung employees that lack a common purpose
- The By-the-book company: that considers documented knowledge is the only valid form
- The Bolt-on company: that considers adding knowledge transfer responsibilities to a duty statement is all that is needed.

It is suggested here that these different cultures may exist within different parts of one organisation.

One can start to see why team learning (eg Senge, 1990) can be an important aspect of organisational learning. The process can start within a part of an organisation, so the systemic factors noted above will have minimal impact at that stage. Individuals can support each other, and a balance can be found between the believers and the non-believers. Evaluation, reflection and reasoning processes may take place quickly within the team if it is given some appropriate facilitating processes.

So organisations can "learn" if people in them have certain competencies, and if a range of business processes are in place. But what if this is not the case? Where is the problem, and what needs enhancement to fix it? With such a large range of potential issues to confront, where would one start, and where should the focus be?
FINDING FOCUS

If establishing a "Learning Organisation" or a "Knowledge Management" capability is of value to an organisation in a turbulent environment, then it is also necessary to understand how it is progressing towards this goal. Combining the attribute matrix described earlier (Table 2) with the recognition that there may be barriers to learning, it is assumed that a deficiency or "missing link" in one stage of the learning cycle will constrain learning. This forms the basis of a diagnostic tool where attributes relevant to each stage are examined to help identify possible shortcomings that must be overcome for organisational learning to progress. The broad impact of such deficiencies is outlined as a top-level diagnostic approach, shown in Table 3 below.

Using the top level Table "possible outcome" descriptions, the likely position of an organisation, or part of it is characterised. Even at this level, some healthy debate normally takes place. The next step involves discussing the possible causes of the "missing link" using the attribute matrix (Table 2). For example, if there is thought to be a problem in the "Expectation to ACT" area, is it:

- A competency problem, with negotiation or communication competencies, or both?
- A process problem, with no effective change management process being available, or the wrong process being selected for the circumstance
- A knowledge utilisation problem, with knowledge being reinvented rather than re-used, or no effective process for combining current and new knowledge in unique ways to yield innovative combinations

<table>
<thead>
<tr>
<th>Exploration and DISCOVERY</th>
<th>Freedom to CHOOSE</th>
<th>Expectation to ACT</th>
<th>POSSIBLE OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>LEARNING ORGANISATION RE-USING AND LEVERAGING ITS ASSETS TO THE BENEFIT OF ITS CUSTOMERS</td>
</tr>
<tr>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>ORGANISATION WITH LOTS OF INFORMATION, BUT LITTLE CONVERSION INTO KNOWLEDGE AND ACTION</td>
</tr>
<tr>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>ORGANISATION ACQUIRING NEW KNOWLEDGE, BUT ONLY USED BY A SELECT FEW TO GIVE SOME ADVANTAGE</td>
</tr>
<tr>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>ORGANISATION LIMITED BY ITS CURRENT KNOWLEDGE, BUT USING IT WELL</td>
</tr>
</tbody>
</table>

TABLE 3 IMPACT OF A MISSING LINK

In stimulating organisational learning there are clearly a large number of influence factors, so with most organisations having limited resources, there are also questions of learning attribute focus and prioritisation to address.
Mention was made earlier that learning needs to result in action. An example of a knowledge management program, where information was well structured and made widely available, but without establishing arrangements to act on this information was also mentioned. The implication of these observations could be that acquiring and refining the ACT attributes should be a first priority. However if these capabilities are not supplemented by a significant flow of new ideas and possible new directions for the organisation from external sources, the organisation may very efficiently stagnate. So the priorities of an organisation may well rotate around the learning cycle elements with time.

In all of the learning phases there are a number of complex attributes to be mastered, and possibly each requires significant effort. So careful consideration is needed of which attribute is the weakest link that requires immediate improvement in order to best achieve the objectives of a particular organisation at a particular point in time. An alternative view is to focus on that attribute capable of yielding a benefit in the shortest time – reinforce a relative strength rather than focus on a weakness.

From the author’s experience, in deciding which attributes to focus on, the following questions should be considered:

- What is the most urgent outcome for the organisation, and which attribute will most likely deliver that outcome
- Does a capability in that attribute exist somewhere within the organisation, and what options exist for accessing the required capability (internally or externally)
- Does sufficient capacity exist to have an impact, and if not, where can sufficient capacity be found
- What constraints might exist that will inhibit learning progress by the organisation. Can these be best removed by acquiring a competency, by utilising a particular process, or by enhancing knowledge management practices? Some examples of constraints are:
  - People in the organisation are not practiced at learning anything new, be it a competency, process or practice (so exercising the discover-choose-act cycle in a simple pilot program may be needed)
  - Learning processes are not valued, or are viewed with suspicion in the organisation (so demonstrating the value of learning through a focus on the Act stage is needed)
  - There is a transitional problem in maintaining the efficiency of an existing arrangement whilst introducing an innovation (so either extra resources or a number of sub-programs must be introduced)
  - The marketplace is not ready to accept the consequences of a particular organisational learning outcome (so educating the marketplace, or making the marketplace a learning focus for the organisation may be needed)

AN ILLUSTRATIVE EXAMPLE

As was indicated in the introduction to this paper, the author’s organisation had determined that making current practices more efficient would be a necessary, but not sufficient basis for remaining competitive in the future. The organisation’s experience in pursuing this goal illustrates some of the learning organisation attribute matrix elements at work.

Exploration and Discovery of new ways of operating was necessary. Critical questioning of current practices through workshop and Business Process Re-engineering activities, and developing them through pilot programs and other
Experiments became the norm. A Consistent Language and vision for the future state of the organisation evolved

Many of the ideas resulted in significant changes to the way the organisation worked, but within two years there were more ideas than the organisation could cope with. The organisation's customers were large global businesses that were changing the way they worked with their supplier base to a more integrative and interactive style, but only with selected suppliers. Forms of Audit and Evaluation (Beckett and Murray, 1998) comparing current status with the visions of both the organisation and its customers highlighted further potential areas for significant change. Choosing the "best" ideas to pursue was necessary, involving Technical Expertise, Decision Criteria and some Scenario Analysis to support effective prioritization in the context of a business environment that continued to change.

The current emphasis of the organisation is on task-oriented Transformational Change and on Knowledge Re-use/Leverage. There is a clear need for enhanced Communication and Negotiation competencies in progressing change with customers, suppliers and the workforce. There is an emphasis on more broadly based Performance Measurement both by the organisation's management and by its customers. Some Learning Organisation attributes have been mastered to a greater extent than others, and there are differences in the stage of development of individual Divisions within the Business. Those pilot groups that have made significant progress have completed several learning cycles, and are back at the Discovery stage but at a new level of performance.

It has been observed that the specific capabilities identified in the matrix are required, but also capacity in terms of time, resources and infrastructure is needed. It is suspected that these issues, along with issues of managing change are behind a commonly recommended pilot program initiation phase. As the pilot area becomes more proficient, it can release resources and offer demonstrated practices to expand implementation of a learning organisation further.

CONCLUSIONS

Concepts of the "Learning Organisation" and "Knowledge Management" that may yield competitive advantage seem simple, and are popular. But the real experience is that their implementation is complex, and there is evidence that many organisations stumble or fail along the way.

In this paper, a "Learning Organisation" is characterised in terms of a Discover-Choose-Act learning cycle with three generic attributes at each stage: underlying competencies, particular processes, and knowledge management practices.

With the model presented in this paper, within each matrix element there is more than one key attribute, so the total number of things to be mastered (or accessed) by an organisation is quite large, and it is noted that:

- A large number of things have to work in concert
- Any one competency, process or knowledge management practice requires considerable expertise, and some require infrastructure support
- 17 items in total to work in harmony, so most likely a multi-discipline team effort would be needed to access competencies and processes to implement any one step in the learning cycle

It might also be noted that simple problem solving that optimises a current system or returns it to the current norm requires less than half of these competencies, highlighting
the effort in becoming a completely competent learning organisation. This observation
is also indicated in the research of Senge et al (1999), where following enunciation of
some learning organisation principles in the early 1990’s, research emphasis moved to
implementation issues, culminating in publication of a "fieldbook", and subsequently
another book describing issues of maintaining momentum.

In considering the broad consequences of failure in a particular stage of the learning
cycle, reference to the associated sub-tier attributes can provide a useful diagnostic
approach. Following this approach through leads to issues of resource allocation and
prioritisation that should be considered by the organisation both from a tactical and a
strategic point of view.

It is noted that whilst the organisation as a whole may have some particular Learning
Organisation implementation issues, there is likely to be some part of that has already
resolved these issues. In this context, the virtues of team-based learning, and of pilot
programs is noted.

REFERENCES

Agote, L. Beckman, S. and Epple, D. (1990) "The persistence and transfer of learning
in industrial settings" Management Science Vol 36 Iss 2 Feb. pp140-154
perspective" Addison-Wesley Publishing, Reading, Massachusetts
management flight simulator approach" European Journal of operations
management, Vol 59, Iss 1, pp 167-182, May 26
approach" in Proceedings of the World Innovation and Strategy Conference,
August, Sydney, Australia
Belbin, M (1996) "The Coming Shape of Organisation" Butterworth-Heinemann,
London
Berreby, D (1996) "Finding the knowledge needle in the data haystack" Strategy and
Cope, W and Kalantzis, M (1997) "Productive Diversity – A New Australian Model for
Work and Management" Pluto Press, Australia
Davenport, T.H (1996) "Some principles of knowledge management" Strategy and
Business, Booz-Allen and Hamilton, Issue 2, pp 34-40
Davenport, T.H (1997) "known Evils – Common pitfalls of knowledge management"
C.I.O., July
Dunphy, D. Turner, D. and Crawford, M. (1996) "Organizational learning as the creation
of corporate competencies" ccc paper 060, The Centre for Corporate Change,
Australian Graduate School of Management, University of New South Wales
Scenarios" John Wiley & Sons Inc, Toronto
Fulmer, R.M. (1994) "A model for changing and way organizations learn" Planning
Review, vol 22, Iss. 3, May-June, pp20-24
Jarvis, P (1987) "Adult learning in the social context" Croom Helm, New York
Performance" Harvard Business review, Vol 70, No.1,Jan-Feb pp 71-79
Leonard-Barton, D (1992) "The factory as a learning laboratory" Sloan Management
Review, Fall issue, pp 23 – 38


Martin, W (1997) "Setting the stage: defining knowledge management" Knowledge Management Conference, Sydney, Australia 22-23 September


M. Olson (1997) "Information technology as an enabler of knowledge management" Knowledge Management Conference, Sydney, Australia 22-23 September


Thomas, C.W (1994) "Learning from imagining the years ahead" Planning Review, Vol 22, Iss 3, pp 6-10, May/June
Sources of Failure in the “Corporate Memory”

Ronald C Beckett¹

¹General Manager, Technology & Innovation, Hawker de Havilland Ltd, Australia

Abstract. This chapter describes a representation of “Corporate Memory” as eight knowledge “sets” with characteristic knowledge flows between them. Some of these knowledge “sets” reside inside a traditional organisation, and some outside the organisation. Every element has some explicit and some tacit knowledge components. Together they stimulate the creation of data, rituals and routines that make a particular organisation unique. Sources of failure within the knowledge sets and in the knowledge flows are discussed. The model suggests that using the organisation’s intellectual assets to stimulate a high rate of beneficial change requires the effective action of two intermediate processes: one related to business rules, and the other one related to their implementation, with both being subject to external influence. Use of the model as a diagnostic aid is briefly discussed.

Introduction

From previous studies of organisational learning, a systems engineering type of model of “corporate memory” was developed which suggested that some components of that memory were internal to the organisation, but some components were external (Beckett, [1]). In this paper, the model is described and used to examine the impact of failure within the different elements of “corporate memory” or failure within the knowledge flows between the elements.

Many organisations today are searching for ways to acquire knowledge that will yield a competitive advantage, and for ways to leverage the knowledge that they already have, to sustain a continuing high rate of improvement. The optimum outcome is to create a combination of practices that is difficult to emulate.

Any organisation, even a newly formed one, will have its own repertoire of practices and routines that reflect the purpose of the organisation and the prior experience of the people in it. And the longer an organisation exists, the more these will be associated with the organisation rather than the particular people in it. For example, most people have some concept of an Army that is independent of the people in it. Unique organisational knowledge will exist in terms of data collected externally and generated internally, routines melded by the operational environment, and relationships reflected in contracts, agreements and structure that may be considered independent of individuals. And when people come into a particular established organisation, they behave differently than in another environment, reflecting the
norms that have developed over time, even though these may not be explicitly enunciated.

This leads to the notion of a “corporate memory”. Some examples are given below

Legal firm, Phillips Fox [2] have captured the knowledge of senior lawyers utilising an information technology approach so that, combined with information from existing repositories inside and external to the firm, the time spent on case research has been significantly reduced. The approach has received awards for its innovative use of technology in the legal profession.

Recruitment firm Morgan and Banks identified both explicit and tacit knowledge that would have a significant impact on their business operations (i.e. critical knowledge), with a focus on enhancing relationships with clients, understanding the capabilities of its people, and evolving smart systems and practices (Whyte [3]).

Experiences such as these illustrate a number of things: that some knowledge and data may be more important than other knowledge and data, that some of the “corporate memory” may lie outside the firm, and that the “corporate memory” will be made up of both tacit and explicit components. In these circumstances, what might enhance that memory, and what might cause it to fail.

Within the model used in this paper, different forms of knowledge are also considered, tacit and explicit, know-how and know-who. The model evolved from discussions within the author’s organisation relating to internally developed software that had been progressively created and enhanced over a long period of time. It was observed that whilst the software had started off as a tool to help people with their then current system of work, it was now perceived by many to actually be the system. The “rules” or tacit knowledge that the software reflected had not been enunciated, but the software had become part of the corporate memory. However there was now something missing from that memory. Such observations indicate that even the value of a codified element of “corporate memory can degrade with time if all elements of that memory are not appreciated and managed.

Knowledge Characterisation and Transfer

It seems that the word “knowledge” can be used in a multiplicity of contexts. At a recent CIO Informat conference (reported by Bushell [4]), a panel group observed that the term knowledge management had been used some 35 times throughout the conference, in contexts ranging from data storage and retrieval to people being stimulated into action. This illustrates that knowledge comes in different forms, generically considered to be either explicit knowledge that is documented and/or codified; or tacit knowledge that is in peoples heads and either consciously or subconsciously utilised.
Nonaka and Takeuchi [5] discuss how an organisation and the people in it learn by knowledge transfer between these two different forms using a number of quite different transfer processes, as shown in the Table below.

<table>
<thead>
<tr>
<th>DESCRIPTORS</th>
<th>TO TACIT KNOWLEDGE</th>
<th>EXPLICIT KNOWLEDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Knowledge gained from experience</td>
<td>Process: Socialisation</td>
<td>Process: Externalisation</td>
</tr>
<tr>
<td>• Simultaneous (here and now)</td>
<td>Outcome: Sympathised knowledge</td>
<td>Outcome:</td>
</tr>
<tr>
<td>• &quot;Analogue&quot; (practice, gradations)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Knowledge gained from rationality and reasoning</td>
<td>Process: Internalisation</td>
<td>Process: Combination</td>
</tr>
<tr>
<td>• Sequential (there and then)</td>
<td>Outcome: Operational knowledge</td>
<td>Outcome: Systemic knowledge</td>
</tr>
<tr>
<td>• Digital (theory, black and white)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the purposes of this paper, as we are seeking competitive advantage, knowledge will be characterised as providing an enhanced capacity to act in ways that ultimately benefit the customers of the organisation. This benefit may be provided through explicit knowledge provided directly to customers, or embedded in equipment or in company systems; or through the actions of people. In either case, to remain competitive, there must be continuous improvement within the business, i.e. it must continue to learn.

One way or another all organisational learning is through the people in it. In researching how adults learn, Jarvis [6] developed a model, that has a number of potential outcomes when people are exposed to a learning opportunity:

- New knowledge may not be acquired if the learner is not able to interpret the language or concepts presented, or if the learner perceives the knowledge simply reinforces what is already known, or if what is presented is contrary to the values of the person.
• Non-reflective learning that enhances the skill level of the person, or leads to incidental learning (e.g. the acquisition of culture) or leads to memorization of the "correct" way of doing things, may take place.

• Reflective learning (with an evaluation step) that changes the way the person acts, or experimental learning (creating pragmatic knowledge as it has been shown to be close to reality), may take place.

Not surprisingly, these kinds of outcomes can be observed at the level of the organisation. In reviewing the outcomes of extensive benchmarking programs and associated knowledge transfer attempts, O'Dell and Grayson [7], and Szulanski [8] observed a large number of instances of non-learning. Szulanski’s research suggested a number of causes: language or interpretation issues that restricted the capacity to appreciate what was being offered; "causal ambiguity"—some difficulty with logic or values; and "tenuous connections"—some difficulty with knowledge hand-over, e.g. due distance or intermediaries between the parties. So if the language of an organisation changes in some way, for example due to a merger or take-over, some aspects of knowledge flow may be degraded, at least in the short term. O'Dell and Grayson suggest a number of practices that will facilitate knowledge transfer. They also observed many instances where, after an extensive benchmarking exercise, best practice was identified in some other part of company undertaking the exercise. This suggests another benefit of characterising and understanding the scope of ones own corporate memory: helping to identify what the organisation already "knows".

A Corporate Memory Representation

A number of authors have referred to corporate memory or something similar, and have started to characterise it in some way. Huber [9] identifies four knowledge management factors linked to organisational learning, described as: knowledge acquisition, information distribution, information interpretation and organisational memory. Demarest [10] describes something akin to corporate memory in a commercial form as commercial knowledge — An explicitly developed network of imperatives, patterns, roles and scripts, embodied in some aspect of the firm, and distributed throughout the firm, that creates marketplace performances. Here a positive outcome for the customer is again raised.

In Europe, some information technology researchers are exploring possible corporate memory attributes [11],[12]. In broad terms, they have identified the following:

• Different kinds of interfaces that might suggest decisions to the user, or explain results, or critique input decisions

• An administration function that inserts rules, finds redundancies and contradictions

• A database that has case-specific information, general information on external rules and data attributes, and an ontological or meta-information layer that controls the evolution of the information repository

Another group trying to establish a knowledge reference model [13] is focusing on several key design objectives:
- Ease of use, building on experience with book referencing, library science and such-like existing analogues
- Semantic precision, with information relationships and descriptors
- Freedom from buzzwords
- Portability of content, such that the system is not dependant on a specific technology solution
- Adaptability to continuous change and growth that can benefit from the cumulative judgements of multiple experts.

Bearing all of this in mind, a high level systems engineering style model was evolved (in the context of a manufacturing organisation) over a period of a year or so with contributions and critique from some colleagues. The corporate memory model is made up of a mixture of knowledge sets, some of which may be outside of the business, that could be treated like sub-systems of a total system, with information or knowledge flows between them. The model, which is shown in the attached diagram, has eight sub-tier knowledge sets:
- Various kinds of external contacts (generally a "know – who “ knowledge set)
- An internal know – how knowledge set
- Owner influences and rules
- Employee/ Community influences and rules (eg through union intervention)
- Customer influences and rules
- Company data warehousing of different sorts
- Operational rule sets and routines
- Operations implementation strategies that determine how the knowledge flows will interact with the firms primary business.

Each of these knowledge sets and the flows between them will be discussed in following sections. A diagrammatic representation of them combined as a knowledge system is shown in the diagram below.
Sub-tier Knowledge sets

The Operations Implementation Strategies knowledge set blends functional requirements, information input and operational data through organisation structure, technological infrastructure, software (not necessarily I.T.) systems and the engagement of people to prescribe the actions necessary and performance expected to meet stake-holder requirements. This set also provides an important feedback avenue. It is an area of focus by Information Technologists, but the dynamic nature of the knowledge set can make a codified approach difficult to sustain.

The Operational Rules knowledge set contains the implicit or explicit “rules”, practices and product requirements that have evolved over time to meet the expectations of various stake-holders and regulatory authorities by exercising the Know how and mental models that represent the companies intellectual assets.

The Data Warehousing knowledge set contains reference data (e.g., market trends) and operational data (e.g., current business performance), including customer performance needs (e.g., delivery schedules) that are accessed to interface with operations. The data is used to directly stimulate action (e.g., make something) or to support decision...
processes (e.g., assess options). The efficiency of data collection is becoming such that
the volume of data can be potentially overwhelming, so there are rapidly developing
technologies for sifting, sorting and pre-packaging it. There is also consideration
being given to different forms of knowledge representation to make scanning and
absorbing it easier (Berreby [14]). From a different perspective, Marceau et al [15]
note that the increasing supply of codified knowledge is increasing the demand for
skills relating to the recognition of patterns in data and selecting relevant data for
scrutiny. This highlights the tacit knowledge component of the data warehouse
function, where the data is an important part of a total decision system. Without an
understanding of this system component, the data may be used incorrectly. The issue
of data quality should also be mentioned. If this degrades with time, e.g., due to data
entry problems, then inappropriate actions may be taken using that data. This can
have the effect of loss of confidence in the data warehouse, and also in the quality of
the feedback from operations that would normally stimulate enhancement of the
Intellectual Asset knowledge set.

The Customer knowledge set has generally explicit product and process requirements
that need to be well understood by the organisation. But as businesses move closer to
their customers, to seek a market advantage and add maximum value, the way
business is done may be just as important as what is done. In addition, the knowledge
that may be accessed via the customer can be valuable in developing a competitive set
of rules and practices within the business. A failure in communications (e.g., due to
changes in personnel) or lack of systems (e.g., Quality Function Deployment) for
properly assessing customer needs can lead to a degradation of critical knowledge
flows.

The Owner knowledge set includes the charter of the business, a range of operating
rules (particularly if part of a larger business) and a range of outcomes expected from
operation of the business. These things can include the explicit knowledge built up
from other business experience, and tacit knowledge, particularly that of the Board or
its equivalent.

The Employee / Community / Legislative knowledge set includes a range of outcomes
relating to how the business operates. For example is job security provided, are ethical
and equitable practices the norm, is the workplace safe and pollution-free, are all
legislative requirements met? The set is a complex mixture of explicit and tacit
knowledge that can vary markedly from one business location to another, even if the
owners and the customers are the same. So different business rules, that may be
implemented using different strategy mixes, can evolve in different locations of the
one company, and this may be essential to have the business operate at all. External
influences totally unrelated to the business or its marketplace, such as changes in
labour relations legislation or in sustainable environment requirements can degrade an
organisations body of knowledge on these matters very rapidly.

It can be argued that the Intellectual Assets knowledge set represents the
conventionally understood know-how of the business. It is made up of intangibles
such as values, norms, networks, people motivation capabilities, and more tangible
assets such as the demonstrated competencies of employees, manuals, paper records, models etc. A complex set of tacit and explicit components, the asset grows and develops from external inputs and feedback from internal operations. Conversely, without these inputs it will stagnate.

The External Knowledge Base knowledge set is primarily related to the ability to access intellectual assets and learning opportunities outside the business. Whilst internal contacts can be very important, the ability to work with and learn from the much larger body of knowledge outside the business can be a source of great competitive advantage. And as supply chains become more integrated, a company's suppliers can be a significant contributor to its competitive capabilities. A failure in that supply chain however can leave a company more vulnerable, with a potential degradation in its total corporate memory. Although know-who is commonly thought of in terms of personal contacts, the Internet is making access to explicit knowledge practical in ever expanding ways.

Knowledge flows

In the diagram representing the corporate memory model, the knowledge flows from one knowledge set to another have been given names. In this section of the paper, the sets linked by each named item is noted, the flow is assigned a short definition, and matters that might enhance or degrade this particular knowledge flow are suggested. Each flow item will now be considered in turn.

**ACTIONS:** flowing from the Operations strategy set to Business operations. Operational outcomes needed to meet customer and stakeholder requirements and beneficially enhance the business. If the actions required are not clearly spelled out in terms and language understandable by those required to implement them, or if there is inadequate capacity or capability to carry them out, then the process will fail. The probability of success may be enhanced by having those who must take action involved in selecting the best combination of enactment strategies.

**FUNCTIONAL REQUIREMENTS:** flowing from the operational rules set to Operations strategy. Enunciation of what is required to achieve stakeholder outcomes sought or to introduce beneficial change using the intellectual assets of the business. How this is done is not necessarily specified. The outcome sought, and any constraints (eg legislation) must be clear and understandable. Where there is a significant tacit knowledge content, the transfer mechanism may be through the establishment of a team, or transfer of an individual or expert or coach. If key people leave a company, then this knowledge flow can be degraded. This is intuitively recognised in some circles, for example, a dynamic CEO or Technical Expert leaving may degrade the share price of a business. Some organisations try and buffer themselves from this dependency by trying to codify all functional requirements. This can be a positive thing, but can add cost, reduce responsiveness, and have less consistent interpretation at the receiving end.
INFORMATION INPUT: flowing from the data warehouse set to Operations strategy. Pricing/scheduling/performance/specification data needed to stimulate timely action and provide feedback on current performance. Data errors or an overwhelming flow of data may inhibit appropriate action. There is scope for innovative packaging, preprocessing or representation of data. System/data version or configuration control processes need to be effective to provide the most appropriate information.

KNOW-WHY/KNOW-HOW AND MENTAL MODELS: flowing from intellectual assets to operational rules. Perspectives, knowledge and competencies reflecting the whole-life experience of the organisation and the people in it. As much of the knowledge is tacit, individuals may not choose to make any or some available, eg as a job protection mechanism. Values/norms reflected in some mental models may not be beneficial to all stakeholders. Structured processes and stimulating environments may be necessary to surface mental models and utilise tacit knowledge. Know-why, knowledge about principles and laws, is also included here. It must be used in the context of the development of the principles with an understanding of the assumptions being made, or a logical process may need to be followed to yield an appropriate outcome using this knowledge as a decision aid. If the operational context changes current applications, eg rules embedded in an Expert System, then the value of this knowledge may be reduced significantly.

KNOWLEDGE NEW TO THE COMPANY: flowing from external knowledge base to company intellectual assets. Ideas, concepts or perspectives from external sources that can change the company’s know-how and mental models. Exposure to learning opportunities is a pre-requisite for acquiring this knowledge. As people are the agents of the organisation at this time, a full range of outcomes observed in the Jarvis [6] model of adult learning are possible. The first is non-learning because the significance of the opportunity is not appreciated. Another possibility is a commitment to memory for later use, and a third is a rapid flow-through to a change in business rules etc. To maximise company leverage of such new knowledge, mechanisms for its externalisation and dissemination need to be put in place. Learning from “associates” also includes customers, suppliers and collaboration partners who can yield specifically targeted benefits, consistent with the ideas of Malerba [16].

KNOW-WHO: flowing from company intellectual assets to the accessible external knowledge base. This is knowledge about who knows what, who knows how to do what, and where information may be found. The flow may be enhanced by personal networking practices or an understanding of how resources such as libraries or the Internet may be used. “Strategic Alliances” that are currently fashionable can have the effect of enlarging the company’s intellectual asset base, but extracting value from this situation is critically dependant on an ability to build personal relationships that can endure despite ups and downs. This form of knowledge may only be useful for a short time, as organisations and people’s position in them change.

NEW KNOWLEDGE FROM EXPERIMENTATION AND EXPERIENCE: flowing from operations strategy to company intellectual assets. Observations, innovations or outcomes from business operations or innovation programs that can change the
company’s know-how and mental models. Because this knowledge arises from processes already in motion within the company, it is already disseminated to some extent, and rapid feedback to change business rules etc is possible. The knowledge still needs to go through the evaluation and/or reasoning/reflective process steps in the Jarvis [6] model before it becomes a company intellectual asset. Senge et al [17] point out that reflection on outcomes realised and variations from target, as expressed through appropriate performance measurement system, can yield new knowledge (as compared with just using the information for reporting).

**OPERATIONS DATA:** flowing from the data warehouse to the operations strategy set and vice versa. Detailed rules, eg standard forms or checklists, manufacturing instructions, representing re-use of knowledge. This is a two-way flow in that routinised, explicit manufacturing instructions etc may be communicated for action, but incremental enhancements and history information that must be kept by the company are passed back for storage in the data warehouse. If the operations data is not clear to those who have to use it, or if there is inadequate capacity or capability to use it, then it may not be acted on. If there is no analysis process in the data warehouse knowledge system, of information flowing back, then learning that could enhance decision making processes is lost.

**OUTCOMES REALISED:** flowing from business operations to operations strategy. A series of actions are launched into business operations and innovation programs. This represents what was achieved as a result. This feedback is a necessary part of the performance management process shown by Dunphy et al [18] to be essential for both effective business operations and change management. There needs to be an evaluation process step, even for successful outcomes, to maximise the learning opportunity and the experience it may provide.

**OUTCOMES SOUGHT:** flowing from stakeholders to business rules etc. The broad outcomes sought from, or the constraints applicable to the business, that would satisfy the stakeholders. The outcomes sought may be explicitly stated or may relate to stakeholder mental models (eg Trade Union philosophies). The latter must be surfaced if the best balanced set of rules and practices are to evolve. Matters of common purpose, trust and personal risk management are inter-related important outcomes that are commonly left unstated.

**PERFORMANCE DATA:** flowing from customer requirements to the data warehouse. Quantitative data on customer needs, eg items ordered, delivery requirements. This explicit information is usually combined with other explicit knowledge to produce a systematic outcome. To understand the full implications of this information, it may also need to be internalised to yield tacit operational knowledge that stimulates additional action, eg if the data provides feedback on company performance, or if a change in production rate has capacity and utilisation implications.

**PERFORMANCE TARGETS:** flowing from operations strategy to business operations. Outcomes additional to actions, eg the time taken to make something that may vary, even though the action (ie make something) remains the same. This is an
important requirement associated with actions. It is important to instruct the team to "kick goals", but it is also helpful if the team knows "where the goalposts are" and how "scoring" takes place. Performance targets are most commonly explicitly stated, or there are attempts to make them so (eg management by objectives). But there may also be unstated expectations that are not easily quantified that need to be understood. For example, how an action is to be implemented – ethically?, collaboratively?; or the does the appearance of a product matter, even though this may not effect its form, function or fit. In respect of this kind of know-how, the tacit knowledge contribution of the people involved in decision making that impacts outcomes is frequently not appreciated. So a company downsizing, for example, may degrade economic performance rather than enhance it if such tacit knowledge is lost.

REFERENCE DATA: flows from the external knowledge base to the data warehouse.
Data from external sources, eg a benchmarking study, that can be directly stored in the Data warehouse for use by existing systems. This is commonly numerical data, but if its original context is not understood, it may be interpreted and used inappropriately. For example, taking the "best practice" employee ratios for every part of the business to plan a total business operation may yield one that is unworkable.
Vast amounts of data may be accessed, but if this is not properly assessed and sorted, it can cause an overload and not actually be helpful.

VARIATIONS FROM TARGET: flowing from business operations to the operations strategy knowledge set. Did we do well, or is there room/need for improvement? Apart from providing feedback that helps "keep score". Monitoring these variations helps understand what is generally in control, and what is out of control. Most important however, is the assessment of cause and corrective action that can lead to organisational learning.

Some Observations

This representation of a "Corporate Memory" is quite complex, even though the foundation diagram fits on one page. And yet each of the sub-tier knowledge sets and individual flows could be expanded on in quite some detail. Every element has some explicit and some tacit knowledge component, with exchanges back and forth between the two components being necessary. This in itself helps explain why people have difficulty grappling with the seemingly simple concept of transferring and managing knowledge.

Allee [19] contends that knowledge is too complex and fluid to be designed, processed and managed from an old thinking perspective. She cites twelve qualities of knowledge, indicating it is messy, self-organising, seeks community, travels on language, is slippery, likes looseness, experiments, does not grow forever, is a social phenomenon, grows organically, is multi-modal, and is "bottoms up". All of these attributes can be identified in running through the knowledge sets and flows described in the model of corporate memory presented.
From the model described here, it is argued that “Corporate Memory” is a knowledge system that provides a capacity to act for the ultimate benefit of stakeholders in, and customers of, the business. Action in this context comes from a blend of data from a data warehouse and a multi-modal strategy to implement a set of rules, practices and product requirements. Whilst these pre-requisites to action sound complex, and involve a number of different kinds of knowledge transfer processes, those leading to the establishment of the rules, practices and product requirements are arguably even more complex.

The rules, practices and product requirements that make a particular organisation unique are influenced by the way the organisation interacts with its customers, owners and other stake-holders, and how it deals with legislative requirements.

Utilising company intellectual assets to stimulate a high rate of beneficial change requires the effective operation of two intermediate processes: the identification and agreement of altered rules, practices or product requirements, and the selection of an appropriate combination of people / technology / system processes that will enact the change.

It is noted that there is potential for failure in each intermediate process, but also in the knowledge transfer vehicles: know-how, mental models, then functional requirements. And the outcomes sought by all of the stake-holders must be balanced in the changed functional requirements. The latter can also be a source of system failure if new requirements by one or more of these powerful stake-holders impact the rules and rituals of an organisation so that the previous operational strategy is no longer viable.

Reflecting on the knowledge transfer vehicles in the context of the four combinations described by Nonaka and Takeuchi [5], it is suggested here that proponents of the “learning organisation” seem to primarily focus on tacit/tacit exchanges and proponents of “knowledge management” on explicit/explicit exchanges. Why? It is further suggested here: because they are the fastest knowledge transfer processes. The primary tacit/tacit transfer process of socialisation is fast because people use multiple sensors in working together in teams. Explicit/explicit transfers, e.g. via the Internet, can also be fast using electronic media. On the other hand, there is evidence that tacit/explicit transfers are slow, as specialist skills are needed to draw out and carefully enunciate tacit knowledge. Similarly with explicit/tacit transfers, e.g. by formal education

**Issues of Knowledge System Failure or Degradation**

The potential for failure in such a complex system with a potentially variable (as people come and go) tacit component is high. Here the notion of “critical knowledge” and facilitating change arises. Lucier and Torsilieri [20], and Davenport [21], [22], in reflecting on where knowledge management programs have failed, noted that only
making knowledge resources available is not sufficient. Not focusing on the most valuable knowledge (probably not "let's put the personnel manual on-line"), and not having a change capability are all common factors contributing to failure.

So how might the model presented here be useful in dealing with such situations? It is suggested that having this top level "map" of the different knowledge sets and of the different knowledge flows helps

- Understand the contribution each set makes to the actions that drive business operations and change programs
- Facilitate the assessment of knowledge elements to identify those with the greatest impact in a particular situation
- Facilitate an understanding of the impact of enhanced or degraded knowledge flows
- Recognise where, and what kind of change needs to take place to enhance the enterprise knowledge system
- Provide a structure for identifying and mapping knowledge at sub-tier levels

Some examples are given below.

Within the description of each sub-tier knowledge set and knowledge flow element, some potential sources of failure or degradation have been noted. It is speculated here that a particular organisation might, using these elements as a framework, add in its own experience of what beneficially stimulates activities within each element, and what degrades that activity. This initiative may well start to draw out, and support sharing of the organisations' corporate memory.

For many Enterprises today, a turbulent operating environment results in external and internal change. For example, the adoption of a new technology by the business to compete better. Or an external requirement for new technology (a major customer insisting on e-business transactions). This will not only impact operations implementation strategies, it will also temporarily degrade the Enterprise intellectual assets knowledge set (some past know-how is no longer relevant) and require greater access to an external knowledge base.

The owners of a business may decide to sell it, so in the near term, the focus will be on maximum profitability and limitations on capital expenditure. This will not only change the business rules, with a flow-on effect through functional requirements, but may change the components of the business's intellectual asset knowledge set that are utilised (e.g. work smarter with old equipment).

Conclusions

The approach presented here supports the notion that "corporate memory" is a knowledge system made up of a number of quite different kinds of knowledge repositories containing both tacit and explicit knowledge components. These repositories are connected by knowledge flows that also have both tacit and explicit components.
The model suggests that using the organisation's intellectual assets to stimulate a high rate of beneficial change requires the effective operation of two intermediate processes: one related to business rules, and one related to their implementation. It is noted that there is potential for failure in each intermediate process, and in the knowledge flows between them, highlighting some of the difficulties in obtaining full benefit from an organisation's intellectual assets.

Using the model presented, some of the influences that make the operations of a particular organisation unique may be identified.

Used as a diagnostic tool, the model can help identify critical information and knowledge flows that provides a sharper focus in designing a particular knowledge management capability. It can help understand what some of the failure points might be at an early stage of design, and provide an appreciation of the impact of internal and external people, technology, and systemic changes.

References

3. Whyte A: Knowledge -- its creation and management as a key business driver at Morgan and Banks. Knowledge Management Conference, Sydney, Australia. 22 - 23 September (1997)
11. ------- Product knowledge sharing – Building a corporate memory. AI Watch, Published by AI Intelligence, Oxford, July (1997)
12. ------- New Dutch Institute spans business and information technology. AI Watch, Published by AI Intelligence, Oxford, July (1997)
13. ------ Knowledge management reference model effort, AI Watch, Published by AI Intelligence, Oxford, June pp 13 – 18 (1998)
18. Dunphy D, Turner D and Crawford M: Organisational learning as the creation of corporate competencies. The Centre for Corporate Change, Australian Graduate School of Management, University of New South Wales. CCC paper 060 (1996)