



## **The Knowledge Advantage (K-Adv): Unleashing Creativity and Innovation © 2004**

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## Table of Contents

Chapter 1. Introduction.....	7
Purpose of the Chapter .....	7
Purpose of the Publication .....	7
Organisation of this Publication .....	8
The Executive Summary .....	8
K-Adv Development and Measurement Tools .....	15
Operational Tools ` .....	15
Benchmarking Tools .....	16
Mapping Tools .....	16
Chapter Summary .....	16
Chapter 2. The Purpose of the K-Adv: Why it is Necessary?.....	17
Purpose of the Chapter .....	17
The Knowledge Economy .....	17
Competences and Competitive Advantage .....	23
Tangible and Intangible Outcomes in the Value Chain–Sustainability and Waste Minimisation .....	25
Chapter Summary .....	28
Chapter 3. The Knowledge Advantage (K-Adv) Concept.....	29
Purpose of the Chapter .....	29
A Definition and Explanation of the K-Adv.....	29
Strategic Implications of the Knowledge Advantage.....	30
Types of Knowledge.....	33
Dimensions of Knowledge.....	36
Communities of Practice (COP) .....	38
Influence of Social Capital Upon the K-Adv.....	40
Implementation Implications of the K-Adv .....	43
Knowledge Transfer for the K-Adv .....	44
Chapter Summary .....	48
Chapter 4. ICT and the K-Adv.....	50
Purpose of the Chapter .....	50
Implications of the Need for an ICT Enabling Infrastructure .....	50
Functioning Hardware .....	53
Functioning Software.....	55
Functioning Networks.....	57
Functioning Portal Interfaces.....	59
Personal Assistance ICT System Support.....	62
Training and Development System Support.....	65
Capacity Planning System Support.....	68
Archiving .....	70
Chapter Conclusion.....	73
Chapter 5. Leadership Enabling Infrastructure and the K-Adv .....	74
Purpose of the Chapter .....	74
The Role of Leadership in Achieving the K-Adv .....	74
Identifying Stakeholders Knowledge Advantage Value .....	78
Understanding Core K-Adv Vision Issues .....	82
Developing Vision Options .....	83
Articulating the Vision.....	86
Planning Vision Realisation.....	88
Mobilising Resources .....	90

Deploying the Vision.....	92
Maintaining the Vision .....	94
Chapter Conclusion.....	98
Chapter 6. People Enabling Infrastructure and the K-Adv.....	100
Purpose of the Chapter .....	100
Implications for the of the Need for People Infrastructure .....	100
Trust and Commitment.....	101
Knowledge Creation .....	108
Knowledge Sharing and Transfer .....	113
Sensemaking.....	120
Business Systems Supporting Rejuvenation .....	125
Reward Systems .....	131
Problem Solving, Experimentation and Learning.....	136
Knowledge Sharing Processes.....	143
Chapter Conclusion.....	149
Chapter 7. Implications of the K-Adv for the Construction Industry .....	151
Purpose of the Chapter .....	151
Power and Influence Implications for Implementing the K-Adv .....	151
Anxiety and the Change Process .....	155
Drivers and Barriers to Innovation .....	157
Innovation Diffusion and the K-Adv .....	165
Chapter Summary .....	174
Chapter 8. K-Adv Development and Application Tools .....	176
Purpose of the Chapter .....	176
General Tools for Developing and Measuring the K-Adv .....	176
Specific Tools – Soft Systems Methodology (SSM) .....	178
Specific Tools – Case Studies.....	183
Specific Tools - Shadowing .....	184
Using the K-Adv Model for Competitive Advantage.....	189
Chapter Summary .....	194
Chapter 9. Conclusions.....	196
Chapter 10. References, Bibliography and Glossary of Abbreviations ...	198
Purpose of the Chapter .....	198
Useful References:.....	198
References:.....	200

## Table of Figures

Figure 1 - ICT Hardware and Software Infrastructure Sub-Elements .....	9
Figure 2 - ICT Infrastructure System Support Sub-Elements .....	10
Figure 3 - Leadership Envisioning Infrastructure System Support Sub-Elements .....	11
Figure 4 - Leadership Infrastructure Vision Realisation System Support Sub-Elements .....	12
Figure 5 - People Infrastructure Social Capital .....	13
Figure 6 - Organisational Process Capital Supporting the K-Adv .....	14
Figure 7 - Development of a Quality Culture .....	20
Figure 8 - Knowledge Strategic Analysis .....	30
Figure 9 - An Innovation Enabler Model .....	32
Figure 10 - The K-Adv: Top Level Model .....	32
Figure 11 - The Role of Social Capital in Creating Intellectual Capital .....	41
Figure 12 - A model of Trust and Commitment Under Tested Conditions .....	42
Figure 13 – Component Breakdown Structure for ICT Enabling K-Adv .....	52
Figure 14 – Component Breakdown Structure for K-Adv Leadership .....	76
Figure 15 - A Stakeholder Model for Projects .....	79
Figure 16 - Process for Maintaining Stakeholder Relationships .....	95
Figure 17 - Component Breakdown Structure for Enabling People Infrastructure .....	101
Figure 18 - Elements of Trust - Source (Whiteley, McCabe et al. 1998, p440) .....	102
Figure 19 - Social Capital in the Creation of Intellectual Capital .....	115
Figure 20 - Exercising Flexibility Options Model .....	128
Figure 21 - An example of a Balanced Scorecard Approach Link to Strategy .....	146
Figure 22 - Driving Cycles for Enthusiasm and Commitment .....	159
Figure 23 - Restraining Forces Acting Upon the Reinforcing Cycles Generating Enthusiasm and Willingness to Commit at the Organisational Level .....	162
Figure 24 - Restraining Forces Acting Upon the Reinforcing Cycles Generating Enthusiasm and Willingness to Commit at the Individual Level .....	163
Figure 25 - Restraining Forces Acting Upon the Reinforcing Cycles Generating Enthusiasm and Willingness to Commit at the Group/Team Level .....	164
Figure 26 - ICT Diffusion Model (Source V. Peansupap 2003 PhD thesis ) .....	166
Figure 27 - COPs Existing in Most Organisations .....	172
Figure 28 - Case Study A's Communities of Practice .....	173
Figure 29 - Tools for Conducting a K-Adv Survey .....	177
Figure 30 - the SSM Model .....	179
Figure 31 - Example of a Rich Picture .....	180
Figure 32 - Applying SSM as a method of Stakeholder Analysis .....	182
Figure 33 - The Shadowing Approach .....	185
Figure 34 - Issue Logging Form .....	185
Figure 35 - Issues Category Reflecting the K-Adv .....	186
Figure 36 - Workshop 1 Impact Index & Feedback Form .....	186
Figure 37 - Cause and Effect Chain Diagram .....	187

Figure 38 - How-How Diagram .....	188
Figure 39 - Summary of Components of the K-Adv .....	189
Figure 40 - Example of a Gap Analysis Exercise .....	190
Figure 41 - Radar Chart of Dimensions of Knowledge.....	194

## Table of Tables

Table 1 - Twelve Types of Knowledge .....	34
Table 2 – Dimensions of Knowledge – Scored by Ease of Knowledge Transfer .....	36
Table 3- Functioning ICT Hardware .....	53
Table 4- Functioning Software .....	55
Table 5- Functioning ICT Networks.....	57
Table 6- Functioning ICT Portal Interfaces .....	59
Table 7 - Personal Assistance .....	62
Table 8 - Training and Development Support .....	65
Table 9- Operational Capacity Planning .....	68
Table 10- Archiving Data and Information.....	71
Table 11- Identifying Stakeholder Knowledge Value.....	79
Table 12 - Understanding Stakeholder's Core Issues.....	82
Table 13 - Developing Vision Options.....	83
Table 14- Vision Articulation .....	86
Table 15 - Planning Vision Realisation .....	88
Table 16 – Mobilising Resources for Vision Realisation .....	90
Table 17 – Deploying Resources for Vision Realisation .....	92
Table 18 – Maintaining the Vision.....	96
Table 19 – Trust and Commitment.....	105
Table 20 – Knowledge Creation Contributing to Social Capital.....	111
Table 21 – Knowledge Sharing and Transfer.....	117
Table 22 – Sensemaking and its Contribution to the Knowledge Advantage .....	122
Table 23 The Four Management Blueprints [137, p30].....	125
Table 24 – Business Systems and Rejuvenation and the Knowledge Advantage.....	129
Table 25 – Reward Systems and the K-Adv .....	134
Table 26 – Problem Solving, Experimentation Learning and the K-Adv.....	140
Table 27 – Knowledge Sharing Processes and the K-Adv.....	147
Table 28- List of Perceived Factors that have High Influence on ICT diffusion <sup>1</sup> .....	167
Table 29 - Findings of Perceived Present Factors Influencing ICT Diffusion CSA .....	169
Table 30 - Comparison of Perceived Presence of Factors in Three Case Studies.....	170
Table 31- Categories of Interviewee in the Three Case Studies.....	173
Table 32 –Using the Galbaith 'Star' Diagram for Benchmarking the K-Adv ..	183
Table 33 - Strategic Analysis for Sculpting Knowledge Action .....	191
Table 34 – Sculpting Action Explicit Knowledge—OUR Organisation.....	192
Table 35- Enabling and Inhibiting Dynamics of Knowledge Transfer.....	192

# Chapter 1. Introduction

Derek H.T. Walker

The following will be discussed in this chapter:

- Purpose of the Chapter
- Purpose of the
- Organisation of this Publication
- The Executive Summary
- Chapter Summary

## ***Purpose of the Chapter***

The purpose of this chapter is to provide an overview of the book. In this chapter I will explain the purpose of the book, explain how it is organised, provide an executive summary and to summarise this chapter.

As an introductory chapter, this helps set the expectations of readers and the executive summary provides the key concepts that are explored in detail throughout the book.

## ***Purpose of the Publication***

The purpose of this publication is to discuss current and emerging ideas and issues relating to the knowledge advantage (K-Adv) that individuals, organisations and communities gain from using knowledge for competitive advantage.

Before proceeding with this section it would be wise to define what is meant by a knowledge advantage (K-Adv).

***An organisation's K-Adv is its capacity to liberate latent creativity and innovation potential through effective management of knowledge both from within its organisational boundaries and its external environment.***

The K-Adv requires a coordinated approach in addressing leadership actions. This entails:

- ♦ **Establishing and deploying a vision** of what the K-Adv means to the organisation;
- ♦ Supporting the **people infrastructure** necessary effectively to use knowledge in their business activities; and
- ♦ Providing the necessary enabling **information and communication technologies (ICT) infrastructure** to do so.

This publication is intended as a companion document to the K-Adv business practice guide developed and prepared through the Cooperative Research Centre in Construction Innovation (CRC-CI) led by the RMIT University CRC-CI research team. It is intended to place in context the purpose, nature and characteristics, and way in which a knowledge advantage can be implemented in a construction project environment. It helps users of the guide to better understand the significance of the K-Adv in contributing to an organisation's management sustainability through being a smarter enterprise that better uses its available intellectual resources.

## ***Organisation of this Publication***

The publication is structured as follows.

- ★ Chapter 1 presents an introduction to the concept of the K-Adv and explains its purpose. An executive summary presents three major elements of the K-Adv together with its constituent sub-elements.
- ★ The purpose of the K-Adv is then presented in Chapter 2 with a focus on the knowledge economy and its impact upon competitive advantage and tangible and intangible outcomes in the value chain. This is important because it provides the context of the K-Adv and indicates its strategic importance.
- ★ Chapter 3 presents important aspects of the theory of knowledge management and the learning organisation. This chapter directly relates to the K-Adv and helps substantiate the structure of the K-Adv as presented in more detail later.
- ★ Chapter 4 concentrates on the supporting ICT Infrastructure and details the major characteristics of this structural component of the K-Adv.
- ★ Chapter 5 concentrates upon the leadership infrastructure of the K-Adv with a focus on envisioning and realising the K-Adv vision.
- ★ Chapter 6 presents the third supporting infrastructure component—the people infrastructure.
- ★ Chapter 7 explains how the K-Adv may be applied in practice and describe drivers and barriers to its implementation to explain why some organisations are further advanced in its implementation than others. It also provides findings from a PhD study into ICT diffusion that is particularly relevant to understanding how the K-Adv is achieved.
- ★ Chapter 8 presents ways in which the K-Adv can be used to measure knowledge assets and how to use knowledge asset analysis to develop strategic and tactical plans.
- ★ Chapter 9 provides a summary to the book.
- ★ Chapter 10 provides the references used throughout this book.

## ***The Executive Summary***

The K-Adv has been developed around the concept that it comprises an ICT enabling infrastructure that encompasses ICT hardware and software infrastructure facilities together with an enabling ICT support system; a leadership infrastructure support system that provides the vision for its implementation and the realisation capacity for the vision to be realised; and the necessary people infrastructure that includes the people capabilities and capacities supported by organisational processes that facilitates this resource to be mobilised.

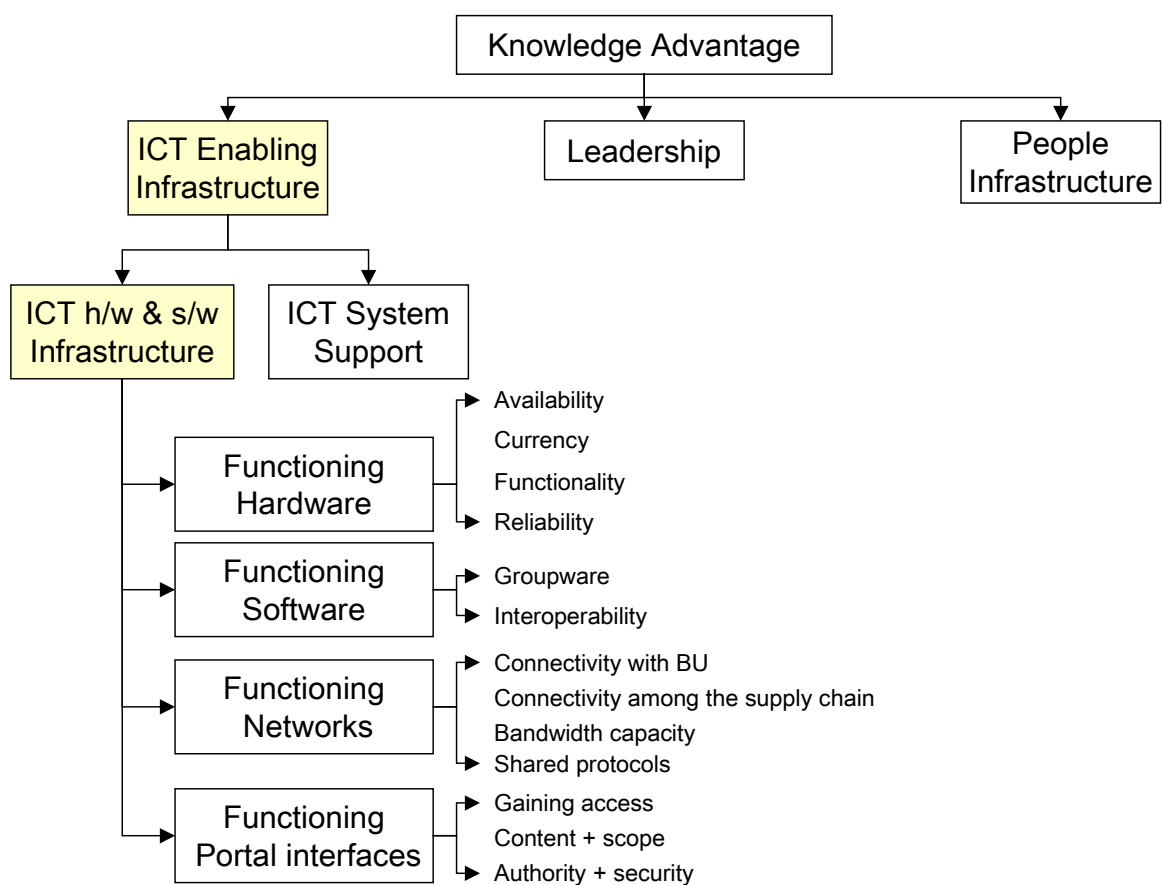
The following sets of figures and bullet points provide the brief summary of the K-Adv. Greater detail follows in Chapter 4, Chapter 5, Chapter 6.

Figure 1 illustrates the ICT enabling infrastructure that requires both hardware and software systems and support mechanisms. The infrastructure requires:

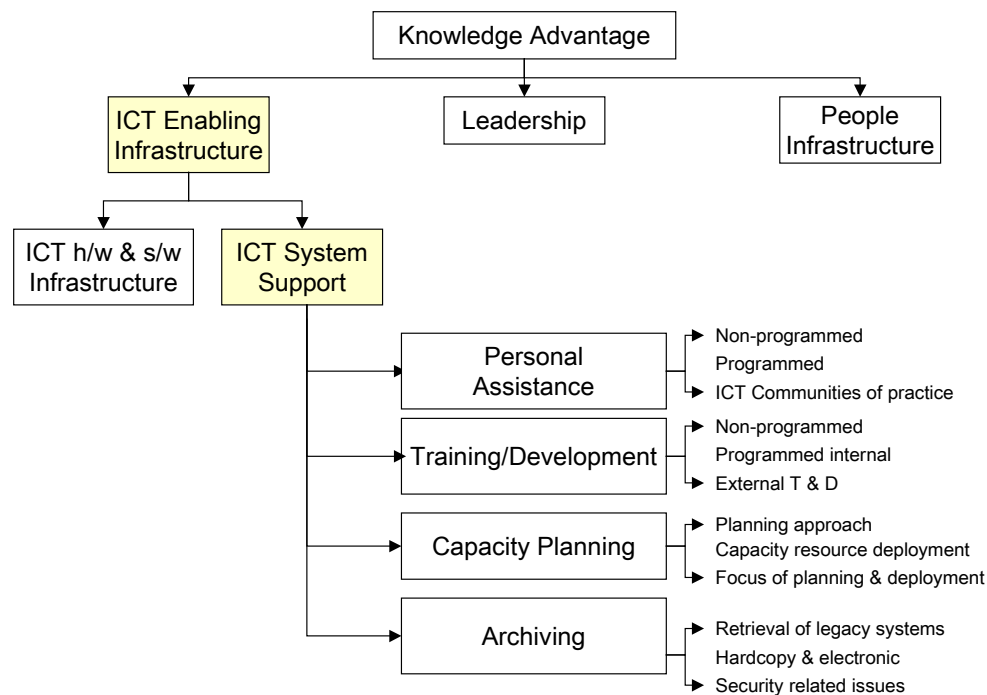
- Functioning hardware that is: available; current; functional and reliable so that it can be effectively used.



- Functioning software that comprises groupware application with interoperable features to enable digital information to be easily and rapidly transferred and shared.
- Functioning networks that connect business units and spanning supply chain organisations with sufficient bandwidth capacity and shared protocols to enable information and data to be effectively shared and transmitted.
- Functioning portal interfaces that provide easy and ready access to valuable data, information and knowledge sources; relevant and pertinent help -content to scope the information and knowledge accessed ; relevant authorisation and security to ensure the appropriate level of access to knowledge.; and finally, a 'system' that can deliver all this in a user-friendly way.



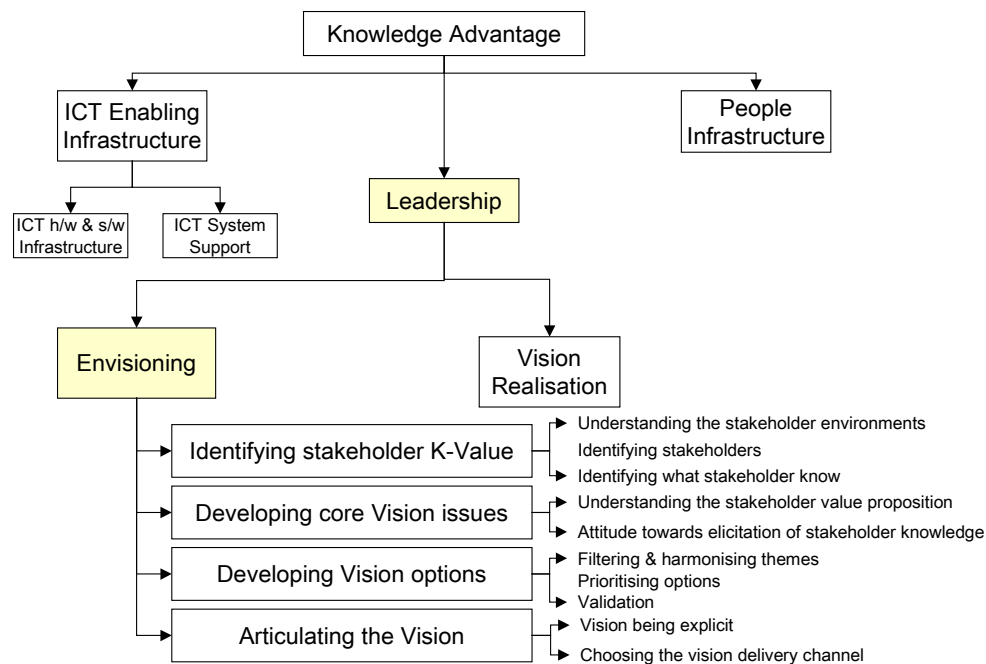
**Figure 1 - ICT Hardware and Software Infrastructure Sub-Elements**



**Figure 2 - ICT Infrastructure System Support Sub-Elements**

In terms of ICT system support, organisations need to provide the means for people to be able to use ICT as identified in Figure 1. This requires a 'people' and 'system' infrastructure as illustrated in Figure 2 to ensure that the hardware and software infrastructure is supported so that people can use it effectively. This requires:

- Personal assistance from non-programmed resources such as mentoring, person-to-person (p-2-p) help in a variety of forms that provides response to individual queries; programmed resources with staff that can respond in a pre-determined way to help them as well as a traditional Q&A or systemised way of responding to typical queries, as well as a communities of practice approach that provides peer-to-peer (p-2-p) help and assistance.
- Training and development that prepares and sustains ICT users. This would be provided through non-programmed mentoring and mutual adjustment support arrangement between people working to help each other, programmed internal training and development arrangements and also external access to training and development.
- Capacity planning that represents an organisation's ability to plan for the ICT infrastructure requirements, deploying resources required to support ICT infrastructures and an appropriate approach to deploying this infrastructure in a way that meets the exigencies encountered.
- Archiving legacy data and systems of support is also part of the ICT support system. Archiving is often neglected but involves vital support for the ICT infrastructure through retrieval of legacy data, information or knowledge, storage and retrieval of hardcopy or electronic form of data, information of knowledge representation and a security system that assists in the orderly and appropriate access to archival materials.

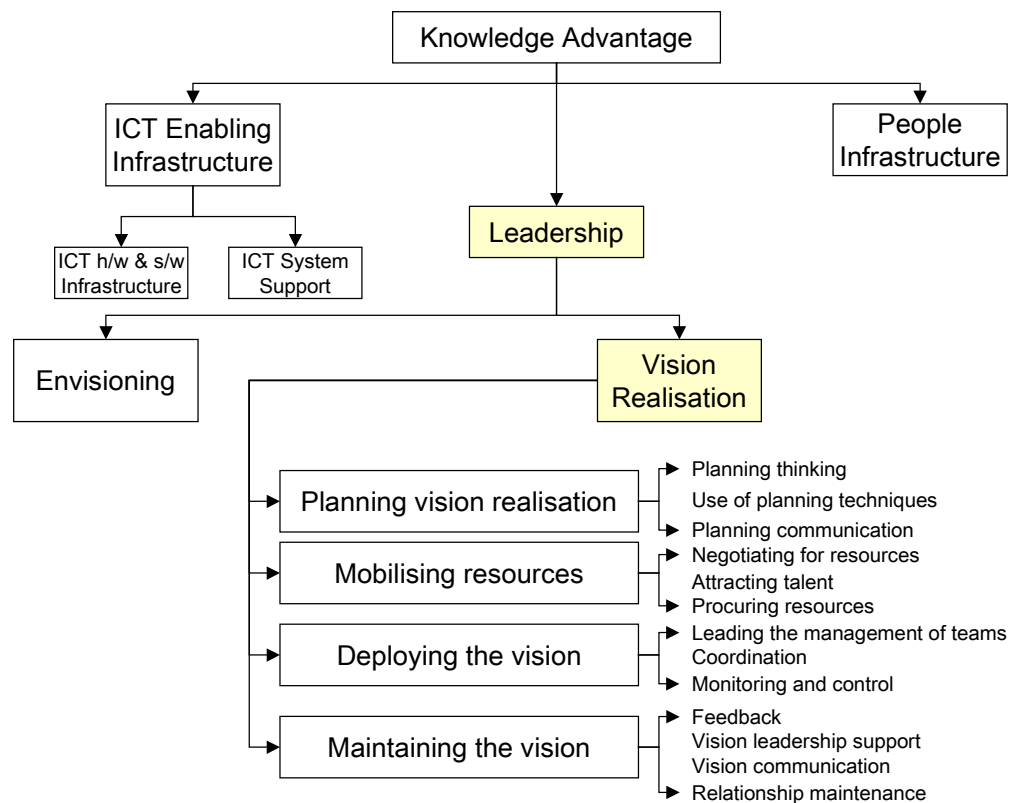


**Figure 3 - Leadership Envisioning Infrastructure System Support Sub-Elements**

The second infrastructure element of the K-Adv is the 'Leadership Infrastructure' as illustrated in Figure 3. This comprises two parts, envisioning and vision realisation.

Envisioning entails:

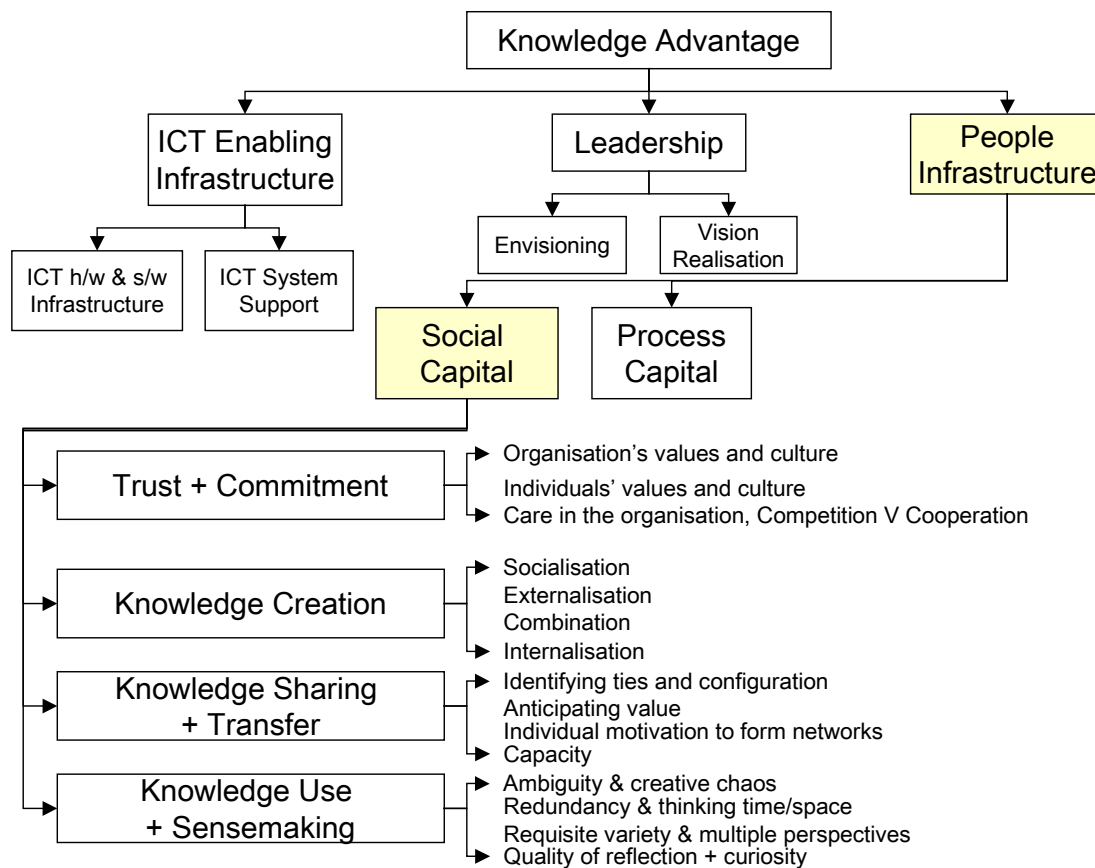
- Understanding the stakeholder environment so that relevant and key stakeholders can be identified; identifying their needs and what they know that can be a valuable resource used to develop a K-Adv.
- Developing core vision issues involves understanding the stakeholders' value proposition—the things that matter to them as well as actually eliciting knowledge from stakeholders to be able to understand what is it that they value.
- Developing vision options involves taking the myriad of issues that can be identified, and filtering and harmonising them into knowledge advantage themes; then prioritising these into groups based on feasibility; and then validating this prioritisation to develop a conceptualisation of issue themes.
- Finally, envisioning requires articulating the vision and this requires making the vision explicit and choosing the vision delivery channel carefully so that the message and channel are coherent and effective.



**Figure 4 - Leadership Infrastructure Vision Realisation System Support Sub-Elements**

Once an envisioning strategy has been developed it needs to be effectively deployed. This is illustrated in Figure 4 and requires:

- Planning the vision realisation. This requires: a high quality of thinking to creatively develop plans; use of appropriate planning techniques; and developing a communication strategy that effectively disseminates the plan in a way that is meaningful to those involved in the plan.
- Plans require resources, and mobilising the resources is a key activity. This requires a negotiation for resources, attracting the necessary talent to deploy the vision and the use of an appropriate procurement approach that fits the circumstances.
- Deploying the vision follows a standard project management approach of using the most appropriate management technique for the K-Adv teams: coordinating the many and various players, and monitoring and controlling the process of deployment.
- Maintaining the vision is an important aspect of the leadership infrastructure for the K-Adv. It requires the development of feedback loops so that the danger of flagging enthusiasm can be identified and addressed. Leadership support mechanisms need to be in place to avoid the vision being viewed as a fad, but rather continually maintained and sustained. Communication systems need to be in place to ensure that continuity of the vision's importance is maintained and the relationship aspects are not neglected. Stakeholders need to know and be assured that the K-Adv focus is being maintained.

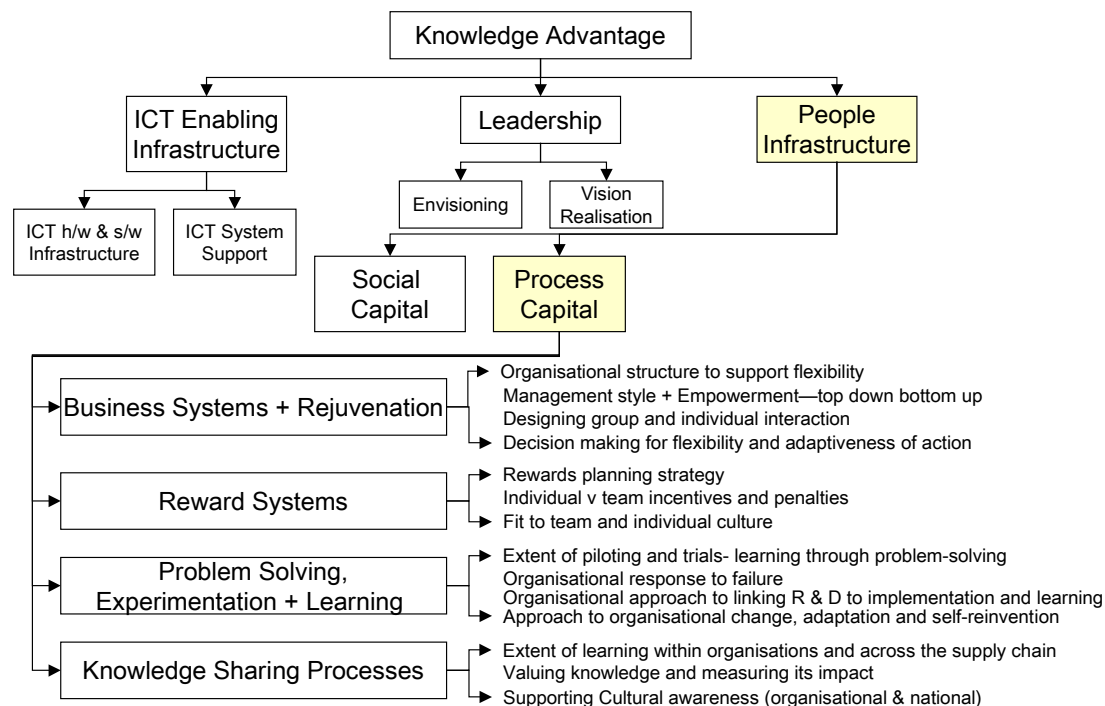


**Figure 5 - People Infrastructure Social Capital**

The third leg of the K-Adv infrastructure is people. This comprises two components, social capital—that is peoples’ ability and willingness to commit to supporting the K-Adv—and, the organisation’s process capital that supports peoples’ willingness and commitment. This is illustrated in Figure 5

Social capital comprises:

- Trust and commitment, which is affected by the organisation’s and the individuals’ cultural values. The level of care and concern for ‘people issues’ within the organisation is often represented by the balance between competition and cooperation that is engendered within an organisation.
- Knowledge creation is a fundamental human activity. It manifests as the socialisation of tacit knowledge, characterised by externalisation to make it explicit. As it combines with the existing stock of explicit knowledge in the organisation internalisation takes place, which absorbs and enriches the knowledge base..
- Knowledge sharing and transfer involves networks of people. So this needs to be configured in some way, for people to want to join the knowledge networks. They must anticipate deriving some value and they must have a desire to share knowledge as well as have the capacity to share knowledge.
- Knowledge use and sensemaking are inextricably interlinked. This requires: a level of ambiguity and creative chaos being engendered; a redundancy of resources to allow people to think and reflect; a requisite variety of stimuli and channels of communication; and a capacity for reflection and curiosity.



**Figure 6 - Organisational Process Capital Supporting the K-Adv**

Social capital cannot be effectively mobilised without the organisation having processes and systems in place to effectively enable and support people to develop social capital, as illustrated in Figure 6. This can require the following:

- A business system that rejuvenates the organisational structure to support flexibility and creativity a management style and empowerment strategy that stimulates people with challenges and supports them in their finding solutions; designing group and individual interactions to promote sharing knowledge; and decision making approaches that support flexibility.
- A reward system that is strategic and clear in its goals; it should motivate the individuals to fit within a team culture so that the rewards are matched to maximise impact of developing social capital.
- A problem solving, learning philosophy that promotes experiential learning; an appropriate response to failure to build a social capital; links research and development with training and development; and encourages adaptation and re-invention of the organisation to capitalise on social capital and the K-Adv.
- A knowledge sharing process needs to facilitate a cross-levelling of knowledge throughout the organisation (including the supply chain), to make the recognition of the value of knowledge explicit; and a visible support cultural awareness so that the rich potential of diverse perspectives can be accessed and capitalised upon.

Having briefly discussed the components of the K-Adv and the importance of each sub-component and elements of each of those sub-components, I will now briefly outline how this understanding can be put to practical use through this text.

It becomes clear that at least two thirds of the knowledge advantage relates to the strategic and practical use of people's ingenuity and intrinsic motivation to share their learning and understanding for the group as well as

individual benefit. In Chapter 7 I discuss aspects of the fears, barriers and more positively the drivers that influence knowledge creation and sharing in detail. These relate, evidently, to sound people management and so the implementation of a K-Adv strategy inextricably forms part of a quality and best business practice framework. The logical extension of this chapter is a discussion of ICT diffusion research undertaken by my PhD candidate Mr Vachara Peansupap. This work links very closely into the K-Adv concept. ICT Infrastructure is obviously a key component of the K-Adv and successful ICT Diffusion can be argued to provide lessons on general knowledge management and innovation diffusion. In Chapter 8, I present some ideas on how to measure and assess K-Adv concept and also provide a set of particular tools and frameworks for achieving the K-Adv. Each of these tools are practical and adaptable protocols for studying how the K-Adv may be enhanced and have been developed as part of the Cooperative Research Centre in Construction Innovation project in delivering improved knowledge management and innovation diffusion—project 2001-004 (2B).

The K-Adv model and tools presented have been developed based upon an extensive and rigorous review of the knowledge management, innovation and business excellence literature.

### **K-Adv Development and Measurement Tools**

A crucial starting point for the K-Adv is to know how to be able to map and measure where an organisation is on a maturity scale for the various elements of the K-Adv categorised as: between being **inactive** and only barely aware of a given aspect of the K-Adv; being **pre-active** in terms of initiating plans for becoming active; being **active** in adopting the particular element; being **pro-active** in accepting and adopting the approach, and then adapting it to suit the context and circumstances of the organisational unit concerned; and finally being embedded with the adaptation having become **routine** and **infused** as the natural way of doing things but in a dynamic sense that recognises that circumstances and context continually change and that any advanced and mature organisation would review and improve their process to meet the needs of a dynamic operating environment.

These tools provide an approach to being able to map where an organisation is on the maturity matrix for any given K-Adv element. Three broad types of tool are discussed. The first is a case study approach, which can be useful for measuring the general maturity of an organisational unit or used to test where an organisational unit may fit into any theoretical framework. In Chapter 3 “The Knowledge Advantage (K-Adv) Concept” I introduce a way at viewing the organisational capacity to manage change, and in Chapter 8 Table 32 I illustrate how the Star model may be used as strategic planning a tool to measure and benchmark organisational units (either as business units or entire organisations). I also show how shadowing and soft systems methodology tools can be used to map where an organisational unit may be on its maturity scale.

### **Operational Tools**

I also show in Chapter 8 how a task or skill/competency can be mapped, based on the seven dimensions of knowledge (illustrated in “Table 2 – Dimensions of Knowledge – Scored by Ease of Knowledge Transfer”)

outlined by Davenport and Prusak's Working Knowledge book. This is illustrated as a radar chart in Figure 41 that can be a useful tool for visualising competencies and skills so that an effective skills transfer strategy can be developed.

### **Benchmarking Tools**

Another tool illustrated in Chapter 8 is the way that gap analysis and benchmarking can be applied to the K-Adv framework presented in this book. Figure 40 illustrates an example of how this can be applied.

### **Mapping Tools**

I also provide in Chapter 8, a tool for analysing and presenting how different types of knowledge may be used within an organisation. I discuss the approach used for analysing how ICT diffusion has been implemented using both a quantitative and qualitative approach. Further, a tool based upon the 12 types of knowledge developed by Clause Sharrow (illustrated in Chapter 3 "Table 1 - Twelve Types of Knowledge" is presented in "Table 32 – Using the Galbraith 'Star' Diagram for Benchmarking the K-Adv". This tool and framework is particularly useful for devising a strategy for a specific type of knowledge transfer and helps to facilitate the process of knowledge management in more targeted, specific and concentrated way. I also continue with this application tool to illustrate how the concept can be then applied to the reader's organisation as a competitive advantage benchmarking exercise and illustrate in "Table 34 – Sculpting Action Explicit Knowledge—OUR Organisation". The last tool that I illustrate in this book is developed from Nancy Dixon's studies of the dynamics of knowledge transfer. These are explained in this book in Chapter 3 and a simple tool is illustrated in Chapter 7 "Table 35- Enabling and Inhibiting Dynamics of Knowledge Transfer", this can be used to map how people, processes and policies may be enabled or inhibited in the organisation or the unit under study.

### **Chapter Summary**

In this chapter I started with a definition of the K-Adv so that the basis of this book is clear.

I outlined the structure of this book and then I then continued with a brief executive summary and description of components of the main six sub-elements of the K-Adv that is grouped under three elements.

Finally in this chapter, I provided an executive summary for busy readers who may wish to first absorb this overview before exploring the rest of the book. I present six figures that map the K-Adv in detail down to the element level for which detailed tables that can be used for benchmarking are discussed more fully in later chapters. I also provide in this executive summary an outline of a number of practical tools that are offered to put the rigorous theoretically developed K-Adv model into practical use.



## **Chapter 2. The Purpose of the K-Adv: Why it is Necessary?**

Derek H.T. Walker

The following will be discussed in this chapter:

- Purpose of the Chapter
- The Knowledge Economy
- Competences and Competitive Advantage
- Tangible and Intangible Outcomes in the Value Chain–Sustainability and Waste Minimisation
- Chapter Summary

### ***Purpose of the Chapter***

The purpose of this chapter is to provide and place the K-Adv in its context of organisations being part of a highly competitive global knowledge economy. Competences and competitive advantage are inextricably linked to the management of a system whereby knowledge is recognised as a defining asset that must be developed, nurtured, harvested and exploited in such a way that it is kept fresh and relevant despite being rooted in the context of a dynamic and turbulent environment.

Thus, this chapter helps set the scene for understanding why the K-Adv is relevant and necessary.

### ***The Knowledge Economy***

An accelerating interest, particularly during the closing decade of the 20<sup>th</sup> Century, has emerged in the knowledge economy together with its major implication of the need for a radical re-evaluation of the role of innovation in business sustainability. For example Gary Hamel and C.K. Prahalad argue that existing approaches to business strategy were failing to deliver true innovation. They argue that the key to creating business sustainability lies in organisations competing for the future by delivering true value to customers and the broader community. They maintain that this can be achieved through a constant cycle of organisations reinventing and re-skilling themselves to be able to anticipate and align themselves with their customer's customer needs in order to deliver unique products and services. They reason that in doing so this would radically transform organisations and reconfigure existing industries and generate entirely new ones [1].

This notion of shaping the future requires that organisations (like Microsoft for example, in moving from being an operating software supplier to coordinator of e-business applications) continually learn to learn and also how to learn to unlearn. Thus the skills required are not only specific to the technology at hand but also to enable organisations to know how to move from delivering one technology, product or service to a new one. These competencies and skills relate to acquiring existing knowledge, generating new knowledge, sharing and morphing new and existing knowledge and knowing how to discard or recast knowledge that has exceeded its use-by date. Further, this emerging business paradigm requires organisation 'A' to

have skills and competencies to form alliances, partnerships and relationships with 'B' and 'C' etc in order that the consortium of organisations can jointly deliver value to a customer using a portfolio of skills and competencies that none of the these organisations individually possesses (or probably wish to possess). We see this in the construction industry with design and construct and BOOT projects. Therefore, one of the required key corporate competencies becomes an ability to move from the conventional strategic focus of merely leveraging and extending existing competences, to the innovation focus of willingness to combine with others to jointly provide value and thus satisfy customer needs [2, p50].

Thus, organisations and individuals are increasingly required to understand more and more about those it interacts with in the value chain delivering goods or services. Further they also need to understand more and more about their customers and their customers' needs. Knowledge and understanding is becoming a far more important competitive advantage that is data and information. This is because the latter is merely the feedstock to understanding and this underpins strategy, design, decision making followed by taking the appropriate action.

The knowledge economy is becoming far more complex and involved. It moves beyond people merely being more focussed upon skills required for undertaking the job at hand. It requires knowledge about creating value for customers, the way in which each individual plays his/her part and more about how individuals play their part so that continual improvement can be achieved through improving product process and relationships. Interestingly, this interaction knowledge includes knowing how to get customers to articulate and contribute to innovation through their knowledge and exploration or speculation of what they might want or need. This focus on customer feedback and interaction has developed into a sophisticated interest in customer relationship management that is based on customer knowledge [3-5].

The knowledge economy concept has thus moved way beyond training and development, ways of codifying and transferring knowledge, ways of extracting and using knowledge to ways of better solving specific problems.

To appreciate the scale of the change currently taking place it is worth taking an historical perspective and view the knowledge economy as another part of the march of revolutions and evolutions of society. Further concepts of constrained resource, critical asset and knowledge response can then be applied to help us understand how this progression was triggered and what it means to us now [6, p349].

The rise of agriculture about 10,500 years ago in the 'fertile crescent' arching through the Eastern Mediterranean through to present day Iraq had a fundamental impact upon society in terms of language, technology and cooperation of peoples through trade and this initial form of industry<sup>1</sup> [7, p104]. Knowledge in this economy was stable. The constrained resource (reason for this industry) was the supply of food the critical asset was cropland. Thus the human response to this condition was for development of

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<sup>1</sup> The book by Jared Diamond 'Guns, Germs and Steel: A Short History of Everybody For the Last 13,000 Years' provides a particularly fascinating account of the rise and fall of various civilizations that have relevance to the debate on the role of competencies and available resources in the rate of development of economies.

knowledge about which crops could be usefully planted, where and when. This knowledge response triggered the development of knowledge about climate, crop types, land formations and characteristics and it even generated theories that became religions. The involvement of society in agriculture was intensive and dominant for many centuries. According to census data cited by Stewart [8, p8-9], shortly after the America Civil War, in 1869, farm goods accounted for nearly 40% of US gross domestic product—as opposed to 14% at the end of the First World War and 1.4% by 2000. Clearly the agricultural revolution was the dominant industry at its peak that lasted many centuries and knowledge was highly focussed around the needs of that industry. It supported the delivery of food and was highly valued by society. Those that effectively used and controlled the enabling knowledge for the agricultural revolution emerged as the dominant elite such as the 'landed gentry'.

The next major revolution we recognise was the industrial revolution. History books generally place its emergence at around the 18<sup>th</sup> century beginning in the UK with the harnessing of steam to power machines that could be put to productive use. This is argued as an arbitrary dating because use of wind and water had been used to power machines in medieval times; however, this used energy forms as the constrained resource. The critical asset was fluid (air and/or water) harnessed through applying knowledge about their properties to deliver energy that powered machines. The knowledge response was to develop better knowledge of physics relating to heat and fluid dynamics and this expanded into a massive development of knowledge about machines, their use and application. The emergent elite became the industrialists and engineering and science professionals flourished.

This explosion in knowledge marched on to trigger social change and massive changes in the way that the world economy developed. Part of this evolution centred on an intensified trade economy in which the constrained resource was distribution channels and transport systems. The response to this condition was development of faster, more efficient and effective modes of transfer. Examples of rapid systematic management technical knowledge development at that time include timetabling, scheduling, organisation and coordination. The emerging knowledge elites became technocrats and administrators. However, new ways of financing and facilitating legal structures to deliver the new distribution systems and manufacturing capacity led to an intertwined parallel revolution in commerce and finance.

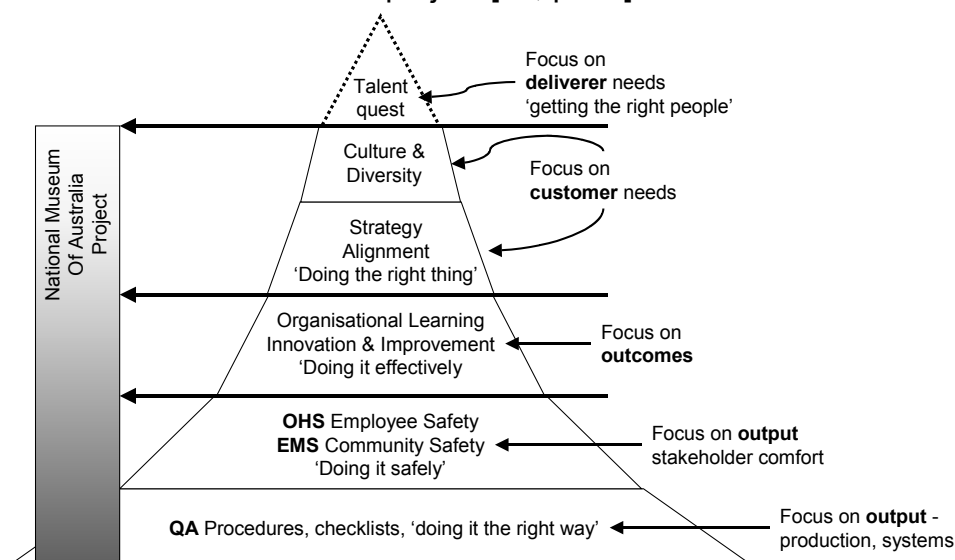
This revolution led to the rise of capitalism and at its core was the constrained resource of tangible goods to be traded and the critical asset was capital. This led to the formation of financial institutions stock exchanges etc in which amongst other aspects, knowledge about financial performance and opportunities was developed. This knowledge focus has substantially driven knowledge generation and transfer through the rise of manufacturing, commerce and trade developing theoretical and practical business knowledge as well as performance prediction and monitoring knowledge to evaluate business success. The emerging knowledge elite became the financiers and business advisors such as lawyers, accountants and business managers.

The current focus on information and knowledge services has led to intellectual capital being the critical resource, people being the critical asset and development of new ways of unleashing ideas, intellect, and creative

energy as the core response [6]. Knowledge and information is not only used to drive business performance but is also used to enable transformation of opportunities into reality through innovation. The emerging elite from this knowledge revolution has led to the rise of the perceived value of the knowledge worker. It started in the last quarter of the 20<sup>th</sup> century with phenomenal growth in influence of information and communication technologies specialists but now the focus interest and influence has shifted to knowledge management and more recently to developing ways in which human and social resources can be harnessed. The emerging elites are those that enable, energise and are activists in the use of knowledge of a wide and deep range of an empowered workforce to unleash innovation and creativity [9-12].

To illustrate this development in the growth of the perceived value of knowledge as a product, consider the air travel industry. Tomas Stewart [8, p15] makes the following point: *“The air travel industry has become two different industries: the flying industry, which is marginally profitable at best, and the information-about-flying industry, which makes money hand over fist.”* He also discusses the way that knowledge about money, finance and other tangible resources has become more valuable than the tangible object itself. This is what was referred to as ‘The Race for the Future’, where business is shaped and sculpted around knowledge about tangible goods to provide intangible services. A good example of this is the way in which Boeing have repositioned their business enterprise from being suppliers of aerospace products through to service and maintenance providers and are now providers of strategic and operational information about aerospace products and services [13].

So what does the knowledge economy mean to the construction industry? This can be understood from the perspective of developing a quality culture through access to and intelligent use of knowledge because this has implications in the way that knowledge is appreciated as a significant productive asset. Figure 7 illustrates this quality culture development with particular reference to the highly successful and innovatively produced National Museum of Australia project [14, p232].



**Figure 7 - Development of a Quality Culture**

At its basic levels of concern, efficiency and effectiveness in existing business is maximised so that things are done correctly in the way that mainly procedural explicit knowledge, derived from the more formal parts of the knowledge economy, is used for planning and organising. As knowledge of stakeholder requirements for safety and security become well appreciated, the focus on safety becomes more pressing but the focus remains on output.

At the next level, the shift in focus moves from outputs to outcomes—from efficiency towards effectiveness when greater consideration is given to doing the right thing rather than doing the thing right. This engages with the knowledge economy from a learning perspective—through more effective and critical knowledge of the range of available structural, human, customer and social capital assets (more of this later in this section). This focus leads to greater innovation and striving for improvement. Here the wide appreciation of the knowledge economy's workings takes form through initiatives to capitalise on tacit as well as explicit knowledge throughout the organisation. We can possibly see a greater emphasis on knowledge management initiatives with particular focus on the role of supporting information and communication technologies (ICT) in ensuring that the 'right thing is done effectively'.

At the 'outcomes' level, organisations start to concentrate greater attention on customer needs when *structural capital*<sup>2</sup> is more effectively mined and harnessed—doing the right thing. This requires another level of engagement with the knowledge economy because it imposes a greater need for information and knowledge about the characteristics and needs of customers (with stakeholders being more readily considered as differentiated types of customer). This in turn requires greater appreciation of the value of an organisation's *customer capital* assets<sup>3</sup>. When seen in this light, investment by an organisation in customer capital can be viewed as primarily a relationship-building exercise using the enabling capacities of both structural and human capital. Customer capital is enhanced through a series of value adding stages from a transaction, to a product solution, to a business solution to an alliance in which customer and organisational goals and objectives are mutually met through aligning strategy to meet this level of customer needs.

At the next level of focussing upon customer need, organisations must recognise and understand the cultural diversity of customers. This is important because it shifts organisations from attempting to match what they have on offer to what they need to offer. This sophisticated engagement with the knowledge economy allows participating organisations to begin to shape their future because they can begin to more effectively align their offerings with their customer needs. One example was the Boeing Corporation's entry into the provision of specialised consulting advise beyond aircraft design and maintenance to facilities management issues such as the impact of runway

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<sup>2</sup> **Structural capital** is the means by which people are connected to physical, information and knowledge infrastructure with which to deliver products and services that attract customers to an organisation rather than its competitor 8. Stewart, T.A., *Intellectual Capital - The New Wealth of Organizations*. 2000, London: Nicholas Brealey Publishing. 278..

<sup>3</sup> **Customer capital** is value of loyalty customers share with an organisation that enables it to continue delivering products and services that attract customers to an organisation rather than its competitor 8. Ibid.. This loyalty can be envisaged as repeat business, co-development of products and services through development of a mutually beneficial relationship, providing feedback to an organisation, dissemination of customer opinion about an organisation and the development of its reputation.

pavement surfaces on the cost-in-use of aircraft [13]. Construction companies also have this potential. Examples include expanding scope for providing constructability advice through to best-value advice for the whole-of-life and adaptability of built facilities.

Recognising organisational cultural diversity of customers has led to radically different ways of offering procurement options that includes strategic alliances and other forms of better sharing perceptions of need, form and functions of constructed facilities [15].

When moving to the next level (illustrated in Figure 7) the focus becomes centred upon people as the critical resource constraint—having the right people needed to engage and derive value within the knowledge economy. This requires effectively deploying *human capital*<sup>4</sup> assets. This can be seen from the perspective of organisations having sufficient cultural diversity to match their talent and skills to their customer's needs and also from the perspective of attracting the best people (the quest for talent) to their organisations. Moreover human capital, i.e. people, best generate *social capital*<sup>5</sup> that is essential for effectively linking people in a value chain to deliver both outputs and outcomes. Engagement with the knowledge economy for such organisations includes knowledge about customers (including the supply chain) so that they become not only the customers of first choice but also that through their knowledge of their employees and associates; they become the employee/associate of first choice.

Clearly, the knowledge economy is real and present for the construction industry. With knowledge intensification of business life, the focus of resource constraints has shifted over the past century from capital to human and social capital assets. This fundamentally affects the way in which business is best undertaken. Firms need to focus on how to best deploy the critical resource constraint of intellectual capital in response to this knowledge economy trend where knowledge and access paths to knowledge is of pivotal importance [17, p42]. Further, the concept of social capital, and the way in which people form networks of influence and supply knowledge when required, is fully linked with the concept of the knowledge economy.

Concentrating on the technology of knowledge management misses a crucial point that knowledge is socially constructed. A useful rule of thumb to remember is that no more than 1/3<sup>rd</sup> of the total time and money resources of a knowledge management initiative should be spent on technology. Past this point the initiative becomes an IT not knowledge one [18, p78]. Thus a knowledge advantage requires technology support but primarily a human focus to capitalise on what the knowledge economy has to offer. In the following sections this human aspect will be concentrated upon.

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<sup>4</sup> **Human capital** embodies the energy, talent, experience, and behaviour of people who create an organisational culture to deliver products and services that attract customers to an organisation rather than its competitor 8. Ibid..

<sup>5</sup> **Social Capital** can be seen as “the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit” 16. Nahapiet, J. and S. Ghoshal, *Social Capital, Intellectual Capital, and the Organizational Advantage*. Academy of Management Review, 1998. 23(2): p. 242-266.. This view in which the employee, customer and supply chain network is seen as capital and an asset is in stark contrast to traditional construction procurement views of employees and the supply chain as being costs and not significant generators of wealth and not capital in this wider context.

## **Competences and Competitive Advantage**

Porter in his seminal work on competitive advantage identified two forms of competitive advantage. Cost differentiation involves being able to provide goods and/or services at lower a cost than competitors. Product or service differentiation is based on quality of delivery, uniqueness of distribution channel or other defining characteristics of the 'value proposition' that identifies the deliverer as providing a distinctive offering that is either unique or sufficiently differentiated from the 'herd' as to be perceived as special and distinctive [19-22]. Central to this concept is the notion that organisations (and indeed individuals) possess a set of learned and practiced core competences that are in their best interest to concentrate upon and develop.

This focus on core competences lies at the heart of differentiation as its competitive advantage. It also lies at the heart of the knowledge advantage. Interestingly, it has been stated that you can actually miss the strength of competitors by only looking at their end products rather than trying to fathom out what their core business strengths (core competencies) are. Core competencies are the fundamental things that organisations or individuals excel at that can give them an edge over their competitors. They are the *"collective learning in the organisation, especially how to coordinate diverse production skills and integrate multiple streams of technology ... it is also about the organisation of work and the delivery of value"* [23, p82].

When viewed in this light it is clear that core competencies and competitive advantage are about integrating people skills (which are highly flexible in their application) with technology enablers (such as information and knowledge transfer systems/machines) supported by management strategy and procedures (that harmonise the people/machine/administrative system interface). Prahalad and Hamel's seminal paper on core competencies (which relates very closely to concepts of the knowledge economy outline earlier and the knowledge advantage) argues that *"the critical task for management is to create an organisation capable of infusing products with irresistible functionality or, better yet, creating products that customers need but have not yet even imagined"* [23, p80]. They liken the corporation to a tree that grows from its roots. Those things that nourish core products are things that the firm excels at, engendered through its business units' activities, and the fruits of this tree are a firm's end products. Core competencies may not be obvious on first inspection. Manufacturing electronic circuit boards may involve competencies in miniaturisation; precision working and a capacity to work in finely controlled internal environments rather than an ability to make circuit boards per se. Recognising this core competence can lead to opportunities in other situations where precision engineering, and tightly controlling internal environments are called for—perhaps in emerging nanotechnology and biomedical industries. This requires systems and human intelligence that allows the firm to recognise what it is good at, to transfer this required knowledge across business units, and to adapt quickly to changed circumstances by reconfiguring its products and services to meet current, emerging, and as yet undefined demand.

An interesting insight into this aspect of the knowledge advantage is that the kinds of organisations that Prahalad and Hamel describe in their work are very good at making sense of their external environments that they find themselves in and the internal environments that they create. Sensemaking is

an important K-Adv skill or competence. Carl Weick [24] has undertaken a lifetime of research and consulting work on sensemaking and describes it as an ability to retrospectively look at a set of circumstances and make an intelligent assessment about likely contributing causal factors, and to understand (make sense) its cause and effect chains. This sounds simple but in fact it is quite complex. It requires a brutal honesty that can be often missing in today's environment of 'spin-doctoring'. When reflective practitioners review a situation they collect relevant 'facts' as well as informed 'impressions' and 'feelings' and they recorded these and absorb them as valuable knowledge that can be applied in analysing situations and discovering causal chains to better understand specific phenomena. This act of making sense of situations is pivotal in understanding how these reflective learning competences can be applied in novel and innovative ways. This concept of reflective learning is not new, Argyris [25] and Schön [26] offer insights into the process of organisational learning and reflective practice—where experts commit sufficient time to think about the way in which they operate to make sense of what worked, what did not work, and why that might be so.

Before concluding this section, it is worth summarising some of the lessons that Prahalad and Hamel draw to our attention. One is that “*when competencies become imprisoned, the people who carry the competencies do not get assigned to the most exciting opportunities, and their skills begin to atrophy*” [23, p87]. This is akin to the current curse of 'silo mentality' where one business unit hogs resources, talent and knowledge to the detriment of the whole organisation—yet this situation is often created as a consequence of internal competition.

When organisations seek a Darwinian path to creating competitive tension within their business units, the natural response will be for managers of key resources or competences to hoard these because this competitive approach rewards winners. This is a negative aspect of the concept of creative tension proposed by Senge [27]. However, innovation requires some level of tension, uncertainty and frisson to keep people alert to changes in their environment. This can be achieved through stimulating creative conflict and the fight for supremacy of excellent ideas—that is generating *creative chaos*. This helps people to transcend restrictive existing boundaries through emersion in an environment where it is safe to make wild suggestions in response to problems and where unusual behaviour, approaches or iconoclastic thinking that provides an opportunity to 'unlearn' or challenge supposed 'self-evident truths' is not only tolerated but encouraged [28, p35].

Purposely creating this tension through what has been termed *requisite variety* is important to innovation. Requisite variety is the availability of a variety of responses to a challenge, often by casting that challenge in an ambiguous manner to force different individuals to see that challenge in their own unique way so that they offer quite different proposed solutions [29, p86]. In the construction industry requisite variety through ambiguity may be triggered by a client providing a difficult to define brief (e.g. achieving best-value whatever that might mean), for a project designer proposing a particularly esoteric design solution that at first appears 'unbuildable', or demanding stretch targets being assigned to a project (e.g. a 25% reduction in time delivery than would normally be the case). Requisite variety can also



be achieved and enhanced through knowledge diffusion within organisations that allows knowledge and information to be rapidly shared throughout the organisation as a whole [28, p37].

The two remaining pre-conditions for providing an environment where tacit knowledge about core competencies can be shared and further developed is *redundancy* and a sense of *commitment*. Redundancy means that there is an intentional overlap of resources to allow the space for reflection and thinking. A sense of commitment to creating an innovative solution to challenges is necessary because a differentiated competitive advantage generally relies on being unique or highly unusual so that it transcends the obvious or 'norm' [28, p36-37]. Commitment is fostered through an environment of trust and care where individuals feel positively obliged to share ideas and knowledge that benefits all within an organisation rather than the individual or small group concerned [15, 30].

The more obvious understanding of core competencies is that they relate to tangible or explicit knowledge about how to do something specialised and well differentiated from the norm. For example the company 3M had substantial depth of understanding of adhesives, chemical properties of substrates, coatings and adhesives. However, it had a policy of expecting its researchers to spend 15% of their work time on personal research projects that they had a passion for. This provided a measure of *creative chaos*, *redundancy* and *personal commitment*. Moreover, 3M's had additional *requisite variety* through its technical core competencies combined with its psychologically safe environment where experimentation and failed experiments were accepted (provided that lessons were learned). In this way 3M was able to turn a 'failed' adhesive experiment into the highly successful 'Post-it' invention. The failure of an adhesive to permanently adhere became the famous and useful invention of a paper note that could be temporarily adhered to a range of surfaces but still be able to be removed when necessary [18, p105]. This example illustrates that a firm like 3M with a massive portfolio of products that regularly change and evolve might have only a few core competencies. In this example, 3M had knowledge about adhesives, substrates and a few related chemical engineering related competencies. The crucial link to innovation for them, however, was 3M's company policy and environment competency that encouraged creative tension and innovation [23, p82].

Many organisations fail to recognise that a working environment that fosters creative tension and commitment of its members to innovative thinking can be considered a core competency. Companies with solid core competencies that can effectively marshal have the capacity to rise to the occasion and provide innovative results. They do so by ingeniously using their core competencies that are dependent upon their human and social capital resources supported by their structural capital assets. To summarise the above section, they would effectively use their K-Adv.

### ***Tangible and Intangible Outcomes in the Value Chain– Sustainability and Waste Minimisation***

The knowledge advantage for successful business activities is principally about adding value through working smarter and for the workforce to instinctively embrace both a quality and innovation culture. The section on

competitive advantage provides useful insights into the importance of a differentiation approach to competitive advantage. Part of this differentiation lies with the full recognition of both tangible and intangible outcomes that organisations provide when responding to a customer need.

The concept of a value chain was proposed and widely explored by Porter [19]. It is a useful way of looking at the process of delivering products and services from the value-adding perspective. Essentially, instead of looking at production as a process of combining functions as resource inputs it looks at these as value-adding contributors. The crucial question asked for each input and at each stage is “what value does this input create to the outcome?” This begs a further question “To what extent can waste be eliminated or minimised from the creation of the outcome?” The supply chain becomes a value chain and upstream suppliers provide value inputs that allows a given supply chain member to add value to these before passing on to the next stage of the process.

A value chain perspective allows a more critical analysis of what was the outcome from the process and the degree to which value was added. If little value was added, or value could be better added in other ways, then that step may be eliminated as it is redundant, or modified so that it would better contribute value. It also raises issues of cost advantage and resource wastage. Non-value activities are progressively squeezed out of the overall process through analysis of waste and taking appropriate action. Undertaking this analysis requires in-depth knowledge about the process, their value contribution, how activities within the process relate to each other, and implications on how processes and sets of systems connect. A value focus leads to thinking about how to achieve whole-system improvements through ‘*double loop learning*’ rather than ‘*single loop learning*’ quick fixes of symptoms on individual system components [25, 31]. A value focus fits well with the Figure 7 quality culture illustration.

When these questions are seriously considered and a focus is applied to value adding and waste minimisation then the definition of value, and the characteristics of outcomes become critical. The issue of resource flows and outputs becomes a second order issue. However, value is often not well defined by the client or the provider of the product or service. Indeed over past decades, a whole new field of performance measurement has developed that flows from the definition of value. Kaplan [32] and Eccles [33] were amongst the first people to consider the importance of outcomes rather than process outputs.

Outcomes tend to encompass intangible performance such as learning, satisfaction, commitment, and the generation of social benefit. It can be argued that these may be more important in the long run when compared to more standard performance output measures such as income generated, project completion time or functionality.

A good example of this is the Sydney Opera House project. This was considered in terms of output performance as a total disaster. It was widely criticised at the time of its completion and opening because of the truly massive cost and time blowouts yet this project became an important strategic iconic project to Sydney. It can be argued that it placed Sydney on the international catalogue of the world’s great cities because of its architectural and cultural iconic significance. It also may have been instrumental in a shift

of focus of Sydney as Australia's gateway city rather than Melbourne. The Sydney Opera House has also provided a wonderful photographic backdrop for TV shows, media events and cultural events as being an iconic representation of Sydney and Australia. It has also been effectively used for a far broader range of functional uses than was ever envisaged at the time of its design. Thus the Sydney Opera House project demonstrates how outcomes can be far more significant in the long term than outputs.

The above discussion neatly prepares the discussion on the merits of the concept of the balanced scorecard (BSC) approach and its contribution to a K-Adv. It was originally devised as an attempt to measure an organisation's performance from four perspectives

- *Financial*—measures that are at present commonly used such as profit levels, market share etc. These answer the question “How do we look to our shareholders?”
- *Customer*—measures that can be used to report on customer satisfaction, customer experience etc. These are concerned with the question “How do we look to our shareholders?”
- *Internal business process*—measures of efficiency and effectiveness of business processes, for example: throughput of a production line; OHS effectiveness in terms of lost time for injuries; quality management system measures etc. These measures help answer the question “What must we excel at?”
- *Innovation and learning*—measures that identify learning and innovation performance. These measures help answer the question “Can we improve and create wealth?”

The above, though only a guide to one set of uses, can be seen as indicative of the sort of wider perspective to organisational performance. The BSC was developed to help link strategy to performance measure and improvement through learning [34, 35]. The aim is to develop measures that test the effectiveness of implementation of strategy so that policy deployment can be better managed and that ineffective strategy becomes evident. It is not uncommon for compromise solutions to complex decisions to result in policy being declared that is internally inconsistent. This is frequently manifested by placing organisations in a double-bind or ‘catch 22’ situation. A BSC has the potential to make this situation obvious because performance measures are made explicit and these provide opportunities for mapping causal links from policy to deployment.

The BSC is useful because of its wider focus on performance rather than being restricted to a financial returns perspective. It provides opportunities to make explicit some of the intangible outcomes that may have remained implicit. An example of this might be in the customer perspective. In order to measure the customer experience a series of qualitative measures may be developed and in doing so assumptions about what customers want or need can be validated and perhaps things that delight customers can be made explicit and measures developed to provide ‘reputation’ performance measures for these.

The BSC is challenging the economic rationalist view of the world. It has the advantage of being a concept that can be modified and adapted to suit a variety of performance measurement circumstances including triple bottom

line [36] measures of financial, social and environmental issues<sup>6</sup>. The key to applying the BSC is working out the value links between the triple bottom line, strategy and performance [37].

The K-Adv is gained from using a BSC approach to performance measurement by enabling organisation to better articulate and know what they aim to do (their strategy) and how they intend to do this (their business plans) and the extent to which they are achieving these plans (the BSC) and what they need to do as a result of measuring performance (action plans arising out of BSC measures). This is undertaken with a focus on value generation and waste minimisation or elimination.

## **Chapter Summary**

Chapter 2 clearly indicates how organisations have to take account of the existence and operation of the knowledge economy. It also traced how the focus of economic activity has evolved from an agrarian economy to today's knowledge economy where talent, knowledge and business competence are key elements for success. The emergence of influential elites at each stage of economic development was also described. In today's workplace the knowledge worker rather than machines possess the key resources that organisations need—the ability to creatively link disparate ideas to develop innovative solutions to complex problems and to create original and new products or services. Machines and systems are incapable of doing this without human intervention. The human mind has properties of rapid and often a bizarre quality of ingenuity that machines have yet to mimic. Thus to succeed, organisations must harness human capital assets. This can be supported by organisational and ICT assets and facilities. The key to success, however, is to facilitate in an effective and intelligent way the right combination of structural, customer, human and social capital.

We saw that the knowledge advantage is principally about using knowledge to gain a competitive advantage. To a minor extent this relates to a cost advantage because it becomes obvious that any organisation that improves its ability to be reflective and active in recognising how it may improve its productivity, will reduce waste costs. Perhaps more importantly, it will reduce costs through management and technology efficiencies.

Organisations however, are more likely to deliver positive business performance benefits through defining its differentiating competitive advantage. Thus, an organisation's ability to effectively use its K-Adv assists it to deliver a differentiating competitive advantage. Through effectively using its K-Adv an organisation can work out what its core competences are, how these may be further developed, how it can identify both tangible and intangible benefits for its products or services, and how it can develop a management system that delivers a performance measurement strategy that can operationalise these to deliver a value adding product/service.

The purpose of a K-Adv and its link to the knowledge economy, competitive advantage, and the delivery of tangible and intangible benefits that create and add value should now be clearer.

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<sup>6</sup> See 36. Elkington, J., *Cannibals with Forks*. 1997, London: Capstone Publishing. 402. for example.

## Chapter 3. The Knowledge Advantage (K-Adv) Concept

Derek H.T. Walker

The following will be discussed in this chapter:

- Purpose of the Chapter
- A Definition and Explanation of the K-Adv
- Strategic Implications of the Knowledge Advantage
- Types of Knowledge
- Dimensions of Knowledge
- Communities of Practice (COP)
- Influence of Social Capital Upon the K-Adv
- Implementation Implications of the K-Adv
- Knowledge Transfer for the K-Adv
- Chapter Summary

### ***Purpose of the Chapter***

The purpose of this chapter is to introduce concepts related to the K-Adv. This includes a definition and explanation of what the K-Adv means. It also includes background discussion on some of the terms and concepts that form the backbone and underpinning theoretical framework for understanding the relevance of the K-Adv.

This chapter provides relevant concepts and theory that is later expanded upon and discussed in context with the three identified elements of the K-Adv. Rather than provide example and get bogged down in detail, concepts are provided here because later chapters provide a better opportunity for rooting these in their K-Adv context.

### ***A Definition and Explanation of the K-Adv***

It is important to remember that innovation, which lies at the core of the K-Adv, is a change management process and much of the literature that has been drawn upon in this publication recognises this link and its implication for leadership, enactment, and the drivers and barriers to achieving innovation. To save readers the time to refer back to that definition it is reproduced below.

***An organisation's K-Adv is its capacity to liberate latent creativity and innovation potential through effective management of knowledge both from within its organisational boundaries and its external environment.***

Teresa Amabile in a recent Harvard Business Review article discussed business creativity and the way that it is often stifled. She argues that creativity is a function of three components—expertise, intrinsic motivation and creative thinking skills. Creativity she argues lies at the intersection of all three components [38, p78]. Expertise is the person's knowledge of a particular domain in question. Maslow [39] first promoted a theory of a hierarchy of motivation factors stretching from physiological, security, affiliation, and esteem to self-actualisation. Intrinsic motivation is the desire and passion that wells up from within a person to achieve great or interesting

things rather than get extrinsic rewards such as physical or security needs. Creative thinking skills relate to flexibility, imagination and nimbleness of mind. It is interesting that these three things are internally generated forces. Amabile argues that the key to managing creativity is to provide enablers to encourage creativity to flourish and to avoid management and system behaviours that create reactive forces that counter our natural disposition to be creative. These will be discussed in more detail later in this document.

The second key word in the K-Adv definition is innovation. Rogers [40] defined it as *“an idea, practice, or object that is perceived as new by an individual or other unit of adoption.”* Innovation obviously involves a perceived need to change from one state to another. Its purpose is Darwinian. It is about survival and growth—about ecological (market) niches being filled by the exuberance of a life force. Innovation is, therefore, a decision-making process to enact change in technology, process, services rendered or other management approaches [41, p238].

The third key word in the definition of K-Adv is knowledge. There are, however, many definitions of knowledge and the next section will develop the concept further. One knowledge definition that best describes it is *“...a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates in and is applied in the minds of knowers. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices, and norms”* [18, p5]. This definition indicates that knowledge principally is a constructed reality in that it does not exist ‘out there’ but is a product of experiences and interpretation and thus on the one hand it is a form of understanding. We also have on the other hand, knowledge that is embedded in procedures, systems and routines.

## Strategic Implications of the Knowledge Advantage

Michael Zack in his article in the California Management Review discusses the process involved in developing a knowledge strategy [42, p134]. This is presented in Figure 8 below.

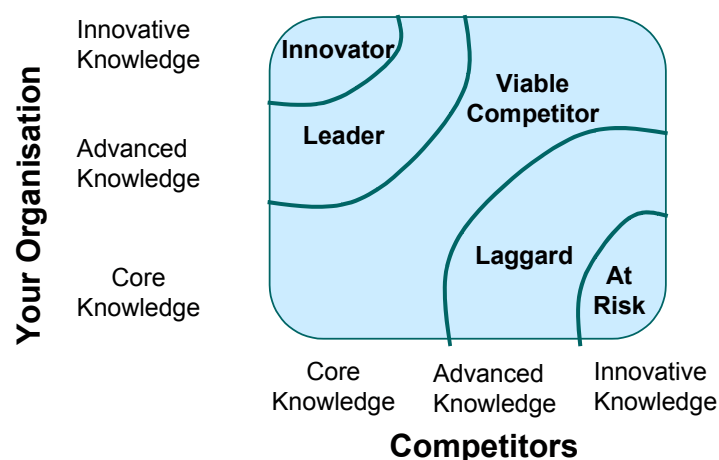


Figure 8 - Knowledge Strategic Analysis

Central to his argument is the notion of *‘core knowledge’*, the minimal knowledge required to stay in the game. *Advanced knowledge* enables a firm

to be viable relative to its competitors, while it may have generally similar scope and quality of knowledge to its competitors but it may be able to have specific differentiated knowledge that places it in a niche market situation. *Innovative knowledge* allows it to lead its industry segment(s) and significantly differentiate itself from competitors. Zack makes the point that knowledge is far from static so that which is advanced today may become core knowledge tomorrow. In Figure 8 he provides a useful map to illustrate the competitive positions of organisations in terms of being at risk, a laggard, a viable competitor, a leader and an innovator. This simple model clearly indicates the value of having advanced and innovative knowledge to have the chance to be able to stay ahead of the pack.

His paper also discusses the role that a knowledge strategy plays in identifying a knowledge gap between what the organisation knows versus what it needs to know and a strategy gap between what the organisation does and needs to do in terms of a knowledge management strategy. He also develops ideas about knowledge being described as internal versus external. He defines *internal knowledge* as being within the heads (as in human capital) or embedded in the organisation's infrastructure (as in structural capital) and *external knowledge* as being derived and obtained from outside the organisation (either using customer capital or from freely available or purchasable sources or through joint ventures and/or closely working with the organisation's supply chain).

Zack links exploration and exploitation strategies of knowledge assets to these concepts. *Exploitation* of knowledge assets is achieved from leveraging from both internal (mostly) and external (sometimes) sources. The objective of knowledge management is to exploit knowledge assets, however, without developing an *exploration* strategy (knowledge creation and experimentation (R&D) through innovation and reflection) the well of knowledge to allow an organisation to maintain a leadership or innovator status.

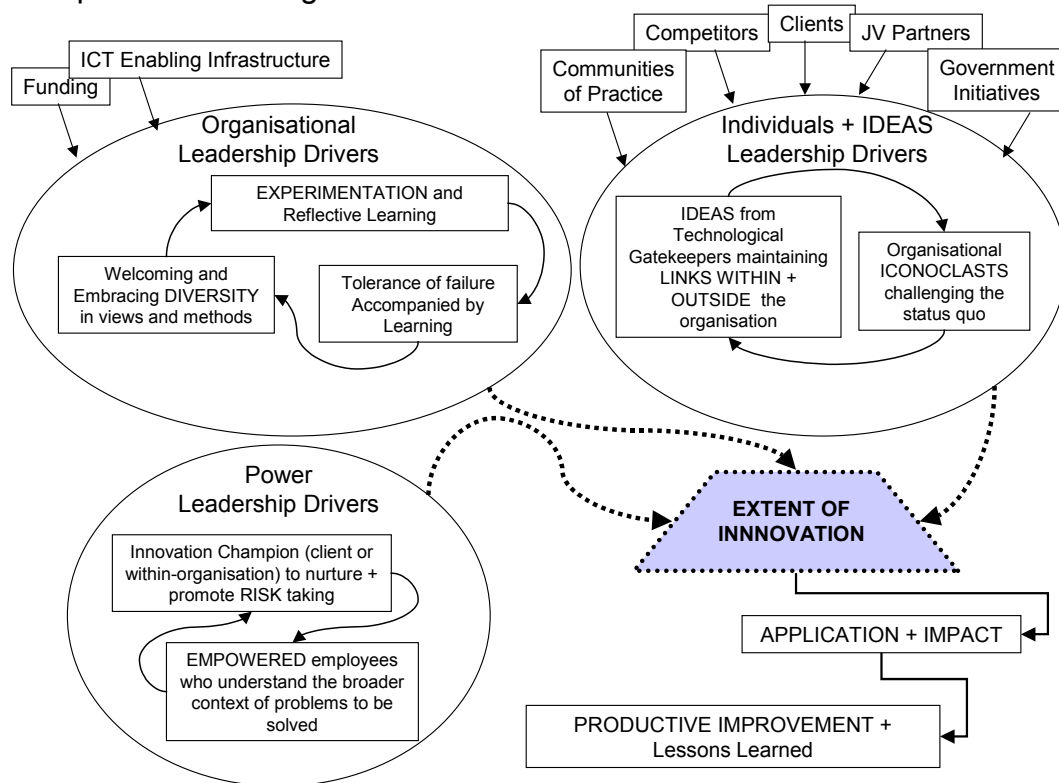
When concentrating on the type of culture and environment that is necessary for incubating and developing a K-Adv, it becomes clear that a high level of leadership and setting a knowledge vision needs to take place. Sound leadership informs and shapes strategy to seek and develop the knowledge vision that will influence and enthuse people to strive for the K-Adv.

So we have the K-Adv as being clearly linked to creativity, innovation and knowledge. There is clearly a requirement for not only people's technical knowledge and competence to innovate, but also an enabling organisational leadership environment. It can be appreciated from the above that the extent of competitive advantage from productive improvements depends upon the interaction of three clusters of cultural factors. Cultural aspects of a relationship-based approach to procurement are more fully explored later.

Figure 9 illustrates a general model of an enabling innovation culture [41, p244]. I do not intend to dwell on a detailed explanation of the model here; interested readers are referred to Chapter 9 of [15]. However, Figure 9 clearly indicates that the extent of innovation is largely determined by human factors.

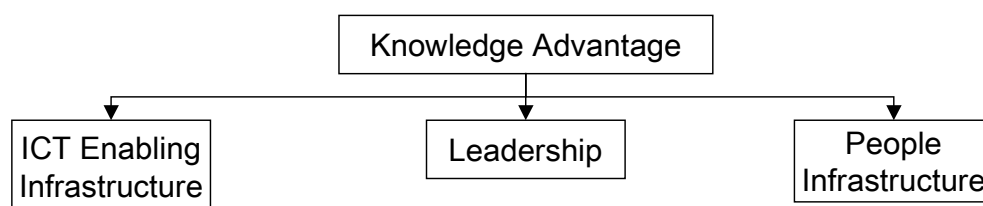
Leadership is represented by creating a learning organisation where experimentation, diversity and knowledge is valued and this is supported by adequate resourcing (including funds) and a supporting ICT infrastructure such as groupware etc. Individuals as well as the hierarchy provide an innovation-friendly environment and culture. They do this by welcoming ideas

from outside the organisation as well as from internal sources. The other aspect of leadership relates to power and its application. There is a clear need for a knowledge and innovation champion. Also employees must be empowered to be able to take initiative, challenge authority and not be intimidated into failure to offer alternatives. The above shape the extent of innovation likely in an organisations and this in turn directly affects its application, impact and the extent of productive improvement that represents the competitive advantage.



**Figure 9 - An Innovation Enabler Model**

Leadership appears prominently in Figure 9 and it entails those leading to have a clear mental model and an ability to sculpt a knowledge-based future for the organisation. In an iterative process, leadership as performed by an individual *knowledge activist* (or more likely a group of visionary knowledge activists) will engage with those in the organisation who can commit and shape resource allocation and organisational policy to develop a knowledge vision for the organisation to use knowledge more effectively. A knowledge activist has been defined as “a manager with broad social and intellectual vision as well as experience in the nitty-gritty business operations, someone who connects external and internal knowledge initiatives and mobilizes workers throughout the organization” [12, p4].



**Figure 10 - The K-Adv: Top Level Model**



In the introduction, the definition of K-Adv was provided and it clearly is composed of three elements. These are leadership, a people infrastructure to carry out the defined vision and an enabling ICT infrastructure. Figure 10 illustrates these at the K-Adv's topmost level.

The necessary resources can be committed to implement a knowledge vision once leadership is in place. This will require the mobilisation of an ICT infrastructure that can support knowledge management activities. Hardware, software infrastructure and ICT system support such as training, help facilities and technology support to ensure the functioning of ICT enablers. A corporate leadership strategy also is needed to provide a facilitating infrastructure to support people's creative energy required to create, share and leverage knowledge for strategic advantage. This creative energy is nurtured through a supportive business process and a healthy business culture that values and rewards organisational learning. Reward systems need not necessarily be financial but should appeal to the appropriate motivational drivers of knowledge workers.

Thus far I have avoided discussing the concept or definitions of knowledge in any depth. Fortunately there are a number of excellent texts that can be referred to for providing the depth of insights that many readers might care to gain. Books that I have read and have found very useful are [11, 12, 17, 18, 29, 43-46]. Given that many readers will not have the time to invest in reading these excellent texts, I have extracted some important definitional issues that are important when understanding the concept of the K-Adv.

### ***Types of Knowledge***

Knowledge can be categorised by type. Zack uses the following typology [42, p132] declarative knowledge (knowledge about or *know what*), procedural knowledge (*know how*), causal knowledge (*know why*), conditional knowledge (*know when*), and relational knowledge (*know with*). Quinn et al [47] describes know-what or declarative knowledge as cognitive knowledge, and procedural knowledge as advanced skills and systems understanding as know why. They add a further concept that is useful to understand the self-motivated drive of creative intellect, or *care-why*. They argue that the organisation of work should be focused around making the most of the best, or developing competitive advantage, through developing a care-why approach. Care-why moves beyond simply knowing what, how, why, when and with what/whom. It appreciates systemic reasoning and then provides the necessary motivation and energy to transform ideas into action. They argue that this is partly a leadership enabling function, organisational deployment issue and also a human and social capital individual issue.

There is a general consensus that knowledge is a richly contextual embedded experience. Our understanding and knowledge about something is deeply rooted in the context that it was learned. The ongoing debate about a capacity to *manage knowledge* has been about the extent to which knowledge is conceived, developed and owned by individuals and the extent to which organisations can benefit from the knowledge embedded in individuals and vice versa. Knowledge is a very nebulous concept and so many years ago when a theory of knowledge was being developed it was conveniently categorised into two forms, tacit and explicit.

During the mid 1960's the concept of *tacit knowledge* was explored. Polanyi discusses how we can know more than we can tell. He cites the example of face recognition. We can recognise a particular person's face, even someone from the past or someone who we have never met, from the thousands and indeed millions of faces we could have presented to us yet we cannot explain how we know that particular face [48, p136]. Tacit, according to the dictionary, means silent, not openly expressed but implied, understood or inferred—from the Latin *taceo* I am silent [49, p1727]. Tacit knowledge is more difficult than explicit knowledge to create, capture, codify, communicate and transfer because it is highly intellectually energy intensive. It requires deep consideration and thought about how to manage this knowledge to benefit individuals and organisations. This is because it involves dealing with people and their motivational drives and inhibitors. It can be argued that people have more complex and unpredictable (and hence manageable) characteristics than programmable machines that characterise technology.

*Explicit knowledge* is that which can be easily explained in explicit terms. In theory it can easily be recorded for later use in textual, pictorial or other recorded forms. This notion is not quite as simple as it might seem. Most explicit knowledge has some tacit sub-text or hidden meaning that involves experience and interpretation of context. For example we might explicitly state that 21C is a room comfortable temperature. This explicit knowledge, which may appear in a manual or design guide for internal environments, makes some hidden assumptions. One of these could be that humidity is 'bearable—whatever that might mean', another is that those people in that room find 21C a comfortable temperature whereas their experience may have taught them that 21C is too cool or alternatively being too stifling and uncomfortable for them. Thus this explicit procedural knowledge is not as explicit as it first seems—indeed if a highly skilled designer were making a decision on a temperature setting then he or she would probably investigate further to unearth the contextual information and knowledge before making a design decision.

Claus Sharmer expressed a view of knowledge being much like an iceberg. Above the water line he envisages explicit knowledge. Below the water line he identifies embodied tacit knowledge (knowledge in use) and what he calls self-transcending knowledge (not yet embodied knowledge) [50, p70]. This notion led him to categorise four types of action in using knowledge; delivering results that create value (performing); improving the process of performing (strategising); reframing the assumption of performing (mental modelling); and re-conceiving the identity of performing (sculpting). Through developing a matrix of the three types of knowledge he identified and the four actions of knowledge use, he developed a categorisation of knowledge into twelve elements as illustrated in Table 1.

**Table 1 - Twelve Types of Knowledge**

Knowledge type (E) Action type (A)	E1: Explicit	E2: Tacit	E3: Self-transcending
A1: Performing	Know-what	Knowledge in use	Reflection in action
A2: Strategising	Know-how	Theory in use	Imagination in action
A3: Mental modelling	Know-why	Metaphysics in use	Inspiration in action
A4: Sculpting	Know-who	Ethics/aesthetics in use	Intuition in action

Table 1 indicates that the base level *performing* knowledge action (or reaction) uses know-what, mainly informational explicit knowledge. Traditional embodied tacit knowledge is in the form of the way-that-things-are-done-here. Self-transcending knowledge is confined to reflection in action with lessons learned being the principal not yet embodied knowledge asset expected to be delivered. Knowledge is regarded in utilitarian terms as a harvestable asset. Any knowledge management initiative is generally confined to a strategy of picking the 'low-level-fruit'. This level of knowledge use typifies problems being fixed single loop learning rather than addressing systemic causes double loop learning [31].

*Strategising* regards knowledge as a process with a focus on knowledge creation, transmission and use at a utilitarian level. Knowledge management is seen in terms of a knowledge creating cycle of: individuals sharing tacit knowledge through socialisation (S); articulating this either verbally or textually to make tacit knowledge explicit (E); combining the explicit knowledge shared with existing explicit knowledge such as operating procedures, manuals, and information bases (C); and then through reflection and embodying that re-framed explicit knowledge, internalising it so that it becomes refined tacit knowledge for many individuals across the organisation (I). This SECI process spirals in a three dimensional cycle rather than circles in a two dimensional structure [29, p73]. Explicit knowledge is still concerned with a single loop learning approach to fixing problems. Tacit knowledge is seen under the SECI process as a living and supported process of theory in use. Self-transcending knowledge is liberated through greater support into imagination in action as strategies are imagined and preferred futures developed.

*Mental modelling* develops explicit know-why knowledge. In a project management setting this may include developing a project vision and clearly articulating not only the vision but also its purpose and justification. This powerful knowledge action is sometimes known as understanding the 'big-picture' [51, p51] which is vital as a step towards goal alignment and developing shared mental models [27] that are necessary for thinking through why it is important to act in a particular way. Tacit knowledge is metaphysical, that is knowledge about the reality/physical in a more structured reflecting manner. Self-transcending knowledge is inspirational in action moving beyond imagination due to the shared mental models allowing transformational visioning of the future.

*Sculpting* takes mental modelling action into reality. [51, p45] describes a sculptor's leadership style as being appropriate for unusual and occasional projects and can be applied well to complex projects. A sculptor shapes ideas, develops form and structure and manages the work environment to undertake the. Explicit knowledge is more know-who in nature in order to be able to commission a design strategy to ensure that the mental model can be achieved as envisaged. Embodied tacit knowledge is ethics and aesthetics in use knowing what is possible and why it should be done and who is best to collaborate with to achieve the mental model. Self-transcending knowledge is intuitive in nature to enact the mental model or vision.

Another consideration to be made when attempting to manage the creation, use, and diffusion of knowledge is how easy it might be to transfer. Burton-Jones [17] describes some kinds of tacit knowledge as 'sticky', that is,

difficult to codify or explain—it tends to stick to the person with that knowledge and is only transferred with a fair bit of consideration and effort. Additionally, the knowledge recipient individual or group needs to be prepared for such a transfer.

The term used for this state of preparedness is the ‘absorptive’ capacity [52]. Essentially this is a capacity to absorb knowledge. Cohen *et al* argue that this is largely a function of prior related knowledge—people learn best by association, linking related accumulated knowledge and experience. For example, the Microsoft suite of Office products all have a similar feel so that getting used to the toolbar on any application that you are new to is not particularly difficult. Similarly, if you speak Italian it is not that difficult to learn other closely related Latin-based languages such as Spanish or vice versa. Companies that encourage R&D or who encourage their employees to undertake training and development courses find it less difficult to be prepared for knowledge transfer. Thus an absorptive capacity is a crucial factor in knowledge being transferred either from tacit to tacit or tacit to explicit—the recipient is bounded by his/her absorptive capacity to understand the shared knowledge content and context.

## Dimensions of Knowledge

Apart from explicit and tacit knowledge there are different characteristics or dimension of knowledge. Seven dimensions of knowledge have been proposed by [18, p70]. These are presented in a modified form in Table 2 below.

**Table 2 – Dimensions of Knowledge – Scored by Ease of Knowledge Transfer**

<b>Scores 1</b>		<b>Scores 5</b>
1 Tacit	←→	Explicit
2 Not teachable	←→	Teachable
3 Not articulated	←→	Articulated
4 Not observable in use	←→	Observable in use
5 Rich in subtext/context	←→	Schematic
6 Complex	←→	Simple
7 Undocumented	←→	Documented

Creating and developing, codifying and coordinating, transferring, and applying knowledge is often referred to as knowledge management [18]. In the process of using knowledge to gain a competitive advantage we need to consider how best to manage knowledge. Before a start can be made on this process it is necessary to understand the characteristics of the knowledge to be ‘managed’. Each of the dimensions illustrated in Table 2 form a continuum from a low level to a high level ease of knowledge transfer. Having a typology such as this helps us to visualise how difficult or otherwise it might be to make tacit knowledge more explicit and provides us with a basis for gaining valuable insights into how to effectively transfer knowledge. Some strategies can effectively and efficiently be used to transfer knowledge using ICT, others by a person to person strategy and yet others can only be effective through allowing individuals to acquire such knowledge through experience (either ‘live’ or through simulation).

In developing a strategy to cope with, or more positively to manage knowledge, we need to craft plans to address the dimensions of knowledge illustrated in Table 2. *Tacit* knowledge for example, needs a different approach to knowledge management than does explicit knowledge. Looking at the left side of Table 2 it is clear that tacit knowledge is difficult to explain through the spoken word or in text form—that is to be made *explicit*. In order for knowledge to be easily transferable and available throughout an organisation it must be able to be explained explicitly.

Some knowledge is unteachable in that the only way to learn it is through experience. One could look at faith-based knowledge as an example. Many balance-type sports including riding a bike, skiing, and surfing fall into this category—each has techniques and theory that can be taught relating to the ‘what’ that happens. However, something special also happens when experimenting and experiencing these sensations by letting the body’s peculiar sensing systems take over from programmed ‘rule-based’ knowledge to develop the knowledge of the ‘how’ to balance in each of these sports.

Some knowledge remains unspoken and cannot be easily *articulated* because other physical senses are more useful for this purpose. Culinary skills for example involves using knowledge derived from the physical senses relating to judgement of taste and consistency of substances like pastry. This knowledge may be explicitly transferable, however, with difficulty by using ingenious and highly resource-consuming means such as the use of multi-media and experiential learning. Nonaka and Takeuchi [29] discuss a relevant example of this with their account of the Japanese invention of the bread-making machine. This innovation realisation required a production design engineer to undergo sustained period of apprenticeship and interaction with an expert pastry chef to be enable the chef to articulate and make explicit concepts such as dough consistence and kneading techniques. Once this was successfully accomplished the production engineers designed the bread-making machine used the chef’s transferred knowledge and developed the machine through further experimentation, and trial and error.

Some knowledge is *not observable*—hidden inside the mind. An example is the creative thought processes of artists, musicians and elite sportspeople. Champion golfers have contributed to golf how-to books yet the average golfer still cannot get into the mind of the author. Talented creative artists of all kinds have ‘undefined’ knowledge that seems impossible to put on a computer chip for distribution.

Knowledge may be *schematic*, easily reducible to rules and patterns, or be so rich in context (known only from using multiple senses) that definition clouds all clarity that might be sought to explain this kind of knowledge.

Schematic knowledge lends itself to being framed in tables, rules and other forms of clear representation. Early work on expert systems has been all but abandoned. Many expert systems have been developed for example using case based reasoning to define the rules and schemas in insurance and call-centre operations for example, however, much knowledge work defies easy categorisation.

*Complexity* versus simplicity also defines ends of a knowledge spectrum. Knowledge about weather prediction (or indeed many other types of prediction) illustrates this dimension. The interaction of many different

elements or dynamic sub-systems can turn predictive knowledge into a highly complex activity.

Finally, some knowledge is *documented* and other is not. Knowledge of ancient languages is dependent of documented sources—whether inscribed upon rock, on papyrus or paper. More prosaically, lessons learned from projects are often rarely documented in the commercial building industry [53].

While there can be valid debate about the knowledge dimensions represented in Table 2 in terms of merging these dimensions into a different configuration of these, the multiplicity of dimensions is difficult to argue with.

Table 1 and Table 2 indicate that knowledge is a very complex resource for organisations to attempt to ‘manage’. While managing information and information systems for decision support can be largely accomplished with ICT, knowledge is to a large extent socially constructed and therefore relies upon humans to transfer and reframe it.

While individuals and small groups can, and do, effectively deploy their individual knowledge and can share knowledge, this will not be fully effective within the organisation. This is because unless a means of sharing knowledge is established so that knowledge creation and re-framing within similar and varied contexts, then the knowledge creating cycle will become limited in its application across the organisation with endless ‘prototypes’ or pilot programs being produced but little knowledge being diffused across the organisation where it can bring greater benefits to the organisation. This vital knowledge creation phase is what Nonaka and Takeuchi refer to as cross-leveling knowledge. They argue that for this phase to function effectively “...it is essential that each organizational unit have the autonomy to take the knowledge developed somewhere else and apply it freely across different levels and boundaries” [29, p88]. This introduces the most significant aspect of knowledge management, how people can be encouraged and facilitated to share knowledge, to transform their knowledge through the SECI process identified earlier [29, p73].

### ***Communities of Practice (COP)***

Etienne Wenger was one of the most influential writers on communities of practice (COP) a concept that encapsulates the spirit of important elements of both human and social capital. He defines COP as “*groups of people informally bound together by shared expertise and passion for a joint enterprise*” [54, p139].

One of the most referenced example of a COP is the study undertaken on the way that photocopying machine technicians formed an informal (but highly focussed) technical support group to help them solve complex and often perplexing problems relating to breakdowns and malfunctions of these machines [55]. The account of this research has been interpreted by numerous writers on knowledge management and more specifically the workings of COP, for example [18, 56]. In Orr’s example of a COP, a number of individuals share a common enterprise and objective (in this case repair and maintenance of photocopying machines), and through their support group share both knowledge and perceptions through narratives (war stories) where they discuss details of problems, their contexts, the messiness and quirkiness of the situation in all its rich detail of tacit details and sub-text.

This support group is informal; it was generally unknown within the employing organisation because it was informal. It was also pivotal in enabling its members to solve complex problems whose solutions did not appear in any manuals or company documentary resources. It was in this regard typical of the coping mechanism that so-called 'poorly qualified' (as measured in a formal sense) people use as part of a process of making sense of a difficult to comprehend situation. It provides salutary lessons in knowledge management that could transform the 'lowly' status of some occupations because it draws upon a rich tradition that stretches back to medieval guilds and more recently professional associations.

The principal behind Orr's study of technicians can be applied to lauded professional associations or even the mentoring of senior executives. The COP principal is that when people can be freed to openly reflect on actions, to critically analyse these actions, to attempt to make sense of them, to share their insights with others in a way that allows 'safe' challenges (that is non-threatening cross examination), and to re-frame their experiences in light of valued input from their peers, then progress is made towards practice improvement. This principal is at the heart of the reflective practitioner [26], and can form the basis for not only incremental improvement in technical practice but also improvement in professional practice in the sense of a truly academic study [57]. Key elements of the Orr example and that of many from COP has been categorised by John Seely Brown and Paul Duguid of the Xerox Palo Alto Research Centre in California [56]. These are:

- Narration or 'storytelling' that provide the thick and rich subtextual knowledge that underpins understanding of complex situations;
- Collaboration that enables the development of joint problem solving by peers in a largely power dimension free environment so that individuals share knowledge as equals in terms of their potential contribution to results;
- Social constructions through sharing and developing insights and modelling mentally through what-if scenarios, alternative solutions or explanations by peers using a shared language that connects areas of tacit knowledge in the SECI socialisation process;
- Bricolage—that is a tendency to cope with complex problems by making do with whatever is at hand so that ingenious use is made of materials, systems, knowledge etc to shape the materials at hand to perform the required task to solve the problem. Often this results in leaps of inspiration and innovation.

This COP approach often is present in varying degrees and intensity in the tea-room gossip to board-room chat. The main difference between unfocussed banter (in terms of business solution finding) and what an effectively functioning COP represents (such as described by Orr) is that the COP is both reflective and analytical in its purpose. It dissects tricky situations and probing them deeply for causal relationships, striving earnestly for feasible solutions. It is not difficult for us to discern between mere banter and effective COP work, and to know when superficiality departs and profundity takes over—regardless of the technical or academic credentials of participants.

Requirements for the social environment to be created for the emergence of COP will be discussed in more detail later in the drivers and barriers to the

K-Adv. However, at this point, it is worth stressing COP requires a trusting and safe environment in which contributions are valued and social capital is recognised as a highly desirable outcome from an organisation's activities. The proactive input of an organisation's leadership group can have mixed results. While caution is relevant because COP are grass-roots organisations that might see corporate interference as controlling or manipulative, an intelligent and sensitive (in terms of power and influence issues) management of the opportunities and shaping of COP is possible.

John Storck and Patricia Hill for example offer a solution that they term a strategic community. They provide examples of cases from Xerox, an organisation that has been widely documented as valuing COP as part of their K-Adv [58]. Their cases indicate that organisations should facilitate COP and help resource them to support initiatives that can be of strategic importance and can be fed back to the organisation as a whole to facilitate the development of a learning organisation—one that continuously reflects on practice and learns lessons from the past as well as find ways of importing knowledge that can be absorbed and melded.

While cultural and other people-related infrastructure aspects have a major influence upon COP we live in a global economy and many of the experts that engage in a COP are geographically separated. ICT has a valuable part to play in the process of bring communities and individuals together in virtual space. One important way that it is used for socialisation is through using groupware communication technologies. A spectacular example of this is provided by John Seeley-Brown in discussing the BP Virtual team where a group of experts located in different places throughout the world were linked by email, video-conferencing and other group tools to work on finding innovative solutions to design the Andrew oil and gas drilling rig that saved over US\$120million and 6 months off the schedule [59, p156]. BP like many companies these days routinely use groupware tools to facilitate knowledge transfer through 'virtual socialisation'. This is one important illustration of how ICT can be used to gain a K-Adv through facilitating COP interaction and cross-levelling knowledge.

The above discussion brings us back to the important precursor for COP—the need for support for generation of social capital. It has been argued that social capital provides credentials for members of a COP, much like a credit card is used by purchasers and traders, that social capital is embedded within networks of mutual acquaintance and recognition and that mutual and durable obligation feed the process. Status and reputation of the individual is enhanced through giving and sharing knowledge within a COP. Figure 11 illustrates how social capital affects the K-Adv through creation of intellectual capital facilitating shared and enhanced knowledge.

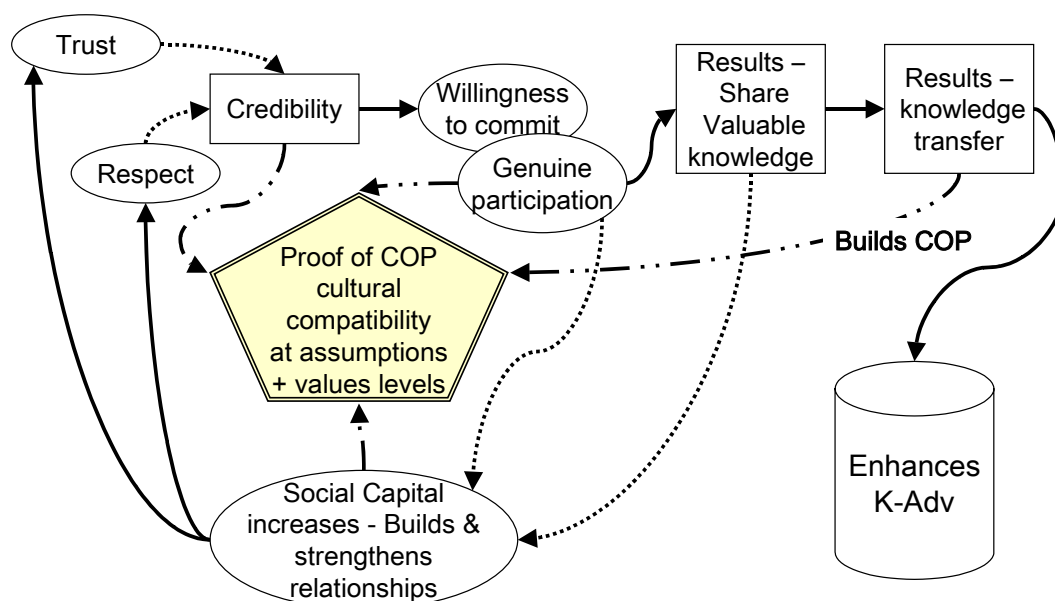
### ***Influence of Social Capital Upon the K-Adv***

Social capital can be described in three dimensions [16, p243]. The structural dimension is the way that it is configured; much of this is invisible and intangible. For example network ties has long been recognised as a real asset but its value has not been effectively measured well. The term 'old boys club' is for example a well-known and much worn phrase to describe one kind of potentially valuable network. The nature of these ties, their extent and configuration are important. Characteristics of the structure of social capital



and a COP, the way that participants' organisations encourage, are aware of and influence a COP affects the way that social capital may be developed [60].

Those engaged within the COP share codes and language and stories as was highlighted by the Orr example of the photocopying machine technicians. Thus a cognitive dimension is present in the creation of social capital. Without common tools for understanding and sharing tacit knowledge for many of the knowledge dimensions indicated in Table 1, the creation of social capital is limited. There is also a relationship dimension comprising trust, norms of the COP culture, expressed and applied obligations. *Commitment* is the physical and mental manifestation of the concept of trust. It is the proof of trust. It is the willingness to reciprocate energy invested through trust in the process of transformation of this energy into tangible results. It means that another party will take this trust on board and 'live up to' the spirit of the bargain by probably committing more personal pride and obligation to 'do the right thing' than would otherwise be the case. Loyalty occurs when trust and commitment are tested. It can be viewed as the bankable capital of goodwill to reciprocate trust in times of adversity [61, p191]. One demonstration of an act of loyalty is to sacrifice something in the short term to maintain a long-term relationship intact and functioning for mutual advantage.



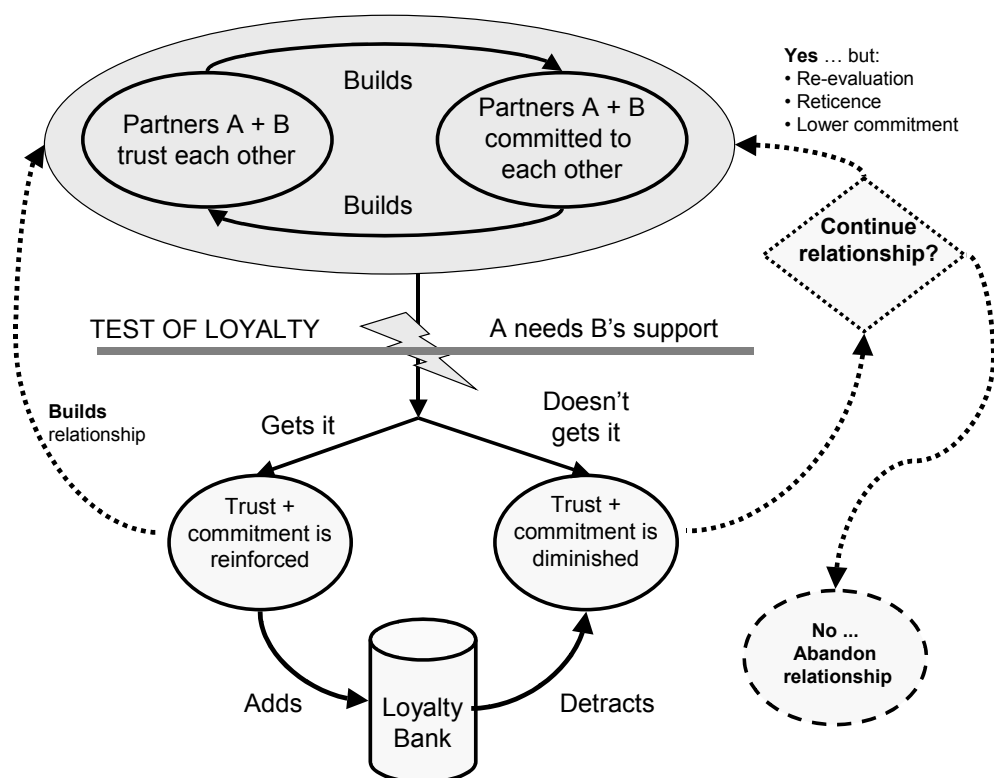
**Figure 11 - The Role of Social Capital in Creating Intellectual Capital**

Figure 12 clearly illustrates the links between trust, communication, commitment and management style. It shows how trust is built and subject to validation by peers. Sacrifices include the often unsolicited helpful and detailed response to a 'help' call to a COP discussion board on an ICT enabled COP. In such cases, out of the ether can come a detailed response to a technical issue that can save enormous amounts of time and trouble for those grappling with such problems. When this happens, the solution provider generates a large degree of credit from the sacrifice. While that sacrifice is in part 'paid' for by the employer of the saviour the mutual obligation inherent in a COP means that the gesture will be repaid at some other time in a different context [62]. Finally, in respect to the relationship dimension of Social Capital,

identification is also critical. People will identify with particular groups as tribes. The Orr example of photocopy technicians is one of a tribe of technicians of a particular interest group. Individuals identify with someone from that group and transfer their own level of trust accordingly—as being part of the same tribe or family.

In discerning between what holds together a COP, a formal work group, a project team and an informal network, Wenger and Snyder argue that what holds together a COP is passion, commitment and identification with the group's expertise. This can be compared with job requirements and common goals for a formal work group, project milestones and goals for a project team and mutual needs for an informal group [54, p142].

Having discussed the dimensions of a COP it is worth thinking about what conditions are required to allow a COP to function effectively. Figure 11 indicates that new intellectual capital is created through COP access to enable the exchange and combination of existing intellectual capital, thus access to both tacit and explicit knowledge sources is necessary. There needs to be an anticipation of value to be derived from being part of a COP as indicated in Figure 12. Further, there needs to be a motivation for exchange and combination of knowledge and so reward systems both extrinsic (such as career advancement, tangible rewards like earning more etc) and intrinsic (such as gaining kudos and admiration, respect and other higher order motivational factors). There must also be the passion and care-why capacity to want to learn or want to share knowledge to be transferred and combined. Finally, there needs to be a capability to exchange and combine knowledge. This brings in the need for 'absorptive' capacity [52] discussed earlier. People in a COP must be capable of recognising and using the available intellectual capital.



**Figure 12 - A model of Trust and Commitment Under Tested Conditions**

To address the strategic implications of knowledge for the K-Adv we can borrow theory from strategic management because the major implication is that a change management process will no doubt be needed to create the conditions identified for the K-Adv to be developed. We also need to draw upon theory of leadership and its impact upon corporate strategy.

### ***Implementation Implications of the K-Adv***

When implementing a change management program a dynamic change model needs to be considered. It is not adequate to merely introduce change by training and development to diffuse knowledge or any other change initiative. Galbraith [63, p74] developed a change implementation model that compliments the model Figure 11. Galbraith provides a dynamic model of change management, his 'Star' model, that can help explain the major implications of introducing a change strategy to develop a K-Adv. First, an organisation needs to have a strategic vision to want to change. Strategic intent needs to be translated into action through a process of analysis of the situation and developing goals and objectives to achieve the vision. People can then work in communities and in organisational structures, whether formal or informal, and for that to effectively occur, there needs to be an agreed set of role and accountability issues—that is structure. People undertake this but people cannot implement change in isolation. For the strategic intent to be realised through people there needs to be an identification and implementation of the skills required to make change happen. There also needs to be a set of processes that provides for the communication, production and transfer of knowledge. People need to be motivated by the correctly aligned reward system to make their change efforts worthwhile. Thus he envisages a mobile configuration (a star shaped interlinking structure in which each element is connected) comprising five nodes: 1 STRATEGY; 2 STRUCTURE; 3 PEOPLE; 4 PROCESS; and 5 REWARDS.

This all takes place in within a dynamic system whereby the K-Adv is developed and deployed. As each part of this star model is altered it impacts upon other parts of the system. For example if strategy is changed then this will require changes to all other nodes of the star. Likewise a change in structure affects people and may require a different reward regime to be deployed, which in turn requires amended processes.

The above model is also supported by the work of Andrew Pettigrew who led a research team from the Warwick Business School that undertook a major study, INNFORM, of organisational strategy and its impact upon how large firm organise themselves. The study was undertaken using a survey with responses from several thousand companies of more than 500 employees and in-depth case studies of 18 of these across Europe the USA and Japan. Their aim was to study the way in which organisations are managing change in response to the impact of globalisation and the emergence of 'knowledge work' being recognised as a key driver of changed work processes [64]. The Pettigrew *et al.* model has three major nodes in a connected triangle that he believes and has clearly demonstrated shapes the way in which the studied companies have organised themselves. These are STRUCTURES, PROCESS and BOUNDARIES. Structures have been affected by trends and trajectories of organisational changes through decentralisation, delaying and a move towards project-based forms of

organisation. Boundaries are changing due to downscoping, concentration upon core competencies and reallocation of energy and other resources to focus on these, outsourcing of activities, and the development of strategic alliances to create complimentary clusters of service delivery options. Processes have changed through: changes in communication patterns both horizontally and vertically within organisations and their immediate stakeholders; investing in ICT; and developing and implementing new forms of human resource management (HRM) [65]. Both the Galbraith's star model and the Pettigrew *et al* triangular model supports the K-Adv model presented in this book. Without wishing to appear over complex, it is clearly important to fully understand the link between knowledge, people, enabling systems and infrastructure and strategy to plan a knowledge initiative so that it can be implemented.

### ***Knowledge Transfer for the K-Adv***

Nancy Dixon provides a number of useful insights into her research of knowledge management used in company such as Bechtel, BP, Buckman Laboratories, Chevron, Ernst & Young, Ford, Texas Instruments and the US Army. She identified 5 types of knowledge transfer [43, p169]:

1. *Serial Transfer*—the knowledge a team has learned from doing its task that can be transferred to the next time that particular team does the task in different setting (context). Such tasks are frequent and non-routine using both tacit and explicit knowledge. Examples include the **US Army's After Action Reviews (AAR)** and BP's "Learning during" reports and Bechtel – Steam Generator group reports;
2. *Near Transfer*—the explicit knowledge a team has gained from doing a frequent and repeated task that the organisation would like to replicate in other teams that are doing very similar work. Such tasks are frequent and routine using explicit knowledge. Examples include Ford's use of best practice replication, Texas Instruments' Alert Notification, and Ernst & Young's KnowledgeWeb;
3. *Far Transfer*—the tacit knowledge a team has gained from doing a non-routine task that the organisation would like to make available to other teams that are doing similar work in another part of the organisation. Such tasks are frequent and non-routine using tacit knowledge. Examples include BP's Peer Assist, Chevron's Project Development & Execution Process CPDEP, and Lockheed Martin's LM21 Best Practice;
4. *Strategic Transfer*—the collective knowledge a team needs to accomplish a strategic task that occurs infrequently but is of critical importance to the whole organisation. Such tasks are infrequent and non-routine using both tacit and explicit knowledge. Examples include BP's Knowledge Assets, the US Army's Centre for Army Lessons Learned CALL and also their use of Learning Histories;
5. *Expert Transfer*—the technical knowledge a team needs that is beyond the scope of its own knowledge but can be found in the special expertise of others in the organisation. Such tasks are infrequent and routine using explicit knowledge. Examples include Buckman Labs' Techforums, Tandem's Second Class Mail, and Chevron's Best Practice Resource Map.

Her contribution to the literature is that she has identified different types of knowledge transfer and more importantly the conditions that govern the appropriate and most effective way that this can be achieved. Her guidelines are based upon an assumption that the receiving group's absorptive capacity is adequate and that the stickiness of tacit knowledge is most effectively dealt with by substantial face-to-face interaction. Thus, different perspectives can be shared and clarification made interactive. She developed a decision tree [43, p147] based on four questions:

1. Will the same team be using the lessons learned?
2. Is the knowledge tacit?
3. Does the knowledge impact upon the whole organisation?
4. Is the task both routine and frequent?

Before discussing how this approach can be described in more detail, it is worth reflecting upon a few salient insights that Nancy Dixon underscores from her analysis of her research across a number of varied organisations. First she highlight that there are different types of knowledge transfer. Many of the organisations she studied had adopted several of these. This is interesting because a number of thought-leaders such as Davenport [18] or Nonaka [29] refer to the same organisations but do not distinguish between these types of knowledge transfer. This means that Dixon has managed to build upon concepts that the cited authorities developed earlier. She also discusses how we think about knowledge and highlights a shift *"from thinking of experts as the primary source of knowledge to thinking that everyone engaged in work tasks has knowledge someone else could use to advantage"* [43, p148]. This opens the door to a policy of sharing knowledge at multiple levels for both key-individual and key-teams—from high-level expertise to an operational workforce using high-level skills to craft innovative solutions to problems.

Far, strategic and expert knowledge transfer involves high profile impact upon organisations. Serial and near knowledge transfer provides high level overall rewards and benefits, along with far transfer due to the value gained from reaping rewards on a frequent basis.

She also identifies a shift in thinking from *"knowledge as it resides with individuals to thinking of knowledge as embedded in a group or community"* [43, p149] this accords with a significant strand of the literature concerned with communities of practice as discussed by Wenger [54]. The third shift that Dixon identifies is a *"shift from thinking about knowledge as a stable commodity to thinking of knowledge as dynamic and ever changing"* [43, p149], in this knowledge is seen not as a commodity locked in a warehouse but as a flow like water across the organisation. These insights help us to understand how we can best implement knowledge management initiatives through a strategic fit between meeting the organisational vision and mission and operational performance measures. This line of thought extends to how a balanced scorecard approach [32, 66, 67] linking cause and effect [34, 35] can be applied to knowledge management. Dixon's insights are more sophisticated because they help explain the variety of knowledge transfer approaches and ways in which knowledge management can be appreciated and applied. They help us challenge a more superficial approach that tends towards 'quick fixes'.

In her book Nancy Dixon cites examples from each of her 5 knowledge types and she argues that some companies have been able to use many of

these knowledge transfer approaches while others have been stuck with using only one or two types. Those organisations that can facilitate all types of transfer when required are clearly in a better position to be both agile (highly responsive) and effective. This is because when required, they act more quickly (not having to reinvent the wheel) and through translation of using knowledge from one context to another they not only intelligently use that knowledge but they also create new knowledge as it applies to a new context.

In addition to Nancy Dixon's accounts of knowledge transfer based upon her 5 transfer criteria, another academic Nigel Holden has studied knowledge transfer from a cross-cultural perspective. He reported upon 4 transnational company (TNC) case studies Novo Nordisk and Lego both of Scandinavian origin, Matsushita (Japanese origin), Sulzer Infra (Swiss based). Each of these case studies were concerned with cultural adjustment across these TNCs' international operations to 'roll out' the corporate systems, processes and organisational culture [68]. The interesting aspect though was that Holden revised his original ideas of a frame of reference to look at these case studies as examples of knowledge transfer. In Dixon's framework, Holden's case studies could be classified as being examples of principally strategic and also, to a lesser extent, expert knowledge transfer.

Holden, as an expert in linguistics, develops interesting insights in the cross-cultural knowledge transfer process and sees it as knowledge translation. He argues that as tacit knowledge (in particular) is exchanged and socialised it is translated into different contexts and worldviews and thus both parties gain benefit from gaining a glimpse into the other's way of internalising this knowledge. This truly takes knowledge transfer to a state of knowledge creation. As Australia (and most other countries these days) has a highly ethnically and culturally diverse population the opportunities for this kind of knowledge creation through knowledge transfer is significant. Moreover, we can view in terms of organisational cultural diversity (sub-cultures with larger organisations), that the same opportunities arise even with more nationally cultural homogeneous organisations. Indeed Holden's work redefines much of the concepts of organisational culture.

The knowledge transfer approach presented by Nancy Dixon requires a major shift in management and leadership style from that currently prevailing in many organisations in the construction industry. This approach requires a more appreciative style of the value of talent at all levels within the organisation. It also requires a much larger investment in people infrastructures that is currently the case with provision for slack resources to allow people time to think, reflect and to regenerate the pool of available knowledge. Knowledge also has to be seen as a key asset to be valued as highly as financial capital and both measured and monitored accordingly to achieve the best returns possible.

While the above thought leaders have advanced our understanding of knowledge transfer we are still left to deal with the complex and difficult issue of knowledge stickiness. Knowledge is sticky and both expensive (in terms of transaction costs) and difficult to transfer because knowledge is more than just facts and information. Knowledge is about context, the history and hidden myriad inferences and cause and effect loops that explain why something did or did not happen in a particular way. Documented manuals and procedures fail to cover all eventualities and are time consuming to

access and absorb. Gabriel Suzulanski conducted a series of studies into the transfer (often failure to fully transfer) of best practice within organisations and concluded that the three major sources of knowledge stickiness (barriers to transfer of knowledge) were *absorptive capacity*, *causal ambiguity* and *the quality of the relationship between source and recipient of knowledge* [69].

The most significant source of stickiness is absorptive capacity. Cohen and Levinthal [52, p128] define absorptive capacity as the ability of a firm to recognise the value of new external information, assimilate it and use it for commercial ends. It is a measure of an ability to absorb ideas, information and knowledge and applies to both external and internal sources of information and knowledge. Their paper is one of the most influential on this aspect of knowledge management. They detail how firms gain this absorptive capacity and much of it entails both hard work and thoughtful management support of growing its development of a knowledge culture. Building absorptive capacity requires long exposure to experimentation, trial and error and reflecting deeply on lessons learned through this process. It also requires its people to seek out information and knowledge both from within the organisation as well as outside. This research activity need not be 'academic' in a bookish sense but is more often the practical outcome of people trying their best to make sense out of complex situations when solving problems. The more practice they have in tackling problems as learning exercises and taking the effort and time to reflect upon what they have learned—and transferring this knowledge to others—the greater is their absorptive capacity. When this does not happen it makes it harder for knowledge to be effectively transferred because these particular required strengths are poorly developed thus the wheel gets constantly reinvented and best practice seem impossible to be transferred.

A consequence of poor absorptive capacity is often a lack of ability to be able to understand the cause and effect loops that envelop any opportunity to learn from experience. Causal ambiguity is the inability to be able to make a cause and effect link. Naturally, if you cannot make this connection then mistakes are repeated, an inability to replicate best practice is evident and the management of valuable knowledge becomes extremely difficult. To be able to effectively diagnose situations and be able to read the cause and effect linkages requires not only deep knowledge about the context of the situation under study, but also an ability to capitalise upon a strong absorptive capacity. Access to ICT tools such as knowledge repositories have potentially great value, but the skills to fully use this valuable asset are essential to be able to make best use of such knowledge. Unfortunately, electronic knowledge repositories have a limited capacity to store contextual knowledge that can be quickly and easily accessed and understood.

The third major influence on knowledge stickiness is the relationship between the source and recipient of knowledge. In terms of electronic sources, they are notoriously cumbersome to engage with—not user friendly. Search engines that either provide few 'hits' or provide an overwhelming number of them that swamps the user's capacity to deal with the information provided. In terms of people-2-people interactions the issue of culture and communication plays a major and often subliminal role. An organisational culture can encourage or inhibit knowledge sharing. Personal traits also can influence relationships. Further, organisational leadership style and structure all influence relationships between colleagues and their motivational drivers.

Finally, it should also be understood that when transferring knowledge through a process such as best practice dissemination, there are four recognised stages of this process [69]: *initiation* (when the idea/innovation or best practice is being recognised); *implementation* (when planning the dissemination and introduction of the innovation takes place); *ramp-up* (when the innovation is rolled out or a cut-over of the new and existing situations takes place); and *integration* (when the innovation becomes routine and embedded). The impact of the three major factors indicated plus others that cause knowledge stickiness to vary in intensity and impact. For example, at the initiation stage, absorptive capacity is highly important because it helps people recognise a best practice and how it may be applied. At the implementation stage a best practice is planned and introduced and this poses communication and relevance challenges. The ramp-up stage can be highly affected by causal ambiguity if any cause and effect loops for the way in which the best practice is being 'tweaked' in its new setting are not well understood. Finally at the integration stage, backsliding needs to be deterred and any tendency for this lack of integration to be understood so that it can become avoided to allow best practice to be embedded and routinised.

Stickiness of knowledge poses considerable problems for organisations wishing to maximise the conversion of tacit knowledge in people's heads into explicit knowledge that has been codified. However, sustaining competitive advantage relies upon an organisation's competencies being difficult to copy or replicate so having a knowledge advantage relies upon both codifying knowledge as well as embedding it in difficult to copy repositories such as people's heads and organisational routines, procedures and culture.

Thus while Nancy Dixon's ideas on knowledge transfer helps us to better plan the nature of social and technology interaction between sources and targets of knowledge transfer, they do not offer comprehensive concrete ideas on how this might be achieved. The importance that *absorptive capacity, causal ambiguity and the quality of the relationship between source and recipient of knowledge* [69] plays in the effectiveness of knowledge transfer supports the K-Adv model presented in this book. The K-Adv model provides both the mapping tools and benchmarking frameworks for organisation to be able to measure the level of knowledge stickiness. Further, the K-Adv development and application tools discussed later in this book provide a concrete approach for using the K-Adv to be adopted and used as a strategic tool to help organisations develop a better understand of how they can develop their core competencies, by *managing an environment that supports and harnesses knowledge to deliver innovation* that in turn **delivers competitive advantage**.

## **Chapter Summary**

It was impossible to fully explore the nature of knowledge within the limited scope of this publication. Useful examples and accounts of case studies reported upon in the literature were provided along with relevant and valuable references. The aim of this chapter was to explain the K-Adv concept and to provide an introduction to the philosophical and practical knowledge concepts and then to offer a realistic indication of how the K-Adv can be achieved. This included: a definition of the K-Adv concept; discussion about the strategic implications of the K-Adv, 12 types of knowledge, 7 and dimensions of



knowledge; a brief outline of the concept of communities of practice (COP); exploration of the implementation of the K-Adv; and a summary of Nancy Dixon's work on 5 types of knowledge transfer. The concepts of knowledge stickiness and absorptive capacity was also explain in terms of its relevance to knowledge transfer.

Having explained the nature of the K-Adv and the various types of knowledge and immediate strategic implications of the nature of knowledge on developing a K-Adv, the next three chapters will concentrate upon a discussion of the three identified enabling infrastructures of the K-Adv—ICT, Leadership and people as presented in Figure 10. In these sections I will explain how the K-Adv can be better understood and how this understanding can lead to a framework for benchmarking and analysing how an organisation may strategically plan itself on a trajectory towards achieving an improved K-Adv.

## **Chapter 4. ICT and the K-Adv**

Derek H.T. Walker

The following will be discussed in this chapter:

- Purpose of the Chapter
- Implications of the Need for an ICT Enabling Infrastructure
- Functioning Hardware
- Functioning Software
- Functioning Networks
- Functioning Portal Interfaces
- Personal Assistance ICT System Support
- Training and Development System Support
- Capacity Planning System Support
- Archiving
- Chapter Conclusion

### ***Purpose of the Chapter***

The purpose of this chapter is to explore and explain the K-Adv's ICT enabling infrastructure in detail. The chapter starts with an explanation of the need for an ICT enabling infrastructure and its place in the K-Adv concept. Each element and attribute is then explained in detail with rigorous justification of its form drawn from the literature.

### ***Implications of the Need for an ICT Enabling Infrastructure***

One of the widely cited examples of an innovative ICT advantage radically changing a company's view of itself as a knowledge economy industry is SABRE, the airlines reservation system developed by American Airlines (AA)—for example see [70]. This system started out as a proprietary internal efficiency initiative to make airline seat reservations more effective. The way that AA then further developed it into a core competitive advantage and then spun the innovation out to be a core part of their competitive position is instructive. Further, they used this as a platform to further transform their organisation with their ICT system called InterAAct, that provided for the conversion of data processing, office automation, personal computing and networking. Hopper's [70] paper reporting of this case study of organisational re-invention due to opportunities afforded by its K-Advantage appeared in 1990. His paper provides an excellent example of how ICT enabling infrastructure transformed a company's competitive advantage. AA started their transformation by using 1980's transactional data processing technology that first concentrated on turning this data into business information such as knowing more about their customers. They then developed their ICT systems to generate better knowledge about their customer's service preferences and other related operational aspects. This led to knowledge being explicitly encoded to be used for solving load factor decision-making problems (through knowing how fill the seats of a plane to best commercial advantage including decisions on pricing and discount structures). Their pioneering approach led to them developing a customer relationship management systems that have now become commonplace.

Another case study mentioned earlier in this document is the BP Virtual Teamwork Project. In this instance, ICT enablers provided a means for experts from various places around the world could be brought together in a virtual environment to pool and exchange knowledge to creatively solve problems that made a qualitative leap in performance than could be achieved through incremental improvement [71, p20-24]. There are now many case studies that have been reported in the literature on ICT's impact upon the production, sharing, transmission and transfer of knowledge. A use resource for further study can be found in [43, 71, 72].

In for example the guide produced by Standards Australia International entitled 'Best Practice—Case Studies in Knowledge Management and Clarke [72] provide knowledge management case studies drawn from various industry sectors including ICT, Manufacturing, Aerospace, Defence, Pharmaceuticals, Chemicals, Banking and Financial Services, Transportation and Professional Services. These are drawn from many of the most forward thinking companies including Xerox, Boeing, Pfizer, Motorola, IBM, Ford, KPMG, Ernst & Young International and many other household company names. Clearly, the value of ICT in supporting knowledge management and the K-Adv is well recognised.

To summarise Rollo and Clarke's summaries [72], ICT is used to facilitate codifying knowledge through knowledge repositories such as best practice cases and lessons learned; developing directories or 'yellow pages' of experts so that their contact details and expertise is made known for contact; storing maps and symbolic information about knowledge that can be used for decision making for example cause and effect chains; storing presentations and background papers for re-use on management consulting assignments for example; multi-media archival materials of numerous kinds for knowledge re-use.

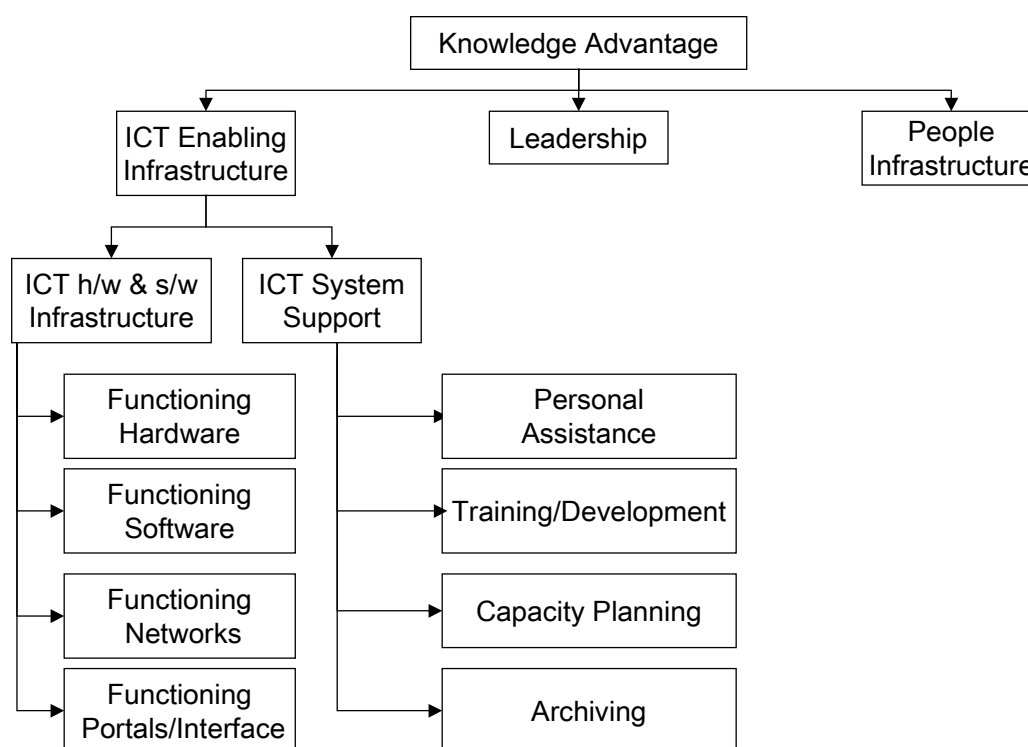
Case studies discussed by [72] and others, for example [18] stress ICT being used for knowledge management as a vital communication tool. The BP 'Virtual Team Project' is a prime example of this but many other virtual communities have been created to share and transmit knowledge and through that process create knowledge by re-framing it in different contexts. Nancy Dixon's work [43] provides a useful example of describing how five types of knowledge transfer facilitates this application of knowledge management to gain a K-Adv.

Knowledge transmission using ICT is widely reported to be undertaken using web-enabled technologies though voice and video conferencing figures prominently. Improved technology applications for compressing signals as well as expansion of data transfer capacity is evident and new wireless transmission technologies are leading to hand held devices being used that make communication beyond the workplace feasible. Much of this is accomplished through the use of web-enabled portals that can link users to computer applications, various knowledge assets and data/information bases.

Figure 10 indicated three elements of the K-Adv, one of which is an ICT enabling infrastructure. However, ICT enabling cannot effectively occur without adequate support systems being in place beyond the operational maintenance of hardware, software, networks and interface portals to the ICT infrastructure. While the literature is rich in examples of case studies that discuss the nature of ICT hardware and software infrastructure used for

knowledge management, there appears to be less emphasis and study on how users of these ICT systems can be best supported to actually use that technology.

In undertaking research for the CRC in Construction Innovation<sup>7</sup> it became evident to the team of researchers that a support system to enable users to effectively exploit the advantages of an ICT infrastructure could be categorised into: help facilities that provide assistance with how to use the ICT technology; training and development geared towards using the ICT systems; the capacity planning process for deciding service levels, benchmarks, and monitoring and control systems to ensure that ICT infrastructure is not only operationally functional but also that users know how to use the ICT; and archival of data, information and knowledge so that it can be used to enhance the K-Adv of an organisation. Figure 13 illustrates a component breakdown structure (CBS) for each of the components: ICT hardware and software infrastructure; and ICT system support.



**Figure 13 – Component Breakdown Structure for ICT Enabling K-Adv**

Each of these two components also comprise a further four components. The CBS provides a framework for understanding how the ICT Enabling Infrastructure assembly contributes to a K-Adv. Further; this framework can be calibrated to develop a performance measurement scorecard that can be used for benchmarking and conducting gap analysis.

I will now discuss how this framework was developed and how it can be used. The focus is on activities of generation, transmission and transfer of knowledge rather than being used as an ICT data or information processing effectiveness model although I recognise that in part knowledge depends

<sup>7</sup> Project 2001-004 (2B), Delivering Improved Knowledge Management and Innovation Diffusion.

upon both data and information therefore there will be consequently be some inevitable overlap in the model's potential use for measuring the maturity of an organisation in terms of ICT application diffusion.

I suggest that the measurement scale for best understanding how far the organisational unit has progressed towards being a state-of-the-art K-Adv knowledge innovator is based upon its goals maturity achievement assessment (GoMAA), specified at the levels of (1) some/small, (2) minor, (3) moderate, (4) substantial, and (5) total. Each element of the K-Adv component breakdown structure will have performance characteristics whose goals achievement maturity can be assessed. This assessment may be undertaken internally within an organisation as a self-assessment exercise or externally by a consultant making a judgement based on both available qualitative and quantitative evidence. Thus a series of scorecard tables can be constructed for each element of the framework.

I will now describe each of the elements of the component breakdown structure for the ICT Enabling Infrastructure and explain the rationale for each performance characteristic and GoMAA value.

### ***Functioning Hardware***

Performance characteristics of functioning hardware can be viewed from the perspective of: availability (having access to hardware when needed); its currency (the hardware's version relative to that which is currently available); its functionality (the way in which it does what it is supposed to do); and its reliability (working in the way that it is supposed to).

**Table 3- Functioning ICT Hardware**

<b>Maturity</b>	<b>Performance Characteristic</b>			
	<b>Availability</b>	<b>Currency</b>	<b>Functionality</b>	<b>Reliability</b>
If I go into this workplace to use hardware to do my K-job, to what extent →	am I likely to find it available to use?	am I likely to find it a current technology version?	does it actually perform versus how it is supposed to perform?	to what extent am I likely to find it working?
Inactive AWARENESS	Very Low less than 20% of the time	Unaware of the trend > 5 years	Very Low less than 20% of the time	Very Low less than 20% of the time
Pre-active INITIATION	Low up to 40% of the time	Laggards of trend <5 > 3 years	Low up to 40% of the time	Low up to 40% of the time
Active ADOPTION	Medium up to 60% of the time	Late majority of trend about 3 years old version	Medium up to 60% of the time	Medium up to 60% of the time
Pro-active ACCEPTANCE ADAPTATION +	High up to 90% of the time	Early majority adopters tested but latest version > 1 year <3 years	High up to 90% of the time	High up to 90% of the time
Embedded ROUTINISATION + INFUSION	effectively 24/7 access	Innovators beta testing or adopting most current version > 1 year old	effectively 24/7 access	effectively 24/7 access

An obvious characteristic of achieving functioning hardware is that it should be *available* for use, that is either there is an adequate supply of the equipment in working order or that the person needing to use it for their knowledge work activities does not have to queue up to use the equipment. The attainment performance for this objective ranges from a low non-zero point of one or none being available to all hardware being available all the time. The exact percentages suggested in Table 3 can be customised for each organisational unit using this framework for benchmarking etc but the figures should represent a reasonable reflection of the maturity scale. For inactive/awareness achievement, one can envisage a scenario where they wish to use a PC, printer, scanning device or whatever is required to generate, transmit or transfer knowledge and the hardware is either there to use up to 1 time in 5 ( $\geq 20\%$ ) or that person has to wait for someone else using that equipment to complete their task 1 time in 5. Pre-active/initiation access and availability would be about 40%, active/adoption up to 60%, pro-active/acceptance and adaptation up to 90% and embedded/routinisation and infusion would be on all hours every day of the year.

A second characteristic of the hardware functionality is its *currency*, that is, does the hardware function at the leading edge of its capacity. This characteristic is linked to organisational policy to some extent because the organisation ranges from being innovation leaders to laggards. At the inactive/awareness maturity level, the organisation would be significantly behind current technology versions and probably unaware of what the current version of hardware can deliver so the available hardware would be most likely 5 years or older in 'age' of its version. The other maturity levels follow a typical innovation diffusion profile as described by [40], being described as laggards, late majority adopters, early majority adopters, at the highest 'embedded/routinisation and infusion' level the organisation would be beta testing state of the art hardware or at least using hardware that is within 1 year old.

*Functionality* is also a key issue of system responsiveness. The key issue here is whether the hardware does what it was supposed to do to meet the knowledge work need. For example, when trying to use video conferencing or conference call technology to what extent does the connection fail to respond for one reason or another? Another typical frustration that people have with hardware is computer screens freezing, very slow screen refreshment rates, slow printing or scanning and other aspects that may be caused by the way that the hardware is configured or the way that the system that it forms part of is configured. Either way, the issue is to what extent does the hardware perform relative to its capacity? This has been calibrated on the maturity scale on the same basis as availability because it and responsiveness are closely linked to supply and availability of hardware.

The fourth characteristic of functioning hardware is its *reliability* against breakdown or malfunction rate. There may be sufficient supply of equipment but that is of little use unless the equipment can be used. This has also been calibrated on the maturity scale on the same basis as availability because it and responsiveness are closely linked to supply and availability of hardware.

## Functioning Software

For functioning software, there are two major issues. First, to use common software applications so that experience and familiarity of using a software application in one workplace leads to an ability to quickly learn how to perform that same function in another workplace. Second, to ensure compatibility of software applications to allow data and information to pass seamlessly across teams and the supply chain to minimise multiple data entry. Functioning software infrastructure also requires commonality to enable skills learned using one software application to be readily transferred to others. For example, the Microsoft suite of software packages and its alliance software partners have established an industry standard way of the 'look and feel' of such features as tool bars, command keys and other aspects that makes it easy and relatively painless to transfer knowledge about using one software application and apply that knowledge to learning how to use another.

Additionally, it is important that there be an ability of various parts of a network to recognise data in the same way. This element of the component breakdown structure can be appreciated in terms of categories of both functioning groupware and of data and information interoperability.

**Table 4- Functioning Software**

Maturity	Performance Characteristic	
	Groupware application software	Interoperability
If I go into this workplace to use software to do my K-job to what extent →	will I be able to share and transfer data without extensive re-entry or manipulation to allow data to be transferred between files between colleagues?	will I be able to share and transfer data without the receiving software misidentifying my data?
Inactive AWARENESS	Stand alone with no groupware or shared software application concept, generic and independent use possible using old versions that are incompatible	Ad hoc use different packages eg word processing documents with little if any ability to be share modified, or to add value, each reading data categories differently
Pre-active INITIATION	Consistent across single workplaces without reference to others	Focus only on business applications only eg MS OFFICE
Active ADOPTION	Task specific applications that leads to knowledge transfer etc such as estimating, planning etc that adds to corporate knowledge	Focus on cross-projects or cross business units interoperability
Pro-active ACCEPTANCE ADAPTATION +	Enterprise system adopted by the organisation using web based software applications such as HR, operational and policy knowledge. Integration via portal is in progress for self-service applications within organisation.	B2B applications such as CITE etc to link supply chain underway and being experimented with
Embedded ROUTINISATION + INFUSION	Enterprise system adopted by the supply chain	All supply chain members engaged in the B2B systems and data transfer for modelling and decision making etc Transparency is evident

Commonality of *groupware* applications is needed to allow uses to effectively share data and information across a chain of ICT users. This will

allow for example planning data and information created by one person on one computer to be able to pass that data to another colleague who may use it for procurement, cost monitoring or for simulation exercises as part of a decision making process. To achieve this means that commonality of software packages and versions needs to be coordinated so that one person does not generate planning data using for example, Microsoft Project version 6, when that data may be used by others in a project team for monitoring using version 3—the data may not be able to be ‘read’ successfully and hence either taken messily into a spreadsheet output from the version 6 software and then imported into the version 3 software.

At the inactive/awareness maturity level, there would be little or no evidence of *groupware application software* being adopted and that this might be a problem because generic and independently developed software applications may be operating within a workplace. This may be because the level of networking is low or that workplaces are free to independently procure software. At the pre-active/initiation level, software consistency and commonality is restricted to a single workplace without thought of adding value to others in a project supply chain. At this level, however, there would be commonality in use of software such as Microsoft Office applications. At the active/acceptance level, task specific applications such as estimating, time planning etc will be used across workgroups and project supply chain partners. At the pro-active/acceptance and adaptation level people in the organisation will be also using an enterprise resource planning system with web-enabled applications such as checking holiday leave, booking rooms for meetings, and viewing policy manuals on-line from any node in a network in the organisation. At the embedded/routinisation and infusion level, this would be recognised by groupware being compatible and extended across the supply chain so that it would be possible for example, to use a diary system to check available dates and venues to arrange a meeting between different members of a supply chain working on a project using common groupware.

*Interoperability* at the inactive/awareness level relates typically to an ad hoc use of different packages with different data dictionaries within an organisation. An example of this would be use of multiple word processing software where files could not be ‘read’ because a document generated by one colleague could not be used by another. Another classical example would be where a door or window as described in a CAD database cannot be recognised by another related software application, a facilities management package for example. At the pre-active/initiation level, there would be only a focus on business application data compatibility (for example all people using Microsoft Office to ensure compatibility and interoperability of documents for word processing and spreadsheet work). At the active/acceptance level, interoperability of data and information across projects or business units. This would require a data dictionary or standard way of recognising various data types and representing data and information in a common way within an organisation. At the pro-active/acceptance and adaptation level, business-to-business (B2B) applications would be used or being progressively experimented with and introduced to link the supply chain using common data and information dictionaries. At the embedded/routinisation and infusion level, all members of a supply chain would have complete interoperability to be able for example, to be able to read cost data from a supplier’s B2B software and



to be able to import this seamlessly into an estimating or cost modelling software application and then be able to pass this information onto a cost planning knowledge base that would be used for budget estimating on future projects.

## ***Functioning Networks***

For knowledge work to be effectively supported by ICT infrastructure, ICT needs to be effectively networked to allow access to data and information that provides the feedstock for knowledge generation, transmission and transfer. This requires internal and external connections for project supply-chain members, adequate bandwidth to support the ICT delivery systems and a common way that parts of the system communicate with each other.

**Table 5- Functioning ICT Networks**

<b>Maturity</b>	<b>Performance Characteristic</b>			
	<b>Connectivity within Business Unit</b>	<b>Connectivity between supply chain</b>	<b>Bandwidth Capacity</b>	<b>Shared Protocols</b>
If I go into this workplace to use a networked device to do my K-job, to what extent →	am I able to directly communicate with others in my workplace and or business unit (BU) using the ICT network?	am I able to directly communicate with others in the supply chain using the ICT network?	does the ICT network support speedy data and information transfer?	does the ICT network enable communication to occur without user intervention to translate data or information?
Inactive AWARENESS	Single workplace, stand alone basis eg using disk data transfer	Telephony, fax, and paper	Simple – constrained by physical transfer using portable technologies (disk, paper, etc)	Ad hoc, different operating software, software applications, versions etc
Pre-active INITIATION	Simple eg 1-6 PCs, 1-3 Printers, in single workplace	Hard disk transfer	Simple portable cabling using low bandwidth (eg as for home office)	Common versions and operating software within a workplace
Active ADOPTION	Single workplace PC server, Intranet links users with all users using partial groupware utilities, eg e-mail, shared utilities	Shared common software applications for KM transfer directly or using e-mail attachments eg where a XL/Word file is then transferred and translated to host system	Moderate bandwidth using hardwired technologies with cables and routers relatively fixed rather than easily changed	Common across workplaces within organisation
Pro-active ACCEPTANCE ADAPTATION +	Cross workplace Intranet links users with all users using many FIXED hard-wired groupware utilities,	Extranet system with FIXED groupware utilities limited to email, shared common files etc	High bandwidth with powerful servers to support hardwired network eg	Common access etc across significant supply chain system partners

	development of corporate memory system		Novelle etc	
Embedded ROUTINISATION + INFUSION	Across all (95%+) users based on mobile access via wireless (infra-red) technologies	Enterprise ERP type system using mobile access technologies e-business connecting the substantive supply chain	High speed wireless and large capacity transfer similar to direct connection between hardware items	Security and access systems defines access level, application and data access automatically

The extent of *connectivity* can vary between some or to a small degree where only a single workplace is networked through to ubiquitous access using technologies that are seamless and transparent to the user. A pre-active/initiation level of connectivity would be represented by a simple configuration much like a 'home office' or small-scale single workplace situation where only a few PCs are linked with printers and or scanners, perhaps also with fax machines. Active/acceptance refers to a PC server driving an Intranet with users being linked via groupware for e-mail, shared software utilities etc within a single workplace such as an office of project site. Pro-active/acceptance and adaptation connectivity is represented by fixed (hard wired) groupware utilities working across workplaces so that the geographical boundaries disappear from the user's point of view. With the embedded/routinisation and infusion level category, networks are based on mobile rather than static connectivity probably using high speed wireless technologies. Thus a person on a project site could link to 'the network' with all its functionality via a mobile device and so geographical boundaries are truly no barrier to communication.

A second characteristic of functioning networks is the ICT enabling level of *connectivity between supply chain partners* to a project. At the inactive/awareness level of attainment, one can envisage data and information for decision making being transferred by telephone, fax, paper. This requires multiple entry of data or information. At the pre-active/initiation level digital resources are transferred via hard disk. At the active/acceptance level, there may be shared common operating software and transfer of data either directly or via emailed attachments. At the pro-active/acceptance and adaptation level the most significant members of the supply chain would be connected via an Extranet or through the Internet with appropriate security firewall provisions. This represents a typical e-business example. The embedded/routinisation and infusion level category steps beyond the substantial category with an enterprise wide system that uses mobile technologies through a variety of transfer means including wireless infrared connections. Most if not all supply chain partners will be thoroughly integrated via this network configuration.

Members may be connected but the transfer effectiveness of data and information to be refined into knowledge may be restricted by the network node's *bandwidth capacity*. At the inactive/awareness level bandwidth is constrained by the physical acts of transferring data and information using portable technologies such as paper or hard disks. At the pre-active/initiation level, bandwidth is constrained by telephone and modem links, as is the general case for a home office. At the active/acceptance level, the network uses hardwired technologies with cables and routers that are relatively fixed

(though can be reconfigured without undue disruption to an office layout). At the pro-active/acceptance and adaptation level, high-powered dedicated servers support hardwired networks using software such as Novelle to drive the network. At the embedded/routinisation and infusion level, all, connections in the network use high speed wireless communication with very high capacity for data transfer.

No network, even the most sophisticatedly configured one, can effectively function if various hardware devices have poor levels of *shared protocols* to exchange data seamlessly. At the inactive/awareness level the approach to networking is ad hoc with different versions of the same class of hardware and/or operating software presenting compatibility problems when sharing data versions. At the pre-active/initiation level, there is considerable commonality of operating software within the workplace. At the active/acceptance level, this commonality may extent across workplaces within a business unit or organisation. At the pro-active/acceptance and adaptation level, commonality is achieved right across the supply chain so that equipment and hardware items readily 'talk' to each other without the need to reconfigure network parts or systems. At the embedded/routinisation and infusion level, security and access systems automatically determines the protocols to be adopted in sharing data, information or knowledge.

### ***Functioning Portal Interfaces***

Three issues influence the effective functioning of a portal interface to an ICT network. First, users need to actual enter an ICT portal so that they can interface with a functioning network therefore the manner in which access is provided is important as some portals are more user friendly and effective than others. Second, the content and scope of data, information and knowledge available via the portal is also an important influence to the impact on organisational performance. Some portals provide only an on-line marketing brochure facility with others essentially invite users to become part of the organisation's business via a full B2B electronic mall. Third, the nature of the security and authority to access data, information and knowledge is also relevant. Portals carry with them risk to the host organisation as it opens the way for unauthorised theft or damage of critical business knowledge assets. On the other hand, they offer opportunities to gain valuable information about the supply chain and clients entering these portals [73-75].

**Table 6- Functioning ICT Portal Interfaces**

<b>Maturity</b>	<b>Performance Characteristic</b>		
	<b>Gaining access</b>	<b>Content and Scope</b>	<b>Authorities and Security</b>
If I go into this workplace to use a networked devise to do my K-job, →	to what extent do I physically get to the portal? where does it take me?	What type of knowledge can this portal get me access to?	How is risk managed for this portal?

Inactive AWARENESS	Function keys/codes or menu to get access to software applications data and information on a workplace or stand alone system	Static organisation information in 'brochure' style. Transactional explicit data with no B2B capacity.	Open access that is unrestricted and unrecorded (tracked or monitored)
Pre-active INITIATION	Early generation portal, 'one size fits all' approach with limited access to interact with the host organisation.	BU data that has been analysed and transformed and/or summarised into information. Facility for limited B2B and tracking progress etc	Password access with no logging systems to track usage and access history.
Active ADOPTION	Web-enabled using an Intranet within the organisation for shared applications and organisational knowledge assets. Push style of access to information.	Integrated commercial application information across the supply chain making facilitating B2B interaction. Limited access to HRM information/knowledge.	Logging and surveillance of use. Priority accessing system to allow different levels of access and authority
Pro-active ACCEPTANCE ADAPTATION +	Web-enabled across the supply chain for major B2B activities access as well as within organisational access to Intranet. Pull style access where portal is customised for each user.	Deep knowledge and insights about the nature, context and implications of organisational information. On-line learning. Full self-service for personnel services information.	Encryption technologies and/or high security bio-security systems.
Embedded ROUTINISATION + INFUSION	Ubiquitous access using wireless technology with voice recognition for gaining access to the ICT network both within and across the supply chain. Becomes the user's personal assistant.	Direct linking to people via video-conferencing, virtual realities to enable experiencing the interaction with them. Wisdom and shared meaning is gained.	Full tracking and monitoring with intelligence to suggest and prompt users automatically anticipating from history rules and preferences.

The way that users *gain* access to a network via its portal provides a distinct 'feel' and insight to the likely interaction experience. At the inactive/awareness level, applications and data/information is restricted to a small workplace group who are either networked through the portal or it operates as a stand-alone system. This portal may use Windows software for example as the graphical user interface or may use an organisation-standard version of a digital dashboard mainly to ease the user's task of locating specific applications software or databases. At the pre-active/initiation level, portals are early generation developments. The focus is on a 'one size fits all' philosophy so that the portal will appear the same to everyone regardless of their usage pattern. At the active/acceptance level the portal allows users to

access an Intranet for shared software applications and data or information facilitating the ICT community to be networked through the Intranet. However, users have to find information through a passive 'push' approach where they have access to plenty of information but they have to use search engines or know specifically where to look in the portal to obtain needed or wanted data or information. At the pro-active/acceptance and adaptation level the portal allows users to access organisational knowledge on a 'pull' basis whereby the system 'knows' the user's profile and helps the user customise their portal screens based upon its 'knowledge' of user preferences, role and function in the supply chain and history of access to information and shared application software. The system knows and learns how to interact with the user to obtain information that he/she wants or needs and the portal becomes customised for that individual. At the embedded/routinisation and infusion level, portals provide ubiquitous customised user access via advanced wireless technologies both within the organisation and across the supply chain. This portal could be accessed through voice activation interfaces and would enquire and suggest helpfully what information is needed for a particular context or problem to be solved. The portal becomes the user's highly effective personal assistant. In the coming decade these may be linked to language translation to allow access in a variety of languages using multilingual portals.

At the inactive/awareness level, the *content and scope* of information accessed through the portal is limited to static data and information. This would include company brochure style data and information with no provision beyond emails to interact electronically through the portal. At the pre-active/initiation level, the portal provides access to refined data and information. For example, it may allow managers at a supervisory level to access summary reports and other similar information that would otherwise be posted periodically (say end of month, end of quarter) thus it allows a greater level of currency of information. A tracking facility is another example of this type of portal interface that allows tracking progress on projects or tracking delivery of packages of deliverables. At the active/acceptance level the portal begins to integrate users, data, information and software applications across a business unit, organisation and across the supply chain. This level provides the basis for conducting e-business. At the pro-active/acceptance and adaptation level, the organisation may have developed or be part of a 'corporate university' such as the ones established at Shell [72, p149] or Boeing [72, p100]. The focus at this level is on knowledge rather than information transfer, but the portals may still restrict the user to text and graphics and limited interactive forums for knowledge creation and transfer activities. At the embedded/routinisation and infusion level, the portal would provide for virtual presence through virtual meetings and easy access to full blackboard technologies so that wisdom and shared meaning can be facilitated through interaction in a close to real face-to-face situations. The portal would give total organisational information and history information (within authorisation limits) so that this can be developed into knowledge through portal access to systems that allow socialisation of tacit knowledge and combining this with stored explicit organisational knowledge to develop insights and wisdom.

*Authority and security* for access and use of portals at the inactive/awareness level of maturity is essentially non-existent. People gain access to systems without requiring any security clearance much like access to most of the World Wide Web. At the pre-active/initiation level, there is need for password access but there is no system logging or monitoring to track level of use, type of use or anything about users of the portals. At the active/acceptance level, there is full monitoring and surveillance of use with priority accessing systems to allow different levels of access and use and this is used to learn about usage patterns as well as to minimise risk of unauthorised access to sensitive data, information or knowledge. At the pro-active/acceptance and adaptation level, encryption technologies are used to secure data and information and provide a firewall capacity. The security approach might also include bio-security recognition systems such as iris scanning. At the embedded/routinisation and infusion level, the focus is not so much on security issues because this would be overwhelmingly addressed at the substantial level instead, the focus is based upon using security information and building profiles of users so that the system can anticipate the portal access to respond to their recorded needs and wants. These systems would be constantly generating and refining rules to fine-tune portal access to make life easier for users. At this level, the system will have a complete profile of preferences for each user developed over time and gathered by access through the portal. A resultant outcome of this focus would be considerable knowledge being generated that requires being seriously addressed in terms of the privacy of information, its potential misuse and manipulative behaviour. At this level of maturity these issues would be both recognised and addressed.

### ***Personal Assistance ICT System Support***

ICT system support is a fundamental feature of any ICT enabling infrastructure. People do not automatically warm to technology because it represents a threat to them as well as requiring their expenditure of energy in learning how to use this technology. To overcome this hindrance, personal assistance is required together with a strategy for training and development.

*Non-programmed* assistance addresses how people can obtain ad hoc requests for help on how get the ICT infrastructure to work for them and addresses their individual problem and so needs highly context-specific responses. These are typically delivered as a call centre or support person who helps users when they call for help.

*Programmed* assistance is geared towards responding to standard but commonly encountered problems and requests for assistance and is driven by and controlled by the support system. These are typically provided through frequently asked questions (FAQ) lists or web page search tools. The also may be characterised by help centre staff transfer of tacit knowledge to explicit knowledge available to all.

Individuals also obtain help by belonging to *communities of practice* and may post cries for help on a COP network and obtain assistance from fellow COP members. As discussed earlier, COPs may be encouraged and supported by firms and organisations and their attitude towards COPS may have a critical impact upon the level of ICT system support provided.

**Table 7 - Personal Assistance**

Maturity	Performance Characteristic		
	Non-programmed	Programmed	Communities of practice (COP)
If I go into this workplace to use hardware to do my K-job, to what extent →	am I likely to find help when I need it on my terms?	am I likely to find help when I need it on the system's terms?	how do COP supported to facilitate ICT infrastructure support?
Inactive AWARENESS	No sponsored assistance or a central point under-resourced facility.	Small numbers of 'help' tutorials or help manuals. No plans for improvement.	The organisation or individual is unaware of COP that apply to them
Pre-active INITIATION	Call centres or other facility are visibly under pressure. Operating on a 'always too late' basis. Poor client feedback.	FAQs and web enabled systems that allow users to search for solutions to common problems.	COP are viewed as a potential leakage of knowledge that need to be guarded against.
Active ADOPTION	Almost adequate resources. Operating on a 'just in time' basis. Adequate client feedback—only 'aspiring to mediocrity'.	A dynamic and well resourced web board of standard solutions with links to external support organisations (originators)+extensive on-line help facilities.	COP are encouraged with caution. Individuals' contribution to COP are neither recognised nor rewarded
Pro-active ACCEPTANCE ADAPTATION +	Designated specialty area specialists. Front line staff has good diagnostic skills to know who to get specific help. System support to do this.	On-line diagnostic tools that are expert system driven so that users interact via a support engine that helps them through to a solution.	Organisation-internal COP are integrated into the support system through chat rooms etc. Membership of organisation-external COP is encouraged, recognised and rewarded.
Embedded ROUTINISATION + INFUSION	Voice recognition 24/7 systems that can talk through the solution with the user and channel solution providers to them or users to experts. Capacity to log solution patterns for future reference by help-line.	Characterised by customer delight service levels. Referrals are systemised and the system remembers these and interfaces to h/w or s/w providers as feedback for improvement.	The organisation sponsors external COP. While not subverting them, they willingly provide resources to support them.

At the inactive/awareness maturity level, of *non-programmed assistance* there will be little or no effort made through the organisation to provide ICT support assistance. Any help that is provided would be based upon personal contact and support on a colleague-to-colleague where mutual adjustment operates in a normal favour-swapping workplace environment. At best there may be a call centre or poorly staffed central point that would be characteristically be wholly overwhelmed by requests for help. Further the quality of support staff may be under strain being overwhelmed by their limited hardware and software application knowledge available to users. At the pre-

active/initiation level, the call-centre, question and answer facility visibly under pressure with users experiencing delays but obtaining attention eventually (generally too late though). The support staff may have good knowledge of a limited number of hardware and software applications in use. At the active/acceptance level, the call centre or other support consultant facility will be operating on a just-in-time basis and gaining a barely adequate client feedback rating. The support staff may have good knowledge of the most frequently used software and hardware facilities and a limited number of specialised hardware and software applications in use. Client satisfaction would be at barely acceptable levels. At the pro-active/acceptance and adaptation level, the call centre or other support consultant facility will be typically operating as a professional service organisation. This will be exemplified with a client-focus that seeks and searches for ways to improve service delivery. Frontline context specific specialists will operate like a well organised clinic where the 'general practitioner doctor' (the ICT systems support consultant) diagnoses the problem with the patient (client) knows what tests to call for and what specialists to recommend (links to specialist advisors with deep knowledge of the hardware or software application being used). Feedback will demonstrate clients being mostly happy or very happy with the service provision. At the embedded/routinisation and infusion level, the support group will be well resources and proactive, operating at the customer delight service level on a 24/7 basis. The support systems will allow human or machine response to individual requests with voice recognition software allowing this. The help centre identifies support specialists for all hardware and software applications, being able to respond to client requests within their realistic expectations. These may be driven by an intelligent meta-knowledge system that keeps track of help calls, responses and domain experts. There could be an automatic feedback system that links to a facilities management system that informs maintenance and upgrade decision making.

For *programmed* assistance at the inactive/awareness level, the organisation will have a number of tutorials or help systems similar to that found on all Microsoft software packages. The degree of sophistication of the tutorial would probably be low for most knowledge management support ICT applications and be in the form of computerised operational manuals and examples. There would be little in the way for a perceived need for or knowledge of how to improve this level of support within the organisation. At the pre-active/initiation level, a standard list of frequently asked questions (FAQs) would be available on a web-enabled help site. At the active/acceptance level there would be a dynamic well maintained web-enabled resource that allows users to search for standard solutions to frequently asked questions with links to external and internal web-resources, domain experts, where identified. At the pro-active/acceptance and adaptation level, a 24/7 on-line help facility for problem diagnosis might be expert-system driven with inbuilt intelligence. The system would then automatically channel users to the relevant and appropriate knowledge asset to obtain a satisfactory answer and inform a facilities management and capacity planning system.

For *ICT communities of practice* at the inactive/awareness level, the organisation and workgroup would be unaware of the existence of any relevant ICT COP that might be of use to them. At the pre-active/initiation level, COP would be viewed as a potential threat with 'leakage' of sensitive



commercial in confidence or competitive advantage knowledge. At the active/acceptance level, COP would be encouraged with caution. There would still be a sensitivity and mistrust that people engaged in them were diverting their energies from the organisation to follow their own hobby or special interest. The organisation would not know how to deal with COP and so participants would be neither recognised nor rewarded for providing access to this valuable social capital asset. At the pro-active/acceptance and adaptation level, COP would be viewed as a natural and integral part of the training and development strategy of the organisation. Membership of COP would be both recognised and rewarded. At the embedded/routinisation and infusion level, COP social capital would be actively sought with the organisation providing resources such as facilities for real or virtual meetings, limited travel expenses and time-off as well as other more active support to sponsor activities wherever appropriate. There would be a sensitivity and appreciation of the delicate nature of COP so that they would not be corporatised or unseemly branded.

### ***Training and Development System Support***

Performance of ICT system support for training and development can be viewed from organisational internal and external perspective. People and groups need to be given ad hoc training and development that is *non-programmed* or very loosely programmed. This would include on-call training courses or programs that can be specially devised or are standard but can be delivered on a just-in-time basis (for example as is the case with Boeing [72, p100] where more than 2,000 employees worldwide have access to training and development) as well as mentoring for example. *Programmed internal training* and development is more likely to be planned for and systematically rolled out as part of a diffusion strategy. When a new ICT tool becomes available or a new version of an existing tool is deployed, there will be a need for training. In terms of *external training and development*, a host of academic and professional development courses and continued professional development, conferences, seminars and support for either formal or informal study are available through specialist providers. This also helps to develop in organisations an absorptive capacity [52]. Table 1 provides a guide on how the maturity levels for this might be used to recognise and measure training and development support.

**Table 8 - Training and Development Support**

<b>Maturity</b>	<b>Performance Characteristic</b>		
	<b>Non-programmed internal</b>	<b>Programmed internal</b>	<b>External T &amp; D</b>
If I go into this workplace to use ICT to do my K-job, to what extent →	will I experience individual and group <i>ad hoc</i> support training and development?	will I experience individual and group planned support training and development?	will I be supported to extend and develop my professionally related knowledge activities
Inactive AWARENESS	People generally mentor each other when problems arise	T&D is sporadic and non-strategic as crises emerge.	A small proportion of people gain support but the criteria are unclear.

Pre-active INITIATION	Internal COP emerge and form study groups or discussion groups possible triggered by quality circle models	T&D relates to a narrow range of topics. Some on-line tutorials etc	Supported by presentation of a suitable business case proposal.
Active ADOPTION	Ad hoc training opportunities are fully supported when needs identified and linked to a business case	T&D plans are linked to user's needs	Staff are supported on a needs only basis.
Pro-active ACCEPTANCE ADAPTATION +	Mentoring is supported as part of the organisational culture. Individual experimentation and reflection is encouraged.	A formal T&D strategy is developed and implemented for ICT knowledge related activities. Widespread involvement with reflective learning case studies and/or experimentation.	Most staff are supported to attend outside events, conferences or academic courses to expand their expertise to add to the organisational knowledge capacity
Embedded ROUTINISATION + INFUSION	A culture exists where a mentor identifies T&D needs and negotiates a development plan to gain appropriate resources to implement	Formation of a corporate university to promote and maintain knowledge discovery and dissemination.	The organisational culture expects outside T&D activities and this is fully negotiated with scope, rationale and process upon being appointed. The focus for development would extend to a concern for holistic personal development.

For *non-programmed internal* training and development at the lowest maturity level, people simply are left to fend for themselves. They generally resort to ad hoc support from their peers and colleagues. In any workplace culture there will be a force for mutual adjustment, 'you scratch my back and I will scratch yours' that does not imply anything subversive or unethical, rather it reflects human nature. It reflects a low level of management training and development intervention planning. Any help facility would be overwhelmed, based upon either a severe shortage of skills, reluctance to commit support resources by senior management, or understanding of the specific issues requiring help. At the pre-active/initiation level, of demonstration of this characteristic there will be a COP that emerges and study groups evolve that support internal training and development in the sense that quality circles provide a self-support system relatively loosely authorised by the organisation but not frowned upon. At the active/acceptance level, ad hoc training opportunities are fully supported when needs are identified and linked to a business case, thus the onus is on employees demonstrating how training and development can directly lead to productivity or other positive outcomes. At the pro-active/acceptance and adaptation level, the organisation clearly recognises the value of experimentation and reflective learning [26] as a useful way to provide non-programmed internal support. At the

embedded/routinisation and infusion level, a pure quality culture pervades in which reflection, learning, and innovation are entwined as a matter of organisational culture [14, 41]. As a consequence, the organisation and individuals negotiate ways in which this culture can be achieved through mentoring and personal contact learning systems.

For *programmed* training and development training and development is sporadic and non-strategic at the inactive/awareness level and only organised as and when crises emerge. At the pre-active/initiation level, it relates to a narrow range of highly transactional and output rather than outcome oriented applications. The organisational response is to provide tutorials and highly structured and possibly unimaginative learning experiences. At the active/acceptance level, training and development is closely linked to user's needs, this may be manifested by choice of delivery systems and module content or by a process of negotiating training and development requirements as part of a work planning process. At the pro-active/acceptance and adaptation level, a training and development strategy is developed and implemented to specifically upskill employees. This would tend to also focus on their reflection on experiences, and could be based around case study analysis either within a training setting or by being involved in post project evaluation exercises that are aimed to provide reflective learning outcomes. At the embedded/routinisation and infusion level, there may be a formation of a 'corporate university' as is currently the case with organisations such as British Aerospace [72, p106], and Boeing's Centre for Leadership and Training [72, p100] or perhaps a joint learning alliance arrangement with supply chain partners or evidence of planned interventions by a learning-manager/executive function within the organisation.

For *external training and development* training and development at the inactive/awareness level, there would be a small number of people being supported to undertake external studies for example at a university or technical institute. At the pre-active/initiation level, support to attend external training and development would have to be supported by a rigorous business case that deters the average person from applying—thus restricting the pool of people gaining access to this form of training and development. At the active/acceptance level, anyone is free to apply but only on activities focussed on immediate needs for their current rather than future functional needs. At the pro-active/acceptance and adaptation level, most staff are supported to attend external learning opportunities and are expected to do so to support their understanding of both ICT technologies and how these may be best applied. These opportunities could include specially organised in-house courses presented by external consultants or learning specialists, externally developed courses or continued professional development events. The aim is expansion of expertise in preparation of future demands and to better understand current contextual issues. At the embedded/routinisation and infusion level, the culture of learning is embedded and this is expected to be made explicit as part of the negotiations revolving around appointment and work planning. The organisation takes its role seriously as community developer and so it sees training and development outcomes from the perspective of brand-image, being an employer of first choice in a world where talent is keenly sought and also from the point of view of developing a vibrant and knowledgeable community.

## Capacity Planning System Support

Effective ICT support does not occur of its own volition. It is generally planned for and deployed. I have identified three elements to this process as illustrated in Table 9. First there is the *planning approach* that follows the plan-do-check-act Deming Wheel [76]. This is a standard methodology for trying to obtain a quality outcome. First we plan, then we do what we planned, then we monitor what we did and then take action on the feedback from monitoring the action and adjust our plans accordingly for the next round of the cycle. Much of this distinguishes between wants and needs and current and future requirements of capacity to support the ICT infrastructure in physical terms as well as support and skills. Second, there is the issue of resourcing to facilitate the required capacity to deliver ICT Infrastructure support the K-Adv. Third, there is a focus on planning and delivery to harmonise capacity in various segments of the organisation and supply chain.

**Table 9- Operational Capacity Planning**

Maturity	Performance Characteristic		
	Planning approach	Capacity resourcing deployment	Focus of planning and deployment
If I go into this workplace to do my K-job, to what extent has →	the planning cycles anticipated meeting my current and future needs?	both planning to, and meeting expected capacity, been based upon :-	the unit of focus for capacity planning and deployment been based upon:-
Inactive AWARENESS	Focuses on user wants rather than needs, needs are not well defined.	When resources become available	Hardware or software. Harmonising equipment with software for individuals.
Pre-active INITIATION	Needs are well articulated and defined and the focus is on what is immediately needed	Just-too-late—general failure to deliver when needed for BUs	Hardware and software. Harmonising equipment with software for each workplace.
Active ADOPTION	Sound needs analysis informs the definition of needs, justified in terms of BU strategies	Just-in-time—general tendency to provide only what is strictly needed. Being a laggard.	Network capabilities. Harmonising by BU
Pro-active ACCEPTANCE ADAPTATION +	Life-cycle plan based on focus groups using both top-down and bottom-up input In line with corporate organisational strategy. Focus on organisational need.	Limited pilot testing to provide pilot groups with beta testing facilities. Building in a contingency or slack to overcome likely dysfunctions. Resourcing for anticipated future needs linked to current needs.	Delivery via portals through networks with capacity planning of organisational staff. Harmonising the organisation
Embedded ROUTINISATION + INFUSION	Based on both 'substantial criteria' and in-depth scenario planning for future focus.	Resourcing to prepare for 'state of the art' technological leadership resourcing to allow piloting, beta-	Harmonising by supply chain.

	Fine tuned strategic plan based on supply chain	testing and preparing for near-future technologies.	
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For the *planning approach* at the inactive/awareness level, the focus on capacity planning is based upon what users claim that they want to do their K-job. Actual needs may not be well known, articulated and planned for. At the pre-active/initiation level, needs are well articulated and the focus is serving the current need as quickly as possible when identified (recognising that there may be lead times). At the active/acceptance level, there would have been a process of planning ahead for needs and to anticipate supply bottlenecks and lead times. The focus remains on current requirements at the business unit level. At the pro-active/acceptance and adaptation level, life-cycle considerations enter the planning process. Capacity planning is framed within the organisational context for example using coherent versions to ensure that common support and learning can be undertaken across the organisation more seamlessly. The planning process would engage top down elements to have strategy inform needs analysis as well as bottom up focus groups for example to ensure a reality check on the current situation. At the embedded/routinisation and infusion level, there would be scenario generation and other future-oriented techniques to scan the horizon for changed environments and the impact that these may have on the capacity plan. There would also be a requirement to align planning with strategy.

For *capacity resourcing deployment* at the inactive/awareness level, resources would be deployed only when they become available. At the pre-active/initiation level, there would be evidence of general failure to resource in time to meet needs. The delivery would always be just too late making life stressful and needlessly complex and difficult for users. At the active/acceptance level, there would be a just-in-time delivery of service strictly matching resource needs with a view to being resource-efficient. At the pro-active/acceptance and adaptation level, there would be a greater focus on resourcing to allow some limited slack for experimenting with piloting new facilities, beta testing and fine-tuning to learn from the new facilities as well as to provide current needs. The slack resources would also be planned to overcome any suspected emerging dysfunction as well as to prepare for likely future needs. At the embedded/routinisation and infusion level, resourcing is recognised to achieve a state of the art facility with resources available for extensive piloting, beta testing and preparation for emerging technologies.

The *focus of planning and deployment* at the inactive/awareness level, would be to harmonise either hardware or software for individuals. This may be serviced on the basis that the 'squeaky wheel gets oiled'. At the pre-active/initiation level, both hardware and software would be harmonised within a workplace. At the active/acceptance level, this would be focussed on the entire business unit. At the pro-active/acceptance and adaptation level, this would be harmonised at the organisational level. The focus would be to have networks and portals to those networks functioning satisfactorily. At the embedded/routinisation and infusion level, the focus would be at harmonising the supply chain. Of necessity this would have to be forward looking and focussed on strategy because this would be a difficult aim to achieve, however, the indications and focus would be clearly on the supply chain.

## Archiving

The ICT support System includes enabling users to gain access to non-current data and information that is only used on an irregular basis and often only intermittently. E-mails for example, together with often bulky attachments, can quickly clock up the storage capacity of many organisations. Thus a strategy for dealing with this needs to be adopted and its maintenance supported. At RMIT University for example, like many other similar large organisations, we have our emails automatically archived after a set period. Users can archive these to their PC hard disk or to another storage facility under their direct control. Generally, archived emails can be rapidly accessed through a Novelle email software package's menu option.

A useful way to view archiving is from the perspective of data, information, knowledge and systems. Some transactional data and information in particular must be kept for a statutory period. After its immediate use it must be stored but available. Other data and information used for decision-making has a shelf life but again needs to be kept for periodic and intermittent reference. When software is upgraded, it often leads to an inability to access archived data and so many organisations also choose to develop a strategy to maintain interoperability of data and bridges that link legacy systems to operational systems. Additionally, a strategy of maintaining refined data as summarised information can also be maintained while allowing the raw data to be destroyed. Thus invoices for example and other records may be destroyed after a suitable legal period and accounting data and information maintained in an archival system. Similarly, knowledge bases of lessons learned can be used to extract lessons learned as 'after action reviews' (AARs) typically used by the US military [18, p8] to develop lessons learned for future reference. Similarly academics using a case study methodology may gather much data and documented material that is summarised and while the source material may be destroyed after a number of years, summaries of data may be archived as part of their research records.

There are essentially three main issues that need to be addressed by archiving. First, the issue of how to deal with *retrieval of legacy systems* needs to be addressed so that recorded history is accessible. We could imagine the tragedy that would occur if all the major art works at the Louvre were to be digitised into jpeg format for example and originals destroyed, and when the jpeg format becomes obsolete, no effort was made to update the jpeg images to a new format or no equipment was maintained that could read and update these images. This problem has already emerged in the home where numerous vinyl or 8-track cassette music tapes can no longer be enjoyed because of playback equipment changes over the past two decades. Second, business data and information is generated in either or both *hardcopy or electronic* form. Electronic data and information is stored on hardware devices and these need to be stored somewhere if their content is to be available from an archive. Third, *issues of security* do not disappear just because data and information may become obsolete for current needs. Security affects the level of access, identification of whereabouts and how meta-data about its periodic access and use patterns may be gathered and made available. While business organisations often place less focus on this aspect, security and government organisations take this issue very seriously.

**Table 10- Archiving Data and Information**

Maturity	Performance Characteristic		
	Retrieval of legacy systems	Hardcopy and electronic	Security related issues
If I go into this workplace to do my K-job, what kind of planning has gone into →	how to retrieve legacy systems and recorded history when necessary?	how to store hardcopy and/or electronic documents, information and knowledge?	how to deal with security of archived data, information or knowledge?
Inactive AWARENESS	No thought of how to retrieve all/parts if required in an emergency	Off site storage, poorly indexed in multiple locations so that general location is unknown	No access security other than kept under 'lock and key'
Pre-active INITIATION	Duplication of both systems until cut-over is complete	Poorly indexed but known general location	Global access to all archive materials
Active ADOPTION	Phased cut over provision for maintaining fully functioning separate new and legacy systems	Well indexed but technology may be out of date to use legacy materials	Segmented and structured access by security password and login
Pro-active ACCEPTANCE ADAPTATION +	Developing data dictionary, information and knowledge indexing between legacy and new	Well indexed and updated to enable reading using current technology	Security logging and monitoring for access, system defined who has access.
Embedded ROUTINISATION + INFUSION	Backward channelling data, information or knowledge to rapidly revert to updated versions of legacy system	All records available with automatic switching to 'archival' source using current technology including indexing technologies for rapid access	On-line real-time information about archival access with information about access for decision making about archiving policy for that particular item.

For *retrieval of legacy systems* that provides data or information used to create, transfer or transmit knowledge at the inactive/awareness level, there would be little or no thought to the way in which to manage all or parts of the data, information or knowledge repositories or how to deal with legacy systems and their data to allow access once they have been taken of live-access systems. At the pre-active/initiation level, there would be a duplication of both live and legacy systems until a cut-off period had elapsed. Confidence would prevail that the 'new' systems were functioning and that legacy facilities could be archived. At the active/acceptance level, there would be a phased cut over period with provision for fully functioning retrieval of both 'new' and legacy systems for a reasonable period after cut over to ensure that legacy systems can be re-activated should any emergency occur where this is necessary over the appropriate period. At the pro-active/acceptance and adaptation level, a data dictionary and appropriate translation systems would be in place so allow indexing between legacy and current systems so that when archival material is needed, it can be regenerated quickly for current use. At the highest level, versioning of ICT facilities would automatically contain the provision for current data to be channelled back into the legacy

systems if required. Thus the legacy system and current systems become fully interoperable and transparent to the user rather than needing to move between 'archaic' procedures that would require corporate knowledge to be fully maintained across legacy systems.

The issue of how to store both *hardcopy and electronic* versions of documents, files, multi-media information and recorded knowledge at the inactive/awareness level, would be handled poorly. This may be manifested by off site storage in multiple locations and perhaps in poor conditions for maintainability of the integrity of the materials. Materials being merely 'shunted off' to an archival storage facility could mean that little or no consideration might have been made in how to locate and retrieve material. The physical storage environment might be inappropriate for maintaining the integrity of the archived materials. Typically for hard copy form, boxed documents in non-indexed containers potentially at the base of stack of boxes would effectively made retrieval very difficult and/or costly. At the pre-active/initiation level, the general location of the container may be well documented and known but poor indexed in terms of where the actual archived artefact might be. Again this makes retrieval difficult and costly. At the active/acceptance level, the access and environment may have been addressed but there would be little consideration of how the material can meet the provisions of the translation between legacy and current systems. For example, a legacy system may require hardcopy that has deteriorated or needs to use reading translation equipment that fails to function. At the pro-active/acceptance and adaptation level, archival system will be well indexed and stored for access and use so that it meets the need of the current-legacy translation needs. It would, however, still most likely require expert treatment so that specialists and not the general user, to be able to facilitate this process. At the embedded/routinisation and infusion level, state-of-the-art facilities will enable seamless switching between legacy to current technology to occur by general users with minimal knowledge being required to operate the conversion procedures or protocols.

For *security related issues* at the inactive/awareness level, there would in essence be no security other than access to a warehouse of storage facility with the equivalent of a lock and key. At the pre-active/initiation level, access to the archival facility would be on a global basis. If this were electronic it would equivalent to having no password protected files or data. At the active/acceptance level, access would be segmented and structured with standard security measures in place such as password and identification required. At the pro-active/acceptance and adaptation level, stricter security provision would apply than at the moderate level (for example using data encryption devices or bio-identification technologies). The structure of access would be highly developed with links to a security logging system that records data about the characteristics of access events. At the embedded/routinisation and infusion level, the meta-data gathered on access and other characteristics would be systematically analysed for patterns and trends to assist with decision making about what data to archive, at what level or intensity and how best to address the retrieval policy. This facility could generate data and user profiles so that the possibility of archival materials being commercialised could be pursued.



## **Chapter Conclusion**

The case for ICT being a knowledge enabler has been persuasively made elsewhere. One rule of thumb that has been offered is that any KM initiative that has more than 1/3<sup>rd</sup> ICT content is not a KM initiative but an ICT one [71, p78]. While this obviously places ICT in a supporting role it nevertheless indicates its high level of importance and impact. Thus, a study of how ICT Infrastructure may support the K-Adv is relevant and necessary.

This chapter began with an explanation of how the contribution of a sound ICT supporting infrastructure can be deployed to not only improve the delivery of an organisation's core competencies but to also facilitate a transformation of its core business and spawn possibilities for spin-off business opportunities relating to its improved K-Adv. The example of AA's SABRE airline reservation IT initiative was discussed in this context.

I also explained how an ICT infrastructure facilitates knowledge codification, transfer and transmission. Figure 13 provided a component breakdown structure to better understand how ICT is involved in developing a K-Adv. I then presented a detailed framework for measuring components of the ICT Enabling Infrastructure for both functioning hardware/software and ICT System Support elements. Table 3 to Table 10 of this chapter provides a guide on how each element of the component breakdown structure can be assessed to provide a maturity index by element and rolled up to the sub-component and component level. These included functioning: hardware, software, networks and portals for user to system interface. Additionally, it included measures for assessing ICT system support components of personal assistance, training and development, capacity planning, and archiving.

At in the 'Implications of the Need for an ICT Enabling Infrastructure' section of this chapter, the mechanism of how a score at each of these levels can provide a means to benchmark internally within an organisational unit, or be used between organisations. Further, in that section, it was inferred that this approach could be used can to provide a gap analysis tool to assist in strategy development of how to best use the ICT enabling infrastructure to enhance the K-Adv.

## **Chapter 5. Leadership Enabling Infrastructure and the K-Adv**

Derek H.T. Walker

The following will be discussed in this chapter:

- Purpose of the Chapter
- The Role of Leadership in Achieving the K-Adv
- Identifying Stakeholders
- Understanding Core K-Adv Vision Issues
- Developing Vision Options
- Articulating
- Planning Vision Realisation
- Mobilising Resources
- Deploying the Vision
- Maintaining the Vision
- Chapter Conclusion

### ***Purpose of the Chapter***

The purpose of this chapter is to explore and explain the K-Adv's Knowledge Leadership enabling infrastructure in detail. The chapter starts with an explanation of the need for a Knowledge Leadership enabling infrastructure and its place in the K-Adv concept. Each element and attribute is then explained in detail with rigorous justification of its form drawn from the literature.

### ***The Role of Leadership in Achieving the K-Adv***

A number of writers on innovation (see [44] for example) agree that while imaginative people may manifest creativity in workplace environments that fail to support their talents, ordinary people can draw upon their hidden innovation talents when operating in a supportive workplace environment that has been led with a vision of enabling innovation.

Amabile [38] as discussed in Chapter 3 identifies three components of creativity in individuals. The first is expertise—technical, procedural and intellectual knowledge. The second is creative thinking skills—being flexible and imaginative to be able to make many and varied connections between concepts in different contexts. The third is motivation—the drive and passion to commit to an idea and deliver the energy required to convince those with influence to effectively support it. This requires visionary leadership in those who champion and support innovative ideas that emerge from within an organisation, rather than business management skills centred on planning and control of that which is known rather than the unknown. These innovative ideas become embedded as a knowledge advantage.

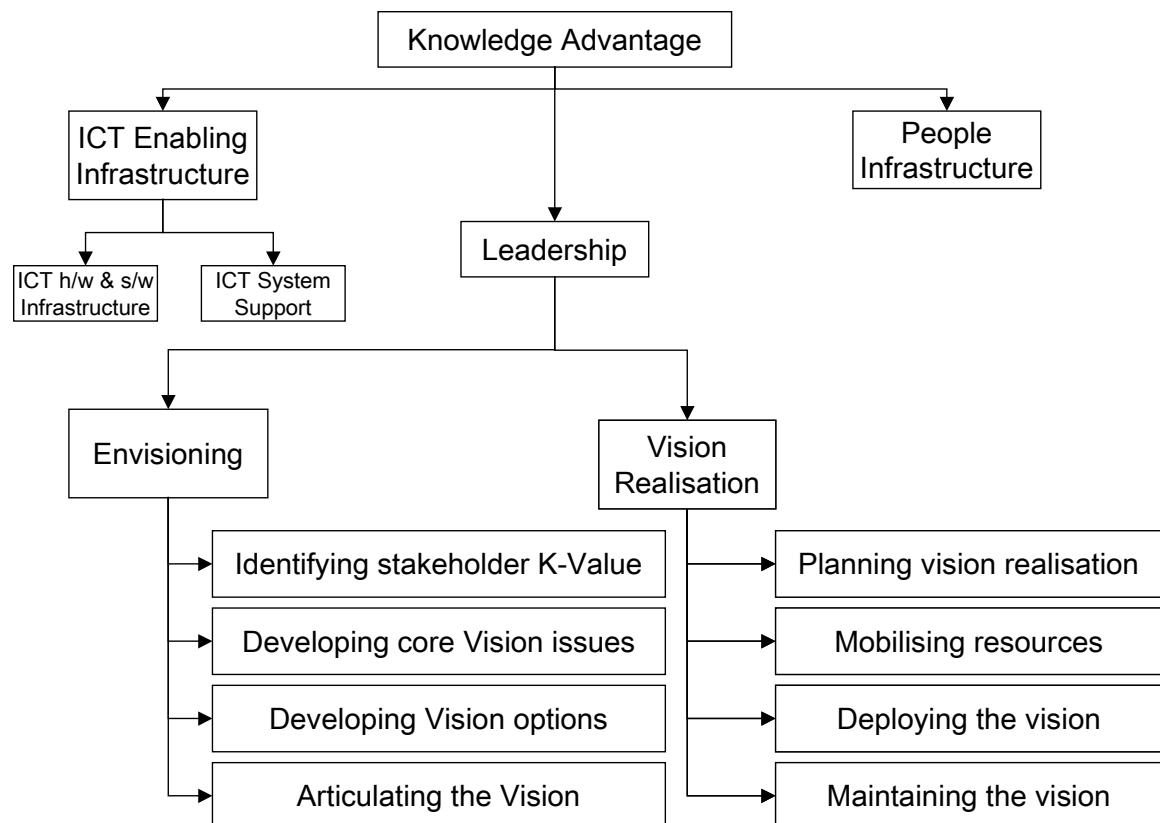
Innovative ideas are often generated from outside an organisation by demanding customers and others who believe that they have a stake (stakeholders) in the outcome's success [73-75, 77, 78]. Therefore a critical leadership characteristic is support for employees to generate innovative and creative ideas by listening to and interacting with customers and other

stakeholders to fine tune suggestions for improved products, processes or services [2].

The link between innovation and a K-Adv becomes clearer when we consider the organisational milieu that supports this kind of close interaction with innovators. Many examples of innovation provided in the literature [44, 79] point to a workplace culture that supports those with innovative ideas (see the next chapter for more detailed discussion on the cultural impact on the K-Adv). Behind any supportive culture is a leadership regime that not only supports diversity in the ways people think and 'know' beyond traditional approaches, but also sets out a clear vision of how people within an organisation can be energised to maximise their own creativity and build upon the ideas and knowledge of others they interact with [80].

It becomes clear that there are two forces at work that result in an effective organisational response that supports the development of a K-Adv to sustain innovation. The first is leadership to empower people and to develop enthusiasm for being innovative. The second is a workplace culture that drives and supports this energy forward rather than inhibiting or crushing it (see Chapter 7). The literature on leadership is too vast to do justice in summarising it in this chapter. One theme, however, that recurs in that body of knowledge is the critical role of effective leadership and the communication and deployment of a knowledge vision and its transforming impact upon those it touches upon the realisation of a the knowledge advantage that generates and sustains innovation.

Maslow [39] argued that people who have achieved their basic physical survival needs are most effectively energised and motivated by the prospect of achieving a higher purpose. He stated that the highest order of motivation is self-actualisation and that when a transcending aim and commitment to do something very special is offered, people can identify with that vision of excellence and generally strive to actualise it from their internalised drive to achieve excellence. In this respect, leadership is about empowerment, energising and enabling people to use knowledge and tangible resources to achieve their vision. However vision by itself is inadequate for the purpose, vision needs to be translated into effective action. As Kotter [81] cautions us, while leadership helps create the vision it needs sound project management skills and a hands-on leadership style and practical application of the vision to deliver and deploy the conceptual big-picture vision.



**Figure 14 – Component Breakdown Structure for K-Adv Leadership**

Leadership can be seen to comprise two vision inter-related activities that develop a knowledge advantage, envisioning and vision realisation. Figure 14 outlines a component breakdown structure for the leadership K-Adv to be followed in this chapter and places it in context with the ICT Enabling Infrastructure and the People Infrastructure will be discussed in Chapter 6.

The envisioning process helps to answer the following progression of questions:

- Who are our stakeholders and what are their needs? As we saw earlier this involves understanding the environments from which stakeholders emerge, identifying them through their environmental context, and then identifying what stakeholders know that can be of value in identifying their needs.
- What are the knowledge advantage issues that lie at the core of the identified stakeholders' needs? This involved identifying what is of value to stakeholders, understanding what stakeholders know about the identified core issues that deeply affect them, and understanding the implications of this knowledge and how it can be marshalled to shape the K-Adv vision.
- What are the issues that should be considered in developing a K-Adv that helps this organisation to not only meet its stakeholders' expectation but also to transform its ability to develop new business opportunities? This involves filtering ideas about the proposed vision and harmonising similar ideas into themes, prioritising these, and then validating them to check for feedback on them in terms of relevance and usefulness to stakeholders.

- What concisely is the vision and how is to be transmitted? This involves making the vision explicit in terms that are readily understood by stakeholders and transmitted via an appropriate communication channel and medium that stakeholders readily use so that all stakeholders have a clear and common view of the vision.

With an effectively envisioned K-Adv vision determined the realisation of that vision can be planned for and deployed. Planning the realisation of the K-Adv vision is essentially a project management exercise and so for readers who have extensive experience in project management this chapter will strike deep chords of resonance. Similarly for corporate strategic planners and change management specialists this chapter will also be familiar.

The Vision Realisation process helps to answer the following progression of questions:

- How can we best plan for vision deployment? This involves classical project management planning methodologies such as determining the organisational structures required, the roles and responsibilities of those deploying the vision, the systems that will support deployment and resources required [82, p272, 83].
- How do we mobilise resources? Having budgeted for resource commitment in the planning stage, this involves coordinating resource availability to be available when and where required to mobilise the vision.
- How do we deploy the vision? Having planned and put in place resources necessary to deploy the vision, this involves managing the process of making the vision deployment happen.
- How do we maintain the vision? Having deployed the K-Adv vision, this involves maintaining stakeholder understanding and commitment to it and managing a process that allows updating, refinement, adjustment and refurbishment in a coherent and orderly manner. This issue is similar to maintaining alliance relationships [84, 85, p61] in that it is about managing relationships with stakeholders in a similar way to alliancing.

One of the most strategic leadership features is envisioning a preferred future and charting a way to get to that future. Von Krogh et al [12, p103] argue that a knowledge vision provides corporate planners with a mental map of three related domains: the world they currently live in; the world they ought to live in; and the knowledge they ought to see—the knowledge vision should specify what knowledge members need to seek and create.

Envisioning requires identifying stakeholders that can contribute to the K-Adv, understanding and developing core issues related to how the knowledge vision can be developed, developing options for the vision, prioritising them and then articulating the vision. Realising the vision for a K-Adv requires planning the deployment, mobilising and coordinating the required resources, deploying and then maintaining the vision.

The broad question is “how can we best engage project or organisational stakeholders to create, share and transfer knowledge that support positive competitive advantage in product, process or service delivery outcomes?”

## ***Identifying Stakeholders Knowledge Advantage Value***

A substantial amount of literature has been written about the stakeholder concept. Discussion about what a stakeholder is and the degree to which these people should be considered in business and social interactions has sparked much debate (see [86] for example). Much of this debate is centred on an instrumental philosophy. It is argued that certain (positive or negative) outcomes will become evident if the interests of certain groups are taken into account. Supporters of this argument view stakeholders as a community of interest unified by various concerns about a project outcome—they are therefore political constituents with a legitimate voice that needs to be heard. The argument follows that to maximise benefit, stakeholders should be given the opportunity to influence plans and outcomes by voicing their concerns about their contributions to planning and monitoring outcomes. The usefulness of this view is that it provides a framework for prediction—if stakeholders are considered then 'X' will follow.

Academic stakeholder theory debate is also centred on a moral stand. Proponents of this school of thought argue that stakeholders affected by an outcome deserve a voice and opportunity to contributing to shaping decisions that affect them. This concern for stakeholders is not so much related to their being instrumental in some kind of active or reactive way but that their aspirations and needs simply deserve to be considered because these stakeholders will be affected by any outcome. This presents some problems in terms of stakeholders being without a coherent voice to express their concerns—the fears for the impact on unborn generations is a case in point.

This ethical view resonated over the last decade of the 20<sup>th</sup> century with concerns centred upon triple bottom line (3BL) accounting. This concept stems from a perceived need to not only account for the impact of a financial bottom line, but also an environmental (the 2<sup>nd</sup>) and social.(3<sup>rd</sup>) impacts [36]. With greater focus activist groups on the 3BL and a growing perceived need for wider sphere of corporate governance being necessary, there has been a recent convergence of views of stakeholder theory from the instrumental as well as ethical perspective centred on the wisdom of being more inclusive towards a diversity of views from supply chain contributors [86, p212]. So, one might ask what does this have to do with a K-Adv? Part of the answer lies with gaining an opportunity to get a broader perspective on issues requiring action based upon a sound and reliable stock of knowledge and a wider pool of wisdom.

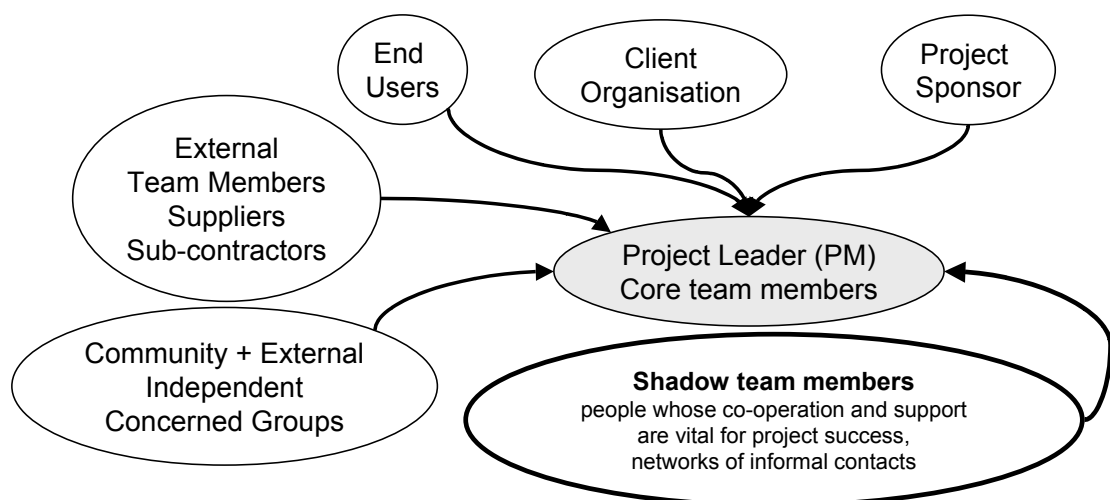
Figure 14 suggests that the leadership element relating to the K-Adv is based upon two sub-elements, envisioning and vision realisation. I suggest that this in turn is based upon the leadership entity seeing beyond any one group involved in the design, construction or assembly stages, operational maintenance and the transformation of a project at the end of its useful life. The impact of decision making at the early stages of a project's inception and preliminary design stages is well recognised in the project management literature [82, 87-90]. Thus, by deepening the pool of expertise and knowledge contribution, decisions and evaluations are richer, more complete and account for a wider range of impacts than access to a shallower pool of knowledge and experience.

The management literature stresses the need for a customer focus in moving beyond the narrower commercial interest of selling goods to not only

learning from the client by finding out how to satisfy their needs but also by working with them to discover ways of doing so [73, 74, 78].

In supply chain management theory, upstream contributors to the value chain view those downstream as their customers to whom they should be adding value [91-93]. The need for viewing the complete project supply chain as an opportunity for learning and a source of enhancing the K-Adv is relevant and of critical importance. Thus from a value chain perspective, it is wise and pertinent to consider how a broad range of stakeholders might affect the development of a K-Adv.

Figure 15 illustrates a model for the above discussion (see [94] for more in-depth discussion of this concept). The additional stakeholder categories that have been included in Figure 15 are the community and concerned groups as well as shadow team members. The work of [51] argues that project managers need to consider both the community interest and those who support project teams. More lately there has been an increasing focus on developing a family friendly workplace as a means of winning the war for talent by attracting the best and brightest minds [95]. All this has relevance to developing a K-Adv and supports the need for visionary leadership as a key driver of a K-Adv through creating the best environment for knowledge to flourish.



**Figure 15 - A Stakeholder Model for Projects**

Performance characteristics of the first component of the breakdown structure element (illustrated in Figure 14) *identifying stakeholder knowledge value* comprises three performance characteristics: understanding the stakeholder environment; identifying stakeholders; and identifying how their knowledge can be of value to impact their potential contribution to the K-Advantage. These are presented in Table 11. For this K-Adv component the main issue is how the knowledge vision can be broadened, deepened and enriched by diversity of ideas about what knowledge content to contribute and how that content can be harvested. Through better understanding likely stakeholder contribution and benefits that can be generated, a more inclusive and richer vision can be developed and be more finely tuned to meet the motivation needs and aspiration of its contributing members.

**Table 11- Identifying Stakeholder Knowledge Value**

Maturity	Performance Characteristic		
	Understanding stakeholder environments	Identifying stakeholders	Identifying what stakeholders know
How can the K-vision be improved, by →	understanding the environments where stakeholders come from.	understanding who these stakeholders are.	understanding what stakeholders know and to whom benefits would accrue from their knowledge .
Inactive AWARENESS	Only considering the financial environment perspective.	Identifying the paying customer/clients	Only being able to identify how their knowledge might bring tangible financially beneficial to the organisation's or project's \$ bottom line.
Pre-active INITIATION	Beginning to consider risk and opportunities more broadly so that environmental and social risk can be quantified.	Identifying internal and external customers/clients within the organisation.	Being able to identify how their knowledge might bring tangible and intangible benefits to the organisation's/project's \$ bottom line.
Active ADOPTION	Considering in both quantitative and qualitative terms, the environmental and/or social environment to reduce these risks in financial terms.	Identifying internal and external customers/clients across the supply chain.	Being able to identify how their knowledge might bring a limited range of 3BL benefits to the organisation or project.
Pro-active ACCEPTANCE ADAPTATION +	Being able to develop an understanding of all three 3BL environments on their own terms.	Identifying the most significant stakeholders with an interest in knowledge about the financial element of the 3BL plus one of the other two elements.	Being able to identify how their knowledge might bring financially and a full range of 3BL benefits to the entire supply chain.
Embedded ROUTINISATION + INFUSION	Being able to fully comprehend the knowledge needs and supply of expertise that various players have in contributing qualitative and quantitative knowledge about their 3BL environments	Being able to identify and classify the most significant stakeholders by 3BL environments.	Being able to identify full 3BL benefits that each stakeholder's knowledge could contribute to the global community.

For *understanding stakeholder environments* at the inactive/awareness level, the focus would be firmly and only on the financial bottom line of the project or business opportunity that the BU is engaged in. There would be an implicit assumption that the financial bottom line is the only relevant one. At the pre-active/initiation level, there would be some evidence of broader appreciation and understanding perhaps driven by OHS and environmental quality accreditation. This would however be nascent and tentative because the organisation would not be very concerned about being accredited on for



example ISO14000 series or for OHS. The implicit assumption about the supremacy of the financial bottom line would dominate their capacity to understand stakeholder environments. At the active/acceptance level, the organisation could be accredited at ISO9000 series and ISO14000 series as well as deeply committed to OHS. The BU would be focussed upon risk reduction with direct financial savings related to waste minimisation and insurance premium reductions. At the pro-active/acceptance and adaptation level, the BU would focus on understanding environments based upon the 3BL and would be able to view them not just from the organisation's point of view, but also from a stakeholder's perspective. This might yield hitherto unforeseen service delivery opportunities. At the embedded/routinisation and infusion level, an enthusiastic search to understand the 3BL environments to potentially transform the organisation and its relationship with the rest of the world would be followed. The prevailing view would be that the world is full of wonderful opportunities that just need to be understood to find a fruitful delivery path for all stakeholders.

The *identification of stakeholders* based on environmental scanning at the inactive/awareness level, would be limited to a perception that the only 'real' stakeholder is the client or paying customer. At the pre-active/initiation level, the concept of stakeholders would be expanded to include organisation-internal groups directly involved in the project concerned. At the active/acceptance level, the concept of stakeholders would be further expanded to include parts of the supply chain. At the pro-active/acceptance and adaptation level, stakeholder's identified would be further expanded to include significant people within the environmental and social 3BL constituency. There would, however, be an implicit shift in assumption that this wider group of stakeholder should be considered for political, and risk-minimisation reasons. At the embedded/routinisation and infusion level, the focus on financial risk would be maintained but there would be wider identification of stakeholder voices that add qualitative data, information and tacit knowledge on environmental and social 3BL issues. Rather than dismissing anything that cannot be readily explained or quantified, there would be a broadening understanding of the stakeholder base to include those who require effort in socialising and sharing tacit knowledge in an attempt to make it more explicit.

Identifying the *stakeholder knowledge value* at the inactive/awareness level is restricted to knowledge about purely tangible financial aspects and only considering the point of view of the business unit. At the pre-active/initiation level, the scope of knowledge value benefits would be expanded beyond tangible benefits to also include intangible benefits that contribute to the financial bottom line. At the active/acceptance level, there would be more comprehensive identification of potential stakeholder knowledge contribution benefits in terms of environmental and social 3BL issues but consideration would be limited to the organisation or project. At the pro-active/acceptance and adaptation level, this 3BL knowledge value benefit would be extended to the supply chain and at the embedded/routinisation and infusion level, this would be further expanded to appreciate benefits to the global community.

Through this progression, the scale and scope, depth and breadth, as well as richness of context and content increases so that it follows a logical and

discrete sequence of stages of enhancing the K-Adv vision. As this vision is expanded and its constituents identified and understood, the vision can be better articulated and therefore better deployed.

### ***Understanding Core K-Adv Vision Issues***

At this stage, stakeholders have been identified from an analysis of the environments from which they came. The nature of the knowledge of what benefits that they can contribute should be also well known. Before a vision can be articulated that is meaningful to stakeholders in terms of delivering valuable organisational or project outcomes, there needs to be a focus upon core issues that resonate with those participating in its delivery and realisation. This element is highly relationship oriented and dependant upon the attitudes that leadership promotes towards stakeholder interests.

The degree of understanding of core issues that affect stakeholders' wants and needs contribute to an organisation's K-Adv. This is derived from being able and willing to elicit knowledge of what product, process or service innovation could be of value to the stakeholders' value proposition.

**Table 12 - Understanding Stakeholder's Core Issues**

<b>Maturity</b>	<b>Performance Characteristic</b>	
	<b>Understanding Stakeholder Value Proposition</b>	<b>Attitude Towards Elicitation of Stakeholder Knowledge</b>
How can the K-vision be improved, by →	understanding the value proposition of identified stakeholders to determine what knowledge issues are the most pressing to respond to them.	getting stakeholders to make explicit their knowledge about their needs that may have some bearing on better determining which core knowledge issues should be addressed.
Inactive AWARENESS	Being unaware, disinterested or uncaring about what is important to stakeholders.	Being unable or unwilling to start to get stakeholders to reveal what they need or what their aspirations are.
Pre-active INITIATION	Being concerned to align identified stakeholders with BU's own value proposition	Having a restricted dialogue to genuinely elicit knowledge from stakeholders due to having a parent-child relationship with them. Lack of resourcing to do so.
Active ADOPTION	Balancing the BU value interest with that of stakeholders through formal research into what motivates them	Belief in the power of synthesising data, information and knowledge to avert risks and maximise synergy. Having an extraction approach with lack of dialogue.
Pro-active ACCEPTANCE ADAPTATION +	Aligning the BU value interest with that of stakeholders through quantitative & qualitative research	Fully engaged exercises through simulation, piloting and joint evaluation.
Embedded ROUTINISATION + INFUSION	Framing transformation change opportunities through understanding the stakeholder's value aspirations.	Proactively seeking ways to induce stakeholders to share knowledge and share in rewards

Understanding the *stakeholder's value proposition* at the inactive/awareness level, is manifested in benign neglect. What is important to them is simply of minimal concern to the BU that is focussed on getting on with what it perceives to be the main issues. At the pre-active/initiation level, there is a restrictive awareness of what stakeholders value. There is a concentrated focus upon only aligning the stakeholders' value proposition with

that which the BU can offer. At the active/acceptance level, there is a sense of negotiation taking place to trade preferences and compromise and influence the balance between the BU's agenda and stakeholder agreement. The attitude is generally one of extracting or mining information rather than fostering knowledge exchange and dialogue. At the pro-active/acceptance and adaptation level, the BU seeks to meet the stakeholders' expressed value proposition. At the embedded/routinisation and infusion level, the aim is to engage stakeholders in a genuine dialogue to jointly explore concepts of value so that hidden and assumed values are unearthed and explored. The BU does this as an opportunity to create value through reframing their business offerings and believe that in doing so they stay ahead of their competitors as well as grow their core competencies in re-framing their business.

In *attitude towards elicitation of stakeholder knowledge* at the inactive/awareness level, the BU displays disinterest in eliciting knowledge from stakeholders because it believes that customer knowledge is largely irrelevant to their K-Adv. At the pre-active/initiation level, attempts to find out what stakeholders know are tentative and not well supported by the BU hierarchy (due to a parent-child relationship with stakeholders) with low levels of budgeted resources being available to elicit stakeholder knowledge about their needs and aspirations. At the active/acceptance level, the focus is on formal process to collect and collate expressions of interest and there would be a highly formal approach with strictly budgeted resources allocated to elicit stakeholder knowledge. At the pro-active/acceptance and adaptation level, there would be a genuine dialogue to explore perceptions, resourced accordingly, with stakeholders to find out what they know. At the embedded/routinisation and infusion level, there would be a proactive exploration with intimate stakeholder engagement and sense of interest in discovering what they know to achieve genuine two-way learning from the experience. Techniques such as soft system methodology [96] might be employed to understand complex situations in a more holistic manner.

## ***Developing Vision Options***

Once core issues concerning how welcomed innovation can be delivered have been identified, the K-Adv vision can be coherently developed and shaped. This involves three sets of activities. The first of these is the need to develop themes and sub-themes from core issues. The second is filtering and harmonised them. The third is prioritisation and evaluation. When this is complete, a clear picture of what must be done to realise a K-Adv emerges.

*Filtering options* to harmonise issues that are closely related converge different perspectives of the same issue, for example, sustainability and cost savings due to waste. *Prioritising* emerging options should be directed at developing a consensus on the relative necessity of each issue that emerges. Resolving inconsistency through *validation* of options to ensure that they are coherent, and consistent ensures that vision options can be seen to be viable and real by a diversity of stakeholders.

**Table 13 - Developing Vision Options**

	Performance Characteristic
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<b>Maturity</b>	<b>Filtering and Harmonising Themes</b>	<b>Prioritising Options</b>	<b>Validation</b>
How can the K-vision be improved, by →	ensuring that issues are coherently grouped into consistent themes and harmonised.	agreeing on priorities and resolving conflicting with internally inconsistent vision proposals	ensuring that the vision supports stakeholder interests and is understood by those represented by the vision's outcomes.
Inactive AWARENESS	Producing a long and broad list of issues without any serious attempt to consolidate them into themes.	Basically prioritising under pressure with little rationale to priorities established. Little transparency.	Highly bureaucratic interpretation of what is valid. This approach often used to hide a sub-text.
Pre-active INITIATION	Grouping issues into themes that fit with a pre-determined agenda—not necessarily shared by the majority of stakeholders.	Religiously following a set-prioritising plan because of a lack of identified alternatives. Priority is based on the 'loudest voice'.	Pretence at being politically correct. Ensuring that minor stakeholders are 'seen' to have had a voice.
Active ADOPTION	Grouping issues into themes that address current or past concerns.	Priorities based on closed-door discussions that 'fix' the agenda from the point of view of perceived 'powerful' stakeholders.	Actually believing that diversity of input to validation is worthwhile for whatever reason. However the way to use diversity is confused.
Pro-active ACCEPTANCE ADAPTATION +	Use of a variety of techniques to unearth themes and issues to gain a holistic and internally consistent appreciation.	Priority based upon a value precept. 'Value' is considered. The meaning of value is open to negotiation based upon credible evidence that engages diverse stakeholders.	Validation by diverse groups because of their ability to contribute to recognising manipulation, obfuscation, and confusion when harmonising objectives.
Embedded ROUTINISATION + INFUSION	Considering themes into both current and future contexts so that a more strategic outcome is expected. Harmonising to creatively align conflicting objectives through intensive and extensive workshops.	A balanced scorecard approach is used to prioritise options based upon a long-term and forward-looking view of the project.	Taking the validation exercise as an opportunity to explore future issues worth considering as the 'next wave' of the K-Adv's realisation.

*Filtering and harmonising K-Adv vision themes at the inactive/awareness level is a highly mechanistic operation. Options are gathered and listed perhaps using facilitated brainstorming techniques. It is likely that themes would be either non-existent or at best underdeveloped. The result is likely to be long lists of issues, poorly categorised and probably manipulated to sustain the status quo. At the pre-active/initiation level, there will be some semblance of order and intelligent analysis; however, those with direct power and*

influence (whatever that may mean in this context) will dominate the establishment of the underlying philosophy of what a theme means and it is they who will determine the ground rules and protocols that determine outcomes. The level of engagement is generally one of being on automatic pilot with a 'tick the box' mentality rather than rigorously thinking issues through. At the active/acceptance level, themes will be developed from core issues on a well-founded basis but these will be instituted on past experience and while of value these may not be particularly relevant in a rapidly changing environment. At the pro-active/acceptance and adaptation level, there will be an assumption that alternative views are both legitimate and critical for sustainable success. This manifests itself in diversity demands of techniques to be applied to elucidate a range of options linked in a variety of ways that may combine to produce unexpected outcomes. The focus on a holistic outcome can lead to vision options taking on a trajectory (in terms of their meaningfulness to stakeholders) far removed from the option's original direction. This presents a challenge of re-framing meaning. One meaning may trigger ideas that re-frames this in another context, another worldview that can have unpredictable spin-offs. At the embedded/routinisation and infusion level, the filtering process will be directed to not only past and current worldviews but also seek to anticipate the future in a strategic manner. Harmonisation will be achieved through commitment of considerable resources. These will be considered of be of lower intensity at the 'front end' than having to be deployed to retrieve a bad position later on at greater expense.

*Prioritising options* at the inactive/awareness level, is exemplified by little or no transparency of conduct and process and a tendency to panic and respond to the 'squeaky wheel'. At the pre-active/initiation level, a rigorous and bureaucratic process will have been established but in practice those who know how to trade favours would benefit most. Thus power and influence and 'game playing' dominates prioritising. At the active/acceptance level, the 'loudest voice' counts less than sheer power and influence. At this level, a purely transactional philosophy is dominant and priorities are approved in terms of the needs of those whose voice is currently most influential regardless of likely consequences. Short termism dominates thinking processes. At the pro-active/acceptance and adaptation level, a balanced scorecard<sup>8</sup> approach is adopted because the focus is upon long-term outcomes, business sustainability and prosperity. A core feature of this approach will be harmonising cross perspective goals and aspirations and finding ways to engage a dialogue between potentially hostile groups so that

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<sup>8</sup> This relates to a view of performance as being a balance from a number of perspectives. The originators of this theory have written some useful papers notably 32. Kaplan, R.S. and D.P. Norton, *The Balanced Scorecard - Measures that Drive Performance*. Harvard Business Review, 1992. **70**(1): p. 171-179, 37. Kaplan, R.S. and D.P. Norton, *Using the Balanced Scorecard as a Strategic Management System*. Harvard Business Review, 1996. **74**(1): p. 75-85, 66. Kaplan, R.S. and D.P. Norton, *Putting the Balanced Scorecard to Work*, in *Harvard Business Review on Measuring Corporate Performance*. 1998, Harvard Business School Publishing: Boston, MA. p. 147-181, 67. Kaplan, R.S. and D.P. Norton, *Using the Balanced Scorecard as a Strategic Management System*, in *Harvard Business Review on Measuring Corporate Performance*. 1998, Harvard Business School Publishing: Boston, MA. p. 183-211, 97. Kaplan, R.S. and D.P. Norton, *Putting the Balanced Scorecard to Work*. Harvard Business Review, 1993. **71**(5): p. 134-142..

common ground, harmonising of objectives and a meeting of minds be achieved.

*Prioritisation validity* is the process of checking to ensure that the themes and priorities are valid, consistent with the overall vision and that they are indeed harmonised. At the inactive/awareness level it is highly bureaucratic and hides the subtext that those setting the agenda have the real power to define what is valid. At the pre-active/initiation level, validity is couched in terms of what is perceived as being politically correct—appeasement to those with power and who possess hierarchal influence to reward. Thus options that are accepted are highly ‘political’ and contrived. At the active/acceptance level, there is an actual belief that diversity is good but there is a poor understanding of how to pursue this in setting up transparent evaluation and decision-making structures. At the pro-active/acceptance and adaptation level, there is a genuine understanding of the role and value of diverse opinion and expertise on any given matter. This is embedded into any prioritisation mechanism to ensure that decisions made are comprehensive and farsighted. At the embedded/routinisation and infusion level, prioritisation exercises are seen as opportunities to explore future needs for the ‘next wave’ so that decisions not only harmonise current stakeholder demands but also prepare the BU or organisation for future demands.

### ***Articulating the Vision***

At this stage the various competing K-Adv vision themes will have been harmonised, resolved, prioritised and validated. The vision’s general shape should be well understood at this stage by all stakeholders. Articulating the vision in detail involves two sub-elements. The first is consolidating the vision message—its mission, sub-objectives and clarifying goals. Cleland [82, p272] described this process, along with the design of the means of delivery, as ‘strategic planning’. The second sub-element is choosing the communications means with which to deploy the vision.

Vision articulation is concerned with how this vision is to be made clear to all stakeholders and how the vision can best be communicated given the wide range of available communication delivery media (such as text, image-based, audio or multi-media) or channels (web, video/DVD, meetings, face to face, communities of practice etc) available to make a message explicit.

**Table 14- Vision Articulation**

<b>Maturity</b>	<b>Performance Characteristic</b>	
	<b>Vision being explicit</b>	<b>Choosing the Vision delivery channel</b>
To what extent is the K-vision →	clear to all stakeholders in explicit terms?	channel used to communicate the vision appropriately and is able to maximise the degree to which stakeholder identify themselves with it?
Inactive AWARENESS	People are confused or unclear about the nature of the K-Adv vision. The vision is communicated in terms and symbols that are difficult to grasp.	There is a communication channel but it is rarely available for their access.
Pre-active INITIATION	People know what the K-Adv vision might be but they have little idea of how it might be relevant to	There is a communication channel readily available for their access but it is generally incompatible with the user’s

	them.	natural access patterns.
Active ADOPTION	People are reasonably clear about what a K-Adv vision might be and how it could be of benefit to them but they interpret it only from their point of view.	The channel is appropriate for most stakeholders to easily gain information about the vision if they know where to look.
Pro-active ACCEPTANCE ADAPTATION +	People are very clear about the K-Adv vision and how it can be of benefit to them and their organisation.	The communication channel used is widely used by stakeholders and so they are very likely to be aware of its existence and how to gain access.
Embedded ROUTINISATION + INFUSION	People are very clear about the K-Adv vision and how it can be of benefit to them and other stakeholders in the supply chain. Objectives and performance measures with targets are clearly established.	The K-Adv vision channel is the one that stakeholders would access automatically for many other purposes and is a channel of first choice. The channel allows people to experience the K-Adv concept.

The degree, to which the *Vision is made explicit* at the inactive/awareness level, is low with a great deal of confusion and lack of clarity about just what it means. This may due to the content being beyond or below stakeholders' communication grasp with terms or symbols that do not resonate with them. At the pre-active/initiation level, there is a mismatch between the level of language, its form and/or its complexity, between the originators of the vision message and its recipients, the message may be formulated in a clear manner but it is not perceived as being relevant to them. At the active/acceptance level, the message is directed to accord only with recipient's point of view. While this assists clarity of purpose it scarcely assists in understanding the benefits that may be gained by others and therefore may hinder cross-cultural (organisational) understanding resulting in a parochial interpretation of the message. At the pro-active/acceptance and adaptation level, the message tends to align stakeholder interest by each independent organisation so that while it further deepens commitment within the organisation, it may inhibit cross supply chain understanding and buy-in.

The *Vision delivery channel* chosen at the inactive/awareness level, might well involve using channels that are rarely fully available to stakeholders, for example little thought would be applied to ensuring that stakeholders have access to the communication delivery channel with for example web access using files that are too large to be easily downloaded. At the pre-active/initiation level, little thought would be applied to stakeholder normal communication patterns. The channel may be delivered via a web site, brilliantly conceived and presented to a stakeholder base where few of them use this communication channel. At the active/acceptance level, the channel would be targeted at the stakeholder's favoured channel but they would need to know where to search for it as the access links and locations details might me poorly communicated. At the pro-active/acceptance and adaptation level, both the message and the channel are well thought through so that stakeholders would find little difficulty in finding this information. At the embedded/routinisation and infusion level, the channel would be the one automatically accessed, as a matter of course by stakeholders, and the channel would allow stakeholders to experience the vision in a way that is meaningful to them personally.

## ***Planning Vision Realisation***

Once the vision has been developed and articulated it needs to be deployed using a coherent plan to do so. The standard project management approach involves first defining the vision, mission, organisational objectives and goals. This phase would have been completed in the articulating the vision stage. The next phase is to develop a methodology for delivery. This involves starting with a work breakdown structure (WBS) and from that scope definitional tool and from that developing a method statement that links activities and their logical dependency upon each other. The term WBS was invented by the US Military in the 1950s having originated from the concept of a product breakdown structure and before that bill of materials [90, 98] as used in the shipping industry for centuries.

An explanation of how this is undertaken can be found for case study projects in the construction, ship building and aerospace industries [99] and more detailed discussion of the details of method statements in construction projects [100]. It is beyond the scope of this publication to delve into any depth on project management techniques, readers are advised to search in the project management literature for example [82, 83, 90, 101, 102]. Once that plan is developed, it defines resource needed (physical, people and system) and organisational structures needed to implement the plan [103, 104].

The quality of planning can be seen, therefore, to be a function of thinking through project scope (developing a WBS), thinking through activity dependencies (developing a critical path network), thinking through risk identification and risk mitigation (risk management), thinking through resource requirements and constraints (resource planning), degree of appropriate effort expended in modelling plans to validate them (use of planning techniques such as critical path scheduling, simulation, flow charts, linear responsibility charts, and modelling) and extent of thought of how plans can be most effectively communicated (similar to Articulating the Vision in terms of content and distribution media) and planning the organisational framework required to deploy the plan (coordination mechanisms, organisational structure and style, monitoring and control mechanisms). In more generic terms quality of planning in general can be categorised as: quality of planning thinking; appropriate use of planning techniques; appropriate plan communication.

**Table 15 - Planning Vision Realisation**

<b>Maturity</b>	<b>Performance Characteristic</b>		
	<b>Planning Thinking</b>	<b>Use of Planning Techniques</b>	<b>Planning Communication</b>
How can the K-vision realisation plan be improved, by →	ensuring that the plan is coherently thought through in terms of scope, task dependency, resourcing and risk etc .	employing appropriate techniques to model and visualise how the plan will be implemented	ensuring that the vision realisation plan is communicated clearly and using meaningful media that effectively targets its audience.
Inactive AWARENESS	Little evidence of thinking through (1) scope, (2) dependency, (3) risk (4) resourcing or (5) organisation	Making lists and schedules centred on the planners idea of what the targets needs to know	Poorly thought through content or media choice so that the message is generally unclear
Pre-active	Evidence of substantial	Charting and use of	Purely focussed on the



INITIATION	consideration of at least two of the five above or superficial treatment of at least three of these.	graphical modelling only on the planners idea of what the targets needs to know	plan author group in terms of what he/she/they think is appropriate
Active ADOPTION	Evidence of substantial consideration of at least four of the five above or superficial treatment of at least four of these.	Extensive use of modelling on the planner's idea of what the targets needs to know	Strong attempt to provide simple summary presentation of the plan with scant levels of detail offered.
Pro-active ACCEPTANCE ADAPTATION +	Evidence of substantial consideration of at least four of the five above	Exploring simulation and modelling and extensive scenarios to better model the plan	Extensive use of planning detail to back up summary plans available for presenting
Embedded ROUTINISATION + INFUSION	Deep consideration of all five of the above consideration areas with comprehensive plans for each of them	Simulation, modelling and extensive visualisation to 'experience' the plan. Highly target-focussed	Highly targeted with mathematical modelling, simulation graphical illustration and text media that can be customised for the user

*Planning thinking at the inactive/awareness level*, there is little evidence of thinking through the issues needing to be planned for. There may be highly qualified planners who have a marvellous theoretical knowledge of planning techniques but the fundamental grasp of what needs to be done and how that might logically undertaken and tacit knowledge relating to the technology involved may be missing. At the pre-active/initiation level, several (at least two) of these 5 identified areas of thinking would be addressed at a fairly superficial level. If an expert in the area concerned, probed for reasoning of the planned methodology there would be an unconvincing response indicated that trite solutions have been accepted without rigour or critical examination of implications of the plan. At the active/acceptance level, there would be a professional concern for planning but it would be limited to three of the five areas. Quite often there would be resources and organisational dimensions lack of considerations—great plans in theory but unworkable in practice. At the pro-active/acceptance and adaptation level, there would be obvious depth of thought in at least 3 of the areas. Moreover, there would demonstrative consideration (albeit at a superficial level) of the other 2 areas so that the plan would be capable of being coherent as long as its realisation was flexibly deployed. At the embedded/routinisation and infusion level, each of the five general planning areas would have been very professionally and deeply addressed. Professional planners would view the proposed plan as being a state of the art plan for realising the knowledge advantage vision.

*For applying planning techniques at the inactive/awareness level*, the plan would consist of lists and schedules that focus purely on the planner's agenda. This would be clearly some kind of bureaucratic response to a demand for 'a plan' regardless of its utility or effectiveness. At the pre-active/initiation level, the less rigorous options for developing a plan may be adopted. For example instead of undertaking a critical path approach where dependency input is required and resource constraints need to be considered, bar charts would be adopted as an easy way to pretend to have fully considered planning implications and consequences. At the active/acceptance

level, the focus would be on modelling what the targets need to know and so there would be a palpable level of customer focus on techniques need to know at a transactional level, i.e. that is to get on with the job. At the pro-active/acceptance and adaptation level, there would be evidence of simulation, what if analysis and other techniques that attempt to get to a fundamental understanding of planning issues regardless of minimal demands from those demanding the planning services. At the embedded/routinisation and infusion level, planners would be using all planning techniques at their disposal and being proactive in using these to help targets to fully understand the plan and therefore contribute to sustainable success.

*Poorly thought through content or media* of the vision implementation plan to enable the target groups to understand the plan and its content exemplifies planning communication at the inactive/awareness level. At this level, there would be a highly bureaucratic approach to communicating 'the plan' though because of its inherent difficulty in addressing stakeholders it must be recognised at a minimalist level designed to meet mechanistic standards. At the pre-active/initiation level, communication of 'the plan' is highly focussed upon perceptions held by the generators of the plan. At the active/acceptance level, there will be a capacity to communicate the plan in summary and executive summary terms but there will be a lack of capacity to provide details that drill down to operational issues. At the pro-active/acceptance and adaptation level, the details of how, why and with what questions (the operational plans) will be well developed. Further, modelling and simulation exercises will provide a sophisticated view of how the plans may unfold. At the embedded/routinisation and infusion level, there will be a capacity for modelling, simulation and other visualisation techniques that transform a mechanistic plan into a practical picture of a complex realisation of the plan. This will be highly targeted to allow specific groups to be able to see 'the plan' in their terms so that it strongly relates to their understanding capacity of how to achieve the vision.

## ***Mobilising Resources***

An effectively planned vision realisation process would have included an assessment of what resources are required to realise the vision. Thus, if we assume that the organisation concerned has a clear idea of what is required, the next step is to develop a case for negotiating with senior management representatives to approve the vision realisation. This may require substantial political and relationship skills [51, 105, 106]. Following this step, there will be a need for attracting suitable organisational talent with the necessary skills required to realise the vision [95, 107]. These could include training and mentoring for non-ICT supporting infrastructure similar to that discussed under 'ICT Support systems, Personal Assistance' (see Table 7), it could also involve communication specialists who design and implement ways in which the K-Adv can be publicised and rolled-out. Additionally, resources other than people will also need to be procured to realise the K-Adv vision. This could comprise consultants, equipment, and services. To procure these resources there would have to be policy and procedures in place to obtain what is needed in the most effective manner possible. These would revolve around a mindset illustrated in Figure 9 as discussed by Walker and Hampson [41].

**Table 16 – Mobilising Resources for Vision Realisation**

Maturity	Performance Characteristic		
	Negotiating for Resources	Attracting Talent	Procuring Resources
How can the K-vision realisation plan be improved, by →	ensuring that the entity responsible for realising the K-Adv plan can negotiate the required resources and they are available to do so.	attracting the required talented people internally and from outsourced teams to be able to realise the vision	ensuring that appropriate procurement policy and procedures are followed to realise the K-Adv vision.
Inactive AWARENESS	Demonstrates poor knowledge of where to source the required resources	Generally accepts what is on offer, assumes that the best are interested	Following an ad hoc hand-to-mouth approach demonstrating a poorly thought through process
Pre-active INITIATION	Negotiates on the basis of winning the best deal possible to gain the required resources.	Generally manages to attract people with adequate skills and motivation to commit to the vision	Following traditional ways that have generally been undertaken in the past without thought to specific contexts.
Active ADOPTION	Maintains the vision in mind when seeking resource commitments but prepared to compromise	Generally manages to shape opportunities to gain access and attract talented enthusiastic people	Being limited by a narrow range of procurement options to choose from that which must be followed.
Pro-active ACCEPTANCE ADAPTATION +	Has an excellent grasp of politics and means for shaping a win-win solution on gaining the required resources	Manages to attract the most talented team of people available	Having a well defined wide set of procurement processes that are rigorously followed
Embedded ROUTINISATION + INFUSION	Builds coalitions of support and seeks negotiated outcomes that encourages others to join in the vision's aims and support its resource commitment.	Builds enthusiasm and passion in potential candidates and keep them motivated to strongly commit to achieving the K-Adv vision	Having the capacity and ability to shape a procurement process to meet requirements with targeted flexibility and rigour. Ethical and transparent processes.

*Negotiations for resources* at the inactive/awareness level, will be exemplified by a poor knowledge and appreciation of where to gain access to the required resources and poor skills in presenting a case to obtain them. At the pre-active/initiation level, the focus is centred on those seeking the resources and any case presented for negotiation would be made on the basis of trying to win as much as possible. At the active/acceptance level, the negotiation will be more even in its focus with an emphasis on compromise and seeking understanding from the resource-granting power. At the pro-active/acceptance and adaptation level, negotiations will be more confidently conducted with a clear and convincing business case forming the basis for jointly seeking solutions aimed at best for delivery of the vision without detracting from other pressing organisational priorities. At the embedded/routinisation and infusion level, the negotiations form another level of the vision itself by being a demonstration of coalition building based upon high-level participant competency and negotiation skills presenting a clear and commanding case.

*Attracting talent* for both internal people and outsourced personnel at the inactive/awareness level, would be based purely on availability, little effort would be expended on searching for the required talent characteristics. At the minor level, those with adequate skills and motivation would most likely be attracted to realising the vision, however, there would be an apparent lack of passion evident. At the active/acceptance level, those attracting the required talent for realising the vision would have evident scope to help shape opportunities to do so. At the pro-active/acceptance and adaptation level, the most talented people available would be attracted to the K-Adv vision deployment project. At the embedded/routinisation and infusion level, there would be a palpable sense of passion pervading the way that the highly talented vision deployment and realisation team conduct themselves. The critical focus of the K-Adv will be permanently at the forefront of their consciousness.

*Procuring resources* at the inactive/awareness level would be exemplified by an ad hoc hand-to-mouth approach. The system adopted may ignore standard procedures for advertising, tendering and awarding outsourcing contracts and so there may high levels of confusion about what aspects of outsourced contracts mean in practice. At the pre-active/initiation level, there would be a strict adherence to organisational standard procurement policies and procedures even if these do not match the needs of a-typical contract arrangements or processes for obtaining key talent or outsourced services. At the active/acceptance level, there may be some organisational guidelines that provide some limited and constrained flexibility. At the pro-active/acceptance and adaptation level, the range of procurement policies, procedures and guides that can be applied for varying outsourced scope, scale and complexity is wide and comprehensive. At the embedded/routinisation and infusion level, procurement of required resources would be highly flexible recognising that at times this may require a full range of options being needed for any given project due to scope, scale and complexity. The process would be clearly transparent and ethical.

## ***Deploying the Vision***

In translating the plan to deploy the vision into reality requires major operational project management skills and competencies. Three major areas of this can be benchmarked and focussed upon. The first of these are Leading the process to lead the management of deployment. A useful typology that can be used is Avolio's [108, p5] five phase of the leadership of teams to ensure that focus on the deployment strategy (rather than the K-Adv vision itself) is generated, sustained and maintained throughout the vision deployment process. The second major area would be the coordination of the vision deployment strategy that would include the way that plans are communicated, liaison devices that support coordination. Again this is strongly supported by the project management literature mentioned previously. The third area is monitoring and controlling to cope with the vision deployment process.

**Table 17 – Deploying Resources for Vision Realisation**

Performance Characteristic
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<b>Maturity</b>	<b>Leading the Management of Teams</b>	<b>Coordination</b>	<b>Monitoring and Control</b>
How can the K-vision realisation plan be improved, by →	ensuring that the leading teams realising the K-Adv plan are empowered to do so.	Communicating and liaising with project deployment teams to coordinating the realisation of the vision	ensuring that appropriate planned actions and procedures are followed to realise the K-Adv vision.
Inactive AWARENESS	Laissez faire approach leaving teams and their members to 'play it by ear'	Poor communication of plans, poor liaison and coordination resulting in a sense of chaos and being overwhelmed	Plans are not monitored regularly so that control over emerging problems is not exercised in time to prevent them being crises
Pre-active INITIATION	Following a passive management by objectives (MBO) approach focussing on problems only after they occur.	Sufficient communication and liaison and coordination to barely cope without being overwhelmed.	Plans are monitored in an inappropriate time to reflect critical activities so that non-critical activities continual slip to become critical.
Active ADOPTION	Following an active management by objectives (MBO) approach focussing on problems before they occur.	Well thought through communication strategy including linking teams and well coordination of required action. Having a sense of coping.	Plans are monitored for control adequately to stick to the plan, however, there is little evidence of forward thinking due to planning expertise and tools used
Pro-active ACCEPTANCE ADAPTATION +	Constructive transactional through the development of roles and procedures that recognise needs of team members.	The implementation of communication of the vision deployment plan and its liaison and coordination is conducted confidently.	Plans are well monitored and control exercised to cope with emergent or unforeseen problems. Confidence and expertise allows flexibility to change plans when necessary.
Embedded ROUTINISATION + INFUSION	Transformational approach demonstrating idealised influence, inspirational motivation, intellectual stimulation, individual consideration	Communication of the vision deployment plan, liaising and coordinating being is conducted with passion and professional focus with clear feedback loops to benefit continuously from lesson learned.	All relevant team members and relevant parties are kept fully informed of progress in real-time and through use of effective visualisation of plans, their impact and simulations that test what-if scenarios, control is clearly maintained.

*Leading the management of the K-Adv Vision realisation teams at the inactive/awareness level will be exemplified by a laissez faire approach. Team leaders would be unclear on their role and characterised by abdicating their responsibilities to focus on critical interests of the project. This may be due to ineptitude or by the leader being over committed to other projects. At the pre-active/initiation level, there would be a management by objectives (MBO) approach though only in its passive sense with a reactive focus on problems after they occur even though the emergence of these might have been easily predicted. At the active/acceptance level, there would have been a more active MBO approach with a sound risk management process being followed. At the pro-active/acceptance and adaptation level, there would be evidence of a constructive transactional approach to leadership with power and influence being used together with a focus on reward and praise for achievement so*

that individuals in teams feel that it is clearly in their interests to make the project a success. At the embedded/routinisation and infusion level, the leadership style would be transformational with a strong focus on individuals in teams being extrinsically motivated to contribute their best. The leadership individual or team would demonstrate this by providing: passion and idealism to influence them; inspirational and visionary communication and examples though conduct; intellectual consideration to ensure a positive learning experience and thorough and deep understanding of the deployment plan and its ramifications; and focussing on the individual needs and aspirations of team members.

*Coordination* (including communication and liaison) would at the inactive/awareness level, be demonstrated by a project in chaos and its team members being overwhelmed. At the pre-active/initiation level, the communication of the plan, liaison arrangements to link knowledge about the plan's progress and pertinent implementation issues and coordinate teams and parts of the project will be in evidence but the way that they are being pursued results in evident frequent incidents of being barely able to cope. At the active/acceptance level, the teams will appear to be coping and adequately informed, linked through various liaison arrangements, to perform as expected. At the pro-active/acceptance and adaptation level, there would be a discernable sense of confidence with clear deployment plans, well structured liaison arrangements to link teams and sufficient coordination in terms of timing and quality of content to deal with emerging problems and resolve them. At the embedded/routinisation and infusion level, coordination is being undertaken with a demonstrable level of passion at all levels with well defined feedback loops to promote continuous learning to improve performance.

*Monitoring and control* at the inactive/awareness level would be insufficient to highlight emerging problems or provide time to work around them resulting in frequent crises and general chaos. At the pre-active/initiation level, there would be evidence of monitoring for control but at an inadequate level to prevent critical activities being affected. At the active/acceptance level, there would be sufficient monitoring for control to avoid crises and threats to the plan's integrity but there would be little evidence of forward thinking and use of tools for conducting 'what-if' scenarios to take advantage of opportunities. At the pro-active/acceptance and adaptation level, monitoring for control would be sufficiently advanced to allow flexibility to change plans when opportunities are identified and investigated to take advantage of them. There would be substantial evidence of forward thinking as part of the monitoring process. At the embedded/routinisation and infusion level, all team members and relevant parties are kept fully informed of progress and substantial use of tools and technologies for visualisation to assess and 'virtually experience' the impact of the plan's progress.

## ***Maintaining the Vision***

The knowledge advantage is continually challenged to evolve in a similar way to the way that organisation's core competencies develop. C.K. Prahalad and Garry Hamel have clearly demonstrated that the evolution, and in many case business revolution through transformation, of core competencies is dependent upon developing and maintaining a K-Adv [1, 23, 109].

To respond to this challenge, organisations must find ways to keep their K-Adv alive and to proactively plan and action its renewal and refurbishment as circumstances change. Like the classic ‘bush hammer’, in which the integrity of the hammer is maintained for many decades even though both the handle and head might be changed dozens of times, the K-Adv vision will undergo continual metamorphosis but should be foremost in the minds of the organisation and its stakeholders so that they know what the organisation values and stands for. Consider British Petroleum for example that now has embraced a vision of sustainability and is transforming its identity to ‘BP beyond petroleum’.

Maintenance is therefore not a matter of preserving, fossilising or embalming the corpse of an outdated vision; it is about renewal and maintaining relevance as well as maintaining its integrity (based upon core competences that supports its trajectory). To ensure effective maintenance of the K-Adv vision realisation four broad areas need to be addressed. First there needs to be constant and continued feedback into the system that sustains the K-Adv energy source. Thus, leaders need to be checking the validity and relevance of the K-Adv vision with its stakeholders at sufficient time intervals to be able to plan and respond to radical or swift changes in the environments affecting the K-Adv. Second, there needs to be continued support from the leadership group that cascades downstream to ensure that the message of the perceived relevance of the K-Adv vision does not become weakened. Third, the relationship links between the links in the leader-follower influence chain needs to be maintained so that changes in K-Adv content can be quickly communicated and internalised. If major changes are required then it will become necessary to repeat the envisioning and vision realisation processes. Fourth, the chain of relationships between stakeholders working to realise the vision realisation will need to be maintained and remain relevant and active. This activity bears striking similarities to the process advanced by Lendrum [84, chapter 6] and illustrated by Walker and Hampson [85, p61].

**Figure 16 - Process for Maintaining Stakeholder Relationships**

Groups	A	B	C	D	E	F
A				!!! A disaster !		
B	++			++ Needs improvement !		
C	\$\$	!!!		\$\$ Works well !		
D	\$\$	++	\$\$	? A bit of a gamble !		
E	!!!	?	\$\$	++		
F	?	?	!!!	\$\$	!!!	

Figure 16 has been slightly amended from [85, p61] to suit the process of maintaining the vision. The objective is to maintain relationships between the leadership group and its stakeholders so that the K-Adv vision realisation and the vision itself remains relevant, meaningful, valid, and that stakeholders are fully aware of its content and meaning and that they can retain their identification with it. The process is to map stakeholder relationships, share

and test results of responses to feedback about the vision. Work on understanding the response from stakeholders and to take appropriate action. The map illustrated in Figure 16 has symbols that describe the relationship that provides the measure of action required.

**Table 18 – Maintaining the Vision**

<b>Maturity</b>	<b>Feedback</b>	<b>Performance Characteristic</b>		
		<b>Vision Leadership Support</b>	<b>Vision Communication</b>	<b>Relationship Maintenance</b>
How can the K-vision realisation plan be improved, by →	developing systems to provide feedback about the K-Adv realisation vision for renewal	Leaders supporting the vision to the extent that vital changes are considered and evaluated.	continuously maintaining a system that allows the vision to be clearly communicated to stakeholders even when changed	continuing to maintain support and trust and understanding between stakeholders even when these change.
Inactive AWARENESS	If feedback is provides, systems to record and disseminate this information is severely limited	Little support of the vision beyond its launch conveying an impression of 'job done'.	Once the vision is communicated any continuation and changes that are developed, the leadership group tends to be poorly understood or communicated.	Stakeholders are viewed as tools to get what the leadership groups desire. No interest is evident for ongoing relationship maintenance
Pre-active INITIATION	Feedback data is gathered and recorded	Leaders verbally support the notion of vision evolution but do not know how to realise it or are unwilling	Sporadic and uncoordinated communication of the vision as changes are decided upon	Little effort is made to maintain relationships unless any immediate benefits are obvious.
Active ADOPTION	Recorded feedback data is analysed and recorded. Limited communication of this analysis.	Leaders support vision evolution and reactively drive it through ensuring systems development to cope with it.	An updated version of the vision is maintained but low level of resources are committed to keep this current	Relationship maintenance is accepted as part of the management process. Rigid processes such as stakeholder workshops are supported.
Pro-active ACCEPTANCE ADAPTATION +	Systems are in place to gather and disseminate feedback for validation	Leadership actively provides resources to ensure that the vision is continually supported and incrementally	The vision as it stands is continually communicated via real-time on-line technology	Both formal and informal channels of relationship mapping for issues to be addressed are fully explored and developed.



		updated		
Embedded ROUTINISATION + INFUSION	Feedback gathered is systematically gathered and transferred to proactively encourage ideas of transformation to be developed.	Leadership is highly proactive in ensuring that process and procedures are in place to explore vision changes both incremental and radical..	Proactive seeking of the most effective ways that the vision can be communicated to stakeholders.	Proactive systems to understand current and model future needs of stakeholder are explored through search conferences, workshops and extensive use of COPs

*Feedback* for evaluating the realisation of the K-Adv Vision at the inactive/awareness level will be generally chaotic. If they exist at all it would be un-collated and poorly communicated to those in the leadership team. At the pre-active/initiation level, feedback is gathered and recorded but in a location not easily disseminated. This may be contrived to 'spin-doctor' hostile or unflattering feedback. At the active/acceptance level, feedback is recorded and its impact and consequences fully analysed but its distribution is limited to those within the power elite group, usually a small internal group with the organisation, who make decision about resource allocation and timing of potential re-framing of the vision. At the pro-active/acceptance and adaptation level, systematic gathering, analysis and widespread feedback of how the K-Adv vision deployment is being carried out is undertaken to embrace the future. At the embedded/routinisation and infusion level, this will include a proactive process of gathering feedback, validating it with stakeholders, and developing foresight workshops to build scenarios and test out options for vision change that prepares the organisation for likely change.

*Leadership support* to maintain and upgrade the K-Adv vision and its realisation plan at the inactive/awareness level would be limited and discouraged as 'rocking the boat'. At the pre-active/initiation level, there would be no shortage of rhetoric but the means of delivery would be unclear and there might be a strong subtext that such propositions may be unwelcome. At the active/acceptance level, the leadership group is keen to support the process of upgrading and maintain the vision but the focus is a reactive one that steps in when problems become evident or emerge to make the vision inconsistent, invalid or incoherent. At the pro-active/acceptance and adaptation level, the leadership group actively supports and ensures resourcing systems that ensure that the vision is examined for appropriate upgrading and revision and that plans are in place to respond to any incremental revisions. At the embedded/routinisation and infusion level, there would be a proactive system with systems to ensure anticipation of future changes both incremental and radical and to fully support its realisation.

*Vision maintenance communication* at the inactive/awareness level, would result in changes being poorly communicated or poorly understood. This could be manifested by dead links in web sites or continuing to communicate out of date materials and would lead to confusion about that which is current. At the pre-active/initiation level, current vision re-framing or upgrades would be sporadically and poorly communicated so that while the leadership team is clear of vision currency other stakeholders would not be. At the pro-

active/acceptance and adaptation level, communication of any changes to the vision or its realisation plan would be communicated real-time using effective ICT enabling technology such as an intranet. At the embedded/routinisation and infusion level, there would be a proactive approach in actively seeking out opinion from stakeholder groups on the best and most meaningful way of communicating the vision as it is upgraded and re-framed to stakeholders.

For *relationship maintenance* at the lowest, stakeholders would be viewed as being purely instrumental tools in getting what the leadership groups wishes to drive and so no effort would be made to maintain relationships unless a threat exists. At the pre-active/initiation level, only a superficial effort would be made and only when additional benefit may be desired or when threat to the leadership group is discerned. At the active/acceptance level, relationship management is factored in as a quality management requirement with rigid rules and procedures to ensure that stakeholders complete quality audits or attend stakeholder briefings. At the pro-active/acceptance and adaptation level, stakeholder maintenance interaction is automatically part of the culture and is undertaken as 'par for the course'. At the embedded/routinisation and infusion level, proactive measures are undertaken to engage stakeholders in a continued process of positive interaction. A customer relationship management (CRM) system may be in place to assist this. The focus is on retaining trust and commitment through open and frank communication and personal contact.

## **Chapter Conclusion**

The case of how to best use the ICT enabling infrastructure to enhance the K-Adv was made in Chapter 4. In that chapter it became clear that the support of an ICT system required good management, particularly in terms of capacity planning to ensure that both hardware, software and network infrastructure as well as the personal assistance, training and development, and archiving components of the ICT infrastructure should be functioning and supporting the K-Adv. In Chapter 6 we will see how the people infrastructure is also a vital component supporting the K-Adv. Linking both these infrastructure is the leadership and strategy development process that is focused upon the development of the K-Adv. Leadership is vital in generating the vision to support the K-Adv and the capacity to complement a good plan with the action of realising it.

In this chapter I began with a discussion of the role of leadership in achieving the K-Adv to place the role of envisioning and vision realisation in context with the goal of charting a way to achieve a sustainable K-Adv. Figure 14 – Component Breakdown Structure for K-Adv Leadership illustrated each component of the envisioning and vision realisation sub-elements of the model. Each component of the sub-elements was then explained in detail and a table of their performance characteristics presented cross-referenced to five levels of a goals maturity achievement assessment (GoMAA). In the envisioning sub-element, I discussed: identification of stakeholder K-value; developing core vision issues; developing core vision issues; developing vision options and articulating the vision. I then attempted to discuss how the envisioning process could be realised. In this component I discussed: the planning process for vision realisation; how resources for vision realisation

could be mobilised; how the vision could be deployed; and how the vision could be maintained.

This chapter is important as leadership links to the realisation of the ICT enabling infrastructure, particularly with respect to ICT operational capacity planning, as well linking to the people enabling infrastructure. This latter aspect will be discussed and explored more fully in Chapter 6.

## Chapter 6. People Enabling Infrastructure and the K-Adv

Derek H.T. Walker

The following will be discussed in this chapter:

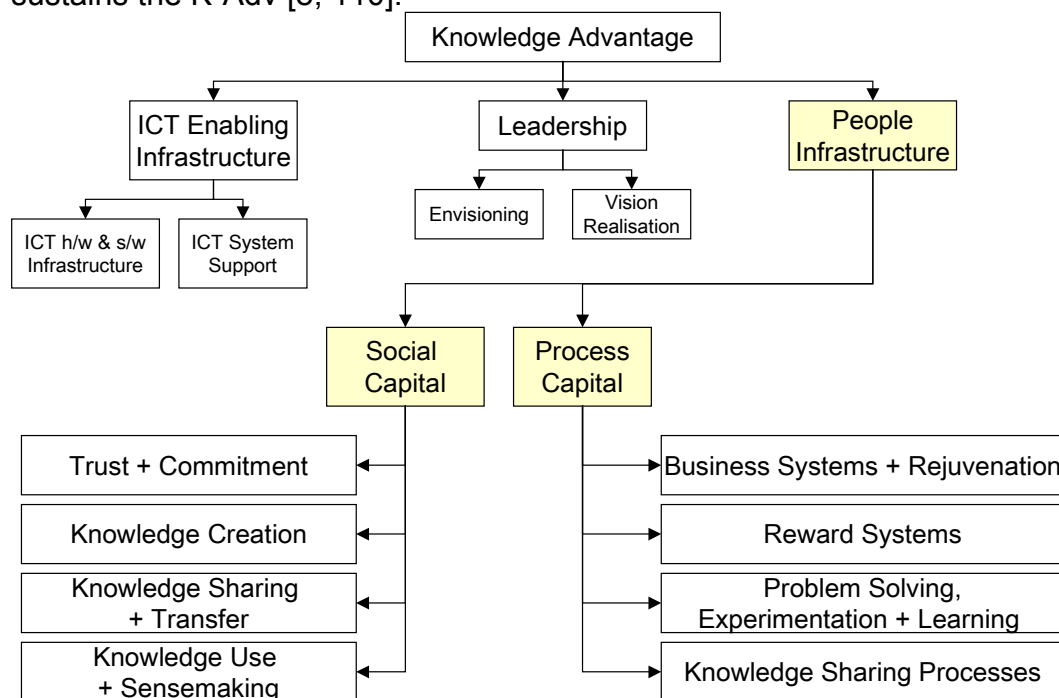
- Purpose of the Chapter
- Implications for the of the Need for People Infrastructure
- Trust and Commitment
- Knowledge Creation
- Knowledge Sharing and Transfer
- Sensemaking
- Business Systems Supporting Rejuvenation
- Reward Systems
- Problem Solving, Experimentation and Learning
- Knowledge Sharing Processes
- Chapter Conclusion

### ***Purpose of the Chapter***

The purpose of this chapter is to explore and explain the K-Adv's people enabling infrastructure in detail. The chapter starts with an explanation of the need for a People enabling infrastructure and its place in the K-Adv concept. Each element and attribute is then explained in detail with rigorous justification of its form drawn from the literature.

### ***Implications for the of the Need for People Infrastructure***

The major factor that influences innovativeness is the way that people are enabled to make innovation happen and it is this force that generates and sustains the K-Adv [8, 110].



## **Figure 17 - Component Breakdown Structure for Enabling People Infrastructure**

Earlier, I identified the K-Adv as being driven by three enabling infrastructures. The first is ICT. The second is a leadership infrastructure that envisions how the K-Adv may be implemented and the way that this leadership groups ensures the realisation of that vision. The third is the people infrastructure.

Figure 17 illustrates the Social Capital and Process Capital components of the K-Adv model together with its sub-components.

*Social Capital* has been defined as “the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit” [16, p243]. This view in which the employee, customer and supply chain network is seen as critical competitive advantage capital and a valuable asset is in stark contrast to traditional construction procurement views of employees and the supply chain as being a costs and neither a significant generators of wealth nor useful capital in this wider context.

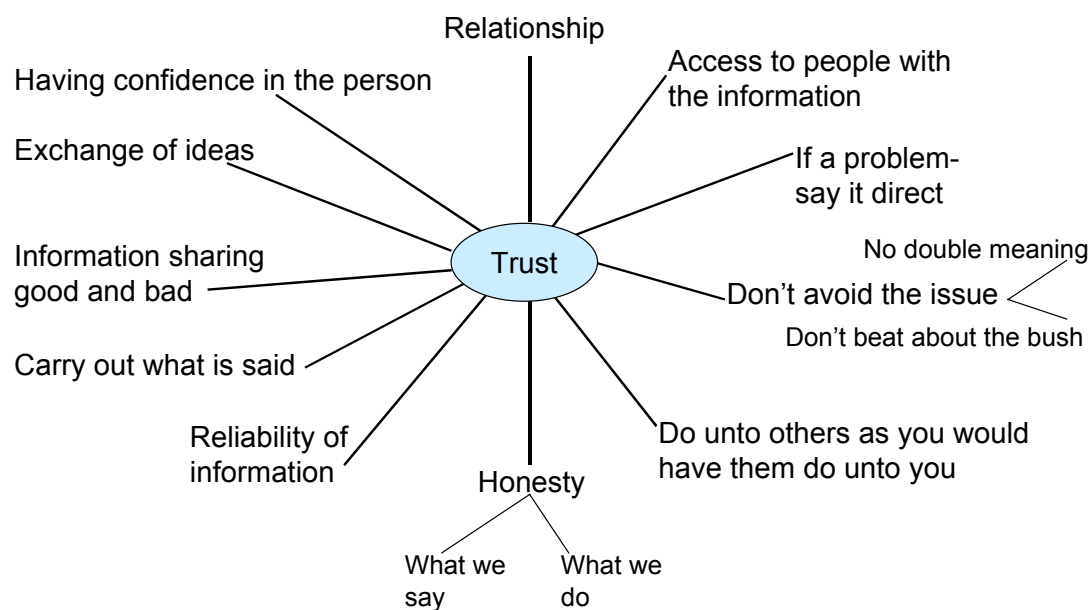
Social capital in the context of the K-Adv model relates to the cluster of qualities that forms a significant part of the people infrastructure. This includes; trust and commitment that forms the means to release latent energy; doing knowledge work to create, share, transmit, transfer and use knowledge; knowledge networks such as COP and those engaged in knowledge transfer within the supply chain; and sensemaking to not only understand the phenomena they experience in undertaking knowledge work but to use this skill to re-frame and reflect upon inputs of knowledge to develop original and innovative outcomes. Seeing how this cluster of people-related factors impacts upon the K-Adv will be a sobering experience for organisations that pride themselves in relying upon a highly rationalists and process driven focus to knowledge work. This is because, as is widely pointed out in the literature, social capital is a crucial intangible asset that drives competitive advantage [11, 110].

I define *Process Capital* as systems and processes that organisations cultivate to allow the creative energies of its social capital assets to be unleashed. These are identified in four broad groups: business systems such as business process re-engineering, lean thinking and other approaches in re-thinking and rejuvenating the way that people do their work to enhance productivity; reward systems to incentivise groups and individuals; experimentation and learning to discover smarter ways to do things through learning from past experiences and piloting and experimenting with new ideas and approaches; and knowledge sharing processes to transmit and transfer knowledge effectively.

### ***Trust and Commitment***

The notion of trust is complex. It has many layers of meaning, for example at one level—you can trust or be confident that something, under a given set of conditions, will or will not happen given your trust assumptions about the implied cause and effect relationship. In most relationships, personal and business, trust is as much about something happening as not happening. This may result in pre-emptive action or precautions being taken. Trust is bound up with past experience both directly with the person(s) concerned and indirectly, through projected or anticipated experiences, thus trust is an intensely

emotional and human phenomenon. Figure 18 illustrates a model of the range of influences that can affect our perception of trust [111, p440]. One interesting aspect of this is that trust is tightly bound up with an open and honest communication style. Management style is linked to process capital in that some management styles that stress empowerment of groups and individual are more likely to generate conditions conducive to trust being nurtured. A number of management theorists have argued this position, for example see [112]. Another interesting aspect of trust is that implies the presence of what is also called emotional intelligence [113, 114]. A review of this is well documented with widespread references to the more general literature in emotional intelligence (EI). Dulewicz and Higgs [115] argue that EI includes aspects that can be best generalised as 'soft-management skills' such as active listening, empathising, consensus building, persuasiveness etc.



**Figure 18 - Elements of Trust - Source (Whiteley, McCabe et al. 1998, p440)**

*Commitment* is the physical and mental manifestation of the concept of trust. It is the proof of trust. It is the willingness to reciprocate energy invested through trust in the process of transformation of this energy into tangible results. Thus a 'trusting' supervisor may back off from detailed specification and control of how tasks may be performed. Commitment, means that another party will take this trust on board and 'live up to' the spirit of the bargain by probably committing more personal pride and obligation to 'do the right thing' than would otherwise be the case. Loyalty occurs when trust and commitment are tested as was illustrated in Figure 12. It can be viewed as the bankable capital of goodwill to reciprocate trust in times of adversity.

Meyer and Allen [116], after an exhaustive review of the literature, offer three components of commitment. Their drives are: affective (want to); continuance (need to); and normative (ought to). Most people, when saying that they are committed to something or someone, internalise their drives to those three components at varying levels ranging from low to high. One response to commitment component, affective (want to), requires intrinsic motivational responses because it relates to people's desires, identification

and cultural adaptation to absorb the objectives to be committed to so that it become one's own—this results in such a strong bond driven by the individual's belief in the goal and vision that is internalised and becomes substantially their own, people support the joint organisational/individual goals so they seek achievement, self-actualisation and higher the levels transformational motivational goals described by Maslow [39]. Continuance commitment (a need to comply) relates to a basic need such as income, status or social maintenance that needs to be satisfied—this relates to a more transactional exchange in which extrinsic rewards are provided to gain commitment. The third component of commitment is normative (ought to)—this results in a sense of obligation and duty in which grudging acceptance, forelock-tugging obsequious followership or dutiful deference.

Gaining commitment from affective commitment can mean, therefore, an assertive and challenging state of constructive conflict is one potential outcome with expectations of harmonising goals through affective commitment to the gain of both individual and the organisational unit. Another possible commitment outcome from continuance commitment relies on providing pay and benefits that only appeal to short term enthusiasm to do what is necessary to maintain the rewards granted. The commitment outcome from normative commitment appears at first to be strong and appealing. Belief and duty are strong forces based upon the very roots of an individual and can provide a commitment to maintain the status quo. This, however, this can result in short term motivation based on lower level appeals giving way to acceptance of these monetary rewards as basic and then dissatisfaction creeping in about workplace conditions [117]. It can also result in a rigid support of the status quo and complacency creeping in. Similarly, for normative commitment, there is a danger of sycophancy as well as the useful coherence and adherence of alignment of goals and objectives resulting in commitment. So this kind of commitment has mixed blessings.

All three types of commitment are generally present in varying levels. The 'want to' commitment appealing to higher-level motivational factors can lead to individuals transferring commitment to parts of an organisation such as their client/customer of professional group while recognising limitations or even hostility to the broader organisations [116, p99]. The 'need to' commitment appealing to a more transactional exchange, results in a fine balance being required between recognising the need to satisfy physical and psychological needs and providing lasting incentives and reward systems. The 'ought to' commitment provides the mixed benefit of loyalty and potential blind-allegiance—while loyalty is helpful it does not provide a level of organisational governance that sustains organisational transformation because the aspiration is at best gradual change and more likely, maintaining the status quo.

The need for tension between organisation-internal turmoil and creative conflict and stability to enact initiatives becomes the guiding principal as to what are the desirable levels of these three types of commitment. Potential creative conflict gained from affective commitment supports the means to accelerate organisational transformation while high levels of support for the status quo gained from normative commitment helps to keep established structures and procedures in place while incremental change can obviate problems that are recognised as needing attention. Thus the desired rate of

transformational change and the type of commitment gained from the workforce provides a delicate and complex equation.

Trust and commitment is therefore depicted as providing a degree of predictability and transparency of both intent and action. It also indicates a matching or at least understanding of the values, norms, language and culture between the organisation and those dealing with it as stakeholders. The need for common or translatable value systems, language, symbolic artefacts and protocols or etiquette [68, 118-121] has been shown to be important for developing shared understanding and thus enhancing the chance of trust and commitment.

Davenport and Prusak advise, “when you need to transfer knowledge, the method must always suit the organizational (and national) culture” [18, p92]. Holden provides relevant cross-cultural perspective through examples of the need for cultural match. In his series of case studies on knowledge management by European and Japanese global enterprises he cites for example the LEGO Group having been founded in Denmark with an aim to provide children with high quality toys that were not used to promote or exploit aggression and that were educational in an active and experimental way [68, chapter 8]. These corporate values remain with the global entity in the way that its culture has developed and evolved with a trajectory emanating from its core values and worldview. When LEGO entered the UK and USA markets, it brought with it the collegial and collaborative commitment throughout the existing organisation as its core value and so information and knowledge transfer was shaped by that cultural norm rather than the competitive norm that was more evident and prevailing relative to the Nordic traditions [122], at that time.

Holden [68, chapter 7] also provides deep insights in the impact of organisational and national culture impacts with his case study on Matsushita. In this example, the cultural footprint of the organisation leader and originator (Konosuke Matsushita) was one of the firm’s defining elements of management style. This company had an explicit mission statement in 1929 communicated throughout the firm long before the idea of corporate strategy or mission statements and the like had been conceived or at least published in the West. The culture of Matsushita was based on 5 business principles: service to the public, fairness and honesty, teamwork for the common course, uniting effort for improvement, and courtesy and humility. These are common precepts for good governance and best business practice supported by many businesses in the past, Japanese cultural norms of ‘face’ and concept of integrity, in which it is deeply offensive to openly question authority in an aggressively vigorous way that does not take respect for the authority source, played an enormous role in the way that knowledge was and is managed. One of the key difficulties that Holden draws attention to in this case study is that “the Japanese discourse perpetuates the Japanese in-group and the non-Japanese out-group” [68, p154]. He draws to our attention implications for difficulty in knowledge creation and transfer because of highly tacit embeddedness of the Japanese culture in its language and customs. The development of a concept to innovative product or service for example is highly knowledge intensive and translation of tacit knowledge relies heavily on ways that a meeting of mind in framing and re-framing concepts and then how these are shaped and improved through constructive dialogue leading to



commitment through understanding is a vital element of knowledge creation and transfer [29].

Another factor that drives trust and commitment is caring in organisations. Von Krough *et al* [12, p55] provides a useful way of viewing this. They create a four-cell matrix to explain the role of care with individual knowledge (IK) and social knowledge (SK) on the X-axis and low care (LC) and high care (HC) on the Y-axis. IK/LC represents *seizing* knowledge with everyone concerned only for himself or herself, this indicates very low trust and commitment only to self rather than others. In the other low care cell SK/LC the behaviour indicated is *transacting* where swapping documents or other explicit knowledge takes place—here trust and commitment is highly conditional and extrinsically motivated by an explicit exchange process. In the high care cells the trust and commitment is more unconditional because the evidence of care provides a validation of good intentions. For example the HC/IK cell is described as *bestowing* that is helping by sharing insights. In the HC/SK cell this is described as *indwelling*, that is living with a concept together. Both these indicate that high care assists in commitment and supports high levels of trust.

Following on from this concept is the manifestation of care in terms of competition versus cooperation. As the level of competition between individuals, groups and members of a supply chain increases with each trying to gain at the others' expense, so trust and commitment diminishes. This attitude has been identified in many reports from many governments over decades as being a fundamental flaw in business relationships in the construction industry [123-126]. A recent study of a successful alliancing project in Australia reveals that care was articulated as a best-for-project philosophy and that it was strongly associated with very high levels of trust and commitment [15].

In terms of understanding trust and commitment, I have identified three strong markers that can be used to measure it and how it may impact upon social capital and through that the people infrastructure supporting the K-Adv.

**Table 19 – Trust and Commitment**

Maturity	Performance Characteristic		
	Organisation's Cultural Values	Individual's Cultural Values	Care + Competition V Cooperation
How can social capital be improved, by ensuring that →	the organisation's cultural values are clear, well understood and promotes trust and commitment.	the individual's cultural norms and values are in harmony with the organisation's and that this promotes trust and commitment.	the organisation and its individuals understand the impact that competitive or cooperative behaviour has on "care why"—promoting trust & commitment
Inactive AWARENESS	Management has little or no idea what the organisation stands for or what behaviours are accepted or rejected.	Individuals have little or no idea what the organisation stands for or what behaviours are accepted or rejected	The organisation shows little care that is reciprocated directed towards the employees and its supply chain.
Pre-active INITIATION	The organisation has a clear mission statement that is either not well communicated or largely ignored	Individuals assume that they can justify their actions successfully if challenged—trust is reserved and tentative	Every one is basically out for him/her self and any exchange of knowledge is purely transactional. User-pays organisation policy.
Active ADOPTION	The organisation's value system is real but	Individuals feel no clash of values or norms with	The organisation attempts to balance competition with

	tacit and embedded.	the organisation.	cooperation where possible
Pro-active ACCEPTANCE ADAPTATION +	The organisation's value system is well publicised and all employees and consultants are initiated to clearly understand what is expected	There is a clear code of conduct that is well communicated and understood. This supports a sense of trust and commitment to share knowledge.	Both individuals and the organisation support and facilitate sharing knowledge and insights with due acknowledgement of generators and enhancers of knowledge.
Embedded ROUTINISATION + INFUSION	The organisation is proactive in ensuring that its culture is relevant and coherent to its stakeholders' needs and aspirations	Individuals are facilitated to share knowledge through organised pro-active programs to build trust and commitment.	There is a proactive approach to match rewards based on cooperation but with a vigorous competition for ideas that are melded through cooperation

*Trust and commitment at the inactive/awareness level*, is characterised by an inability of management of the organisation to fully and clearly understand what behaviours that the organisation stands for in terms of its values and culture and articulation of what behaviour or norms are acceptable or not. As a result of this lack of clarity, there would be quite predictably various interpretations of what is an acceptable standard of what can or cannot be done. This ambiguity would place a barrier to employees and consultants working within the organisation to fully trust and commit to sharing knowledge. At the pre-active/initiation level, the organisation would have a mission statement that is either not well communicated or perhaps is substantially ignored. Again, this could result in people holding back knowledge because they may feel that it could be used against them or could be a waste of energy and time pursuing ideas that are not appreciated. At the active/acceptance level, the organisation's value system is real but highly tacit and embedded in history, thus established employees and consultants are clear what the organisation stands for, but it is difficult for new recruits or isolated individuals to know the organisation's culture. At the pro-active/acceptance and adaptation level, there would be a well publicised and clear statement of the organisation's cultural norms and standards. There would be a well know corporate history, probably stemming from the influence of its founders and regular newsletters and other cultural artefacts that make the culture explicit. At the embedded/routinisation and infusion level, the dangers of cultural rigidity and ossification would be clearly understood. There would be a proactive policy of ensuring that the culture and its artefacts such as newsletters, rituals, habits and norms are relevant in its operating environment, the needs and aspirations of its stakeholders. For example, lack of diversity in terms of gender and ethnicity is currently a possible barrier to entry in some organisations that needs to be changed to attract the best talent and to help supply chain partners and other communities to make that organisation its preferred partnered choice.

*Individual cultural values at the inactive/awareness level* reflect the organisation's lack of clarity on cultural values at that level. The individual would be confused about how to approach knowledge work and would probably fear or feel uncomfortable about rejection and therefore would be reluctant to share knowledge. At the pre-active/initiation level, individuals assume that what works for them in terms of cultural mores, should be OK with the organisation. However, because they are unsure due to a lack of clarity by their host organisation, they will still be reserved, conservative and

reticent. This assumption may be wrong and so there will be evidence of cultural clashes such as them appearing to flout 'the rules' or being 'too bureaucratic and pedantic'. At the active/acceptance level, there would be no overt or regular clash of cultural values but newcomers would be tentative until they have absorbed the organisation's tacit cultural knowledge. At the pro-active/acceptance and adaptation level, the individual would have a clear, unambiguous and well articulated series of cultural artefacts that explain the organisation's culture and so they would know how to align their values with that dominant paradigm or else how to effectively hide any conflicting views. This would result in high trust because at least the individual knows the rules and environmental culture; however, commitment may be guarded and limited where clashes of cultural values are concerned. At the embedded/routinisation and infusion level, individuals are facilitated to share the process of shaping the organisational culture and where there are likely to be a clash there would be a mechanism to allow the individual to influence a change in culture. The results would be high levels of trust and predictability in terms of anticipating consequences of actions and this would probably drive high levels of commitment.

For *care and the balance between competition and cooperation* at the inactive/awareness level, the organisation and individuals dealing with it will reciprocate little evidence of care for each other. This would result in low levels of trust and commitment and may be exemplified by managers as a 'culture of blame' or people not being 'team players' and by individuals as working in a 'culturally toxic environment'. At the pre-active/initiation level, the care-why factor referred to by [12] is low. Everyone is basically out for themselves and so knowledge exchange, sharing and transmission is undertaken on a very transactional basis with little effort or energy being expended in offering an idea or knowledge for its own sake. At the active/acceptance level, the organisation and individuals attempt to balance competition and cooperation to be able to get closer to win-win situations when making a knowledge transaction. The level of trust and commitment would be present but somewhat reactive and underdeveloped. At the pro-active/acceptance and adaptation level, both individuals and the organisation support and facilitate sharing knowledge and insights with due credit and acknowledgement of generators and enhancers of knowledge. The balance between competition and cooperation would be well understood and rather than compromise between the two poles, people would be favouring one or the other to act within the milieu that perceive themselves to be in. Thus trust would be high and commitment conditional and tentative to the responses received. At the embedded/routinisation and infusion level, a proactive approach matches rewards based on cooperation but with a vigorous competition for ideas that are melded through cooperation. If any individual or group start from one pole or the other there would be a conversation to explore where on the continuum the particular knowledge work task to be undertaken lies. There might be a combination approach being adopted whereby collaboration is used as a filter or vice versa as the starting point for action, however, all participants will be aware of the need and desirability to care for the outcomes and efforts will be focussed on that goal.

## **Knowledge Creation**

Davenport and Prusak argue that “knowledge management process has to be ‘baked’ into key knowledge work processes” [18, pxi], that is managing knowledge must become embedded in all aspects of our work and that means linking it to strategy, culture and be supported by both ICT and people as outlined in the K-Adv model presented in this publication.

Ikujiro Nonaka and Hirotaka Takeuchi [29, p73] regard knowledge as a process that spirals in a three dimensional cycle with a focus on knowledge creation, transmission and use. They conceptual this occurring through a conversion and value adding process through sharing both tacit and explicit knowledge between individuals and groups and indeed across groups throughout an organisation. Knowledge is created and re-created as it is reframed and transformed through multiple perceptions and being tested and challenged by all those involved in the knowledge enrichment chain.

Knowledge management is seen in terms of a knowledge creating cycle of: individuals sharing tacit knowledge through socialisation (S); articulating this either verbally or textually to make tacit knowledge explicit (E); combining the explicit knowledge shared with existing explicit knowledge such as operating procedures, manuals, and information bases (C); and then through reflection and embodying that re-framed explicit knowledge, internalising it so that it becomes refined tacit knowledge for many individuals across the organisation (I).

When tacit knowledge is shared between people it is sympathised. It is, however, difficult to share tacit knowledge because by definition it is unspoken often hidden, and embedded in experience and a person’s senses. Another issue worth remembering is that tacit knowledge can be ‘bad’ or inaccurate—following habit is not always good practice. The advantage to the holder of tacit knowledge in sharing it with others is that by doing so this knowledge becomes not only tested and validated but both parties in a knowledge exchange gain deeper insights through the dialogue of exchange.

Knowledge creation in developing innovative products or services has been explained as a 5-step process. The first step is *sharing tacit knowledge* and it has been summarised as follows [12, p83]:

- Direct observation—through doing so and sharing a dialogue about the observation, observers can also test beliefs about what works, what does not and speculate why that may be so;
- Imitation—imitate an action based upon observation;
- Experimentation and comparison—trying out various solutions and sharing perceptions;
- Joint execution—community members attempting to solve problems under the watchful and helpful support of a more experienced person.

In each case the quality of learning is closely associated with the quality of dialogue between those sharing tacit knowledge. The more reflective and questioning that becomes through probing for explanations of the unexpected, the better the quality of interaction [25, 26]. Seven dimensions of knowledge was discussed in Table 2 and these can be used as the basis for making a decision about how to best share tacit knowledge.

The second step is *creating concepts* and this requires using a common language to express ideas and knowledge. Metaphors and analogies are

useful tools to create visualisable symbolic representation of ideas and knowledge. 'Good' metaphors will resonate strongly and help simplify complex ideas into understandable chunks that the brain can cope with. A concept can be developed from a vision of how that concept might address a response to a shock or high-level challenge to the survival of an entity.

One of the most widely cited example of concept development as part of a knowledge sharing cycle is the Matsushita's original winning idea for a home baking machine came from a *concept* of any consumer being able to bake a loaf of bread at home using a machine to be developed by Matsushita that would produce bread as good as that made by the best pastry chef in Japan. This concept, when realised, became a leading home appliance advancement, however, previous attempts to develop this machine had failed a number of times over the preceding decade because it was judged to be too difficult technically. The shock that spawned the concept was the need for Matsushita to survive a severe market threat and to internal restructuring.

The product required capturing and embedding the skills of a baker in the critical dough-kneading process that is highly tacit. The storey makes fascinating reading and interested readers should refer to Nonaka, I. and Takeuchi, H. (1995). *The Knowledge-Creating Company*. Oxford, Oxford University Press, Chapter 4. Several useful lessons were illustrated in that example. These are summarised as follows:

- There first needs to be a shock administered to dislocate people from a sense of complacency and smugness. This shock may be real such as a war, danger of the organisation being swamped, or threatened in some way—a sense of crisis needs to be created;
- There needs to be a creative and positive response to 'rise to the occasion' by teams of people with different but complementary knowledge and skills rallying around to share their contributions to some great, challenging and intriguing task;
- There needs to a requisite variety of knowledge, skills and ideas with sufficient redundancy of information and knowledge to provide sufficient options to be able to shape the response into a doable initiative;
- There has to be individual and group intention to find a concept that can provide the necessary response to overcome the crisis.

The Matsushita bread-making appliance example resulted in highly complex problems of tacit knowledge extraction being solved together with solving highly complex technical problems of automatically dispensing the bread's ingredients (knowledge available from one of the company's divisions), of heating the dough produced (knowledge available from another division), and kneading the dough produced (knowledge available from yet another division). It was only when their separate knowledge sources were brought together to respond to the shock focussed on the concept that they had developed for a 'competition killer' product, and only when they shared their knowledge to respond to the vision of the concept product that they had identified that they were able to rise to the occasion.

The third step is *justifying the concept*. If the vision is the primary focus then the concept must address that focus and be consistent with it. To justify a concept there must be constraints specified. In the Matsushita bread-maker example the constraint was that it be "easy and rich" that is easy to make and

that the flavour had to be sufficiently rich to be consistent with the benchmark of the best pastry chef in Japan. Moreover, in the three cycles of development and refinement of this remarkable machine the cost had to be within the range of the mass consumer and the convenience in terms of size, and other factors that made the concept feasibly deliverable to the market.

The fourth step is *building a prototype*; this experimental is critical to fine-tune the product or service and further testing the concept. The act of prototyping has been described as a “kind of self-regulating playful phase in which the participants assemble things at hand and make them into a new object without losing track of the original, justified concept” [12, p89]. This accords with Carl Weick’s [24, p62] use of the term ‘bricoleur’ being derived from the French for ‘jack-of-all-trades’. As implied, prototyping involves a lot of tinkering that is valuable in developing a K-Adv because it tends to grow competencies through the process of reflection upon experience that stimulates further creation of knowledge. Prototyping and experimentation is often undertaken by small groups of highly creative individuals in ‘skunk works’ environments in which they seek lean resources to ‘play’ with ideas or to develop prototypes that can be further developed once sanctioned [127, 128]. At the prototyping phase there is an opportunity to be more effective with the use of knowledge assets such as a record of reflections and lessons learned, ICT tools such as simulators and media resources (i.e. video conferencing) to bring people with critical skills and knowledge together physically or ‘virtually’.

The fifth phase is *cross-levelling knowledge* “the prototype itself displays knowledge in the physical form of drawings, specifications, or models, and it can be passed on to pilot manufacturing, full-scale manufacturing, distribution and sales” [12, p90]. There is a number of ways in which this can be accomplished. Nonaka and Takeuchi [29, Chapter 5] discuss the idea of middle-up-down process of knowledge creation—they argue that top management sets the agenda in terms of creating a shock (or communicating the implications of an externally generated crisis), middle management interprets this in terms of a concept that they develop and this is then explored under their guidance by workplace employees who are able to identify practical solutions to technical problems. This is similar to a bottom-up approach combined with top-down directing of innovation energy—here a bright idea may be developed through a skunk works and then if successful, it is championed by top-management who provide the cross-organisation involvement and resource inputs to maximise positive impact.

Holden offers an additional dimension to cross-level knowledge with his explanation of how a cultural of encouraging multiple and diverse insights provides critical K-Adv, particularly his illustrations of case studies drawn from global organisations [68]. He discusses how global organisations successfully develop cross-cultural competencies and he offers a concentric model of knowledge transfer [68, p277]. At its core lies a pre-established atmosphere for learning, networking and knowledge sharing. Surrounding this in concentric circles is: participative competence—that is an ability to concurrently hold several opposing, often extreme, views in mind; interactive translation—an ability to work with others to translate concepts and knowledge from in one cultural setting (organisational or national) and point of view to another; knowledge sharing; knowledge distribution; and at the

outside ring enveloping all this, an atmosphere for further knowledge-sharing. His thesis is that in a global world with widespread migration and people undertaking work assignments in a range of countries outside their 'home', each organisation is likely to be multicultural in population and each organisation has its own history and therefore unique organisational culture. Thus cross-cultural competence is a knowledge-related activity.

So in terms of knowledge work I have identified four strong markers based on the SECI model that can be used to measure how knowledge work may impact the k-Adv across the five phases of knowledge creation.

**Table 20 – Knowledge Creation Contributing to Social Capital**

Maturity	Socialisation	Performance Characteristic		
		External-isation	Combination	Internalisation
How can social capital be improved, by ensuring that →	developing ways that tacit to tacit knowledge is effectively shared.	tacit knowledge can effectively be made explicit.	explicit knowledge derived from socialisation can be effectively combined with existing explicit knowledge.	explicit knowledge derived from the combination process can be effectively embedded as newly created tacit knowledge.
Inactive AWARENESS	People rarely exchange tacit knowledge and tend to get on with their own job without thinking how others approach the same task	Socialised knowledge is generally made available in rudimentary explicit form at the local level.	People tend to have private or highly localised knowledge bases that they update and use.	Many lessons learned and exchange of knowledge is lost with much 'reinvention of the wheel'.
Pre-active INITIATION	Sharing tacit knowledge is largely a matter of passive exchange as observing or imitation.	Socialised knowledge is generally made available in explicit form at the BU or at the workplace level.	BU or workplace knowledge bases are updated as a matter of discretion of those sharing knowledge.	Knowledge is generally internalised only at the individual level.
Active ADOPTION	Sharing tacit knowledge involves a show-and-tell process and discussion questioning cause and effect.	Socialised knowledge is generally made available in explicit form at the organisation level.	BU or workplace knowledge bases are updated as a matter of course rewarding those who share and upgrade the knowledge base.	Knowledge is generally internalised at the workplace or BU level.
Pro-active ACCEPTANCE ADAPTATION +	The organisation facilitates where possible, opportunities for creating tacit knowledge sharing.	Socialised knowledge is generally made available in explicit across the supply chain supported by ICT.	Policy and practice directs cross company transfer of best practice and renewal of knowledge bases	Knowledge is effectively internalised at the organisational level.

Embedded ROUTINISATION + INFUSION	Organisations have well-established rules for pro-actively promoting and supporting exchange of tacit knowledge throughout the value chain.	Organisations fully support and maintain effective ICT tools for recording and maintaining a knowledge bank of socialised tacit knowledge.	Re-combined knowledge is thoroughly validated and updated as a matter of embedded culture. This extends across the supply chain.	Knowledge is effectively internalised across the supply chain
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*Socialisation* at the inactive/awareness level, rarely involves equality of mutual exchange or meaningful dialogue about their tacit knowledge. Any communication of tacit knowledge is delivered in a one-to-many with little opportunity for discussion. Any value derived from people sharing knowledge is confined at individual level only and is often lost as people leave the organisation. At the pre-active/initiation level tacit knowledge is passively exchanged. This is accomplished by demonstration and or imitation of tacit knowledge being exchanged with little if any meaningful discussion of the significance or implications of this knowledge. At the active/acceptance level, socialised tacit knowledge is generally made available through a show-and-tell with debate, probing and a questioning of cause and effect relationship relating to tacit knowledge shared. At the pro-active/acceptance and adaptation level, the organisation facilitates tacit knowledge exchange wherever possible and promotes the transfer of tacit knowledge as widely as possible through experimentation and piloting throughout the organisation. At the embedded/routinisation and infusion level organisations have well established proactive procedures to maximise the impact of sharing tacit knowledge throughout the supply chain. This may for example involve secondment of personnel to supply chain partners.

For *externalisation* at the inactive/awareness level, knowledge is made explicit in a limited and rudimentary for accessible by the individuals concerned and few other people. At the pre-active/initiation level, this knowledge is made available to those in the BU or workplace group. At the active/acceptance level, this knowledge is made available throughout the organisation. At the pro-active/acceptance and adaptation level, knowledge is made externally available to the organisation via ICT with users being supported to input and edit entries. This could be offered in the form of chat-rooms or on-line communities of practice. At the embedded/routinisation and infusion level, this is undertaken across the supply chain.

For *combination* of explicit knowledge with organisational knowledge bases at the inactive/awareness level, people tend to maintain highly localised or private knowledge bases and so the wider knowledge base does not get updated. At the pre-active/initiation level, manuals and procedures are updated within the organisation at the discretion of those combining their updated knowledge with the organisational knowledge. At the active/acceptance level, BU or workplace knowledge bases are updated as a matter of course and those who share and upgrade the knowledge base are rewarded. At the pro-active/acceptance and adaptation level, knowledge bases are effectively updated in real-time and so organisation-wide currency of knowledge updating is achieved. At the embedded/routinisation and infusion level, people automatically update re-combined and updated



knowledge by as a matter of embedded culture with a focus on cross supply chain access.

For *internalisation* of re-framed and revised knowledge at the inactive/awareness level, is poorly undertaken. Individuals 're-invent the wheel' and frequently lose value from the SECI process. At the pre-active/initiation level, only individuals achieve internalisation of lessons learned. At the active/acceptance level, knowledge is internalised by most of the workplace or BU. At the pro-active/acceptance and adaptation level, knowledge from the SECI process is fully internalised across the organisation. At the embedded/routinisation and infusion level, this is achieved substantially across the supply chain.

## ***Knowledge Sharing and Transfer***

Nahapiet and Ghoshal wrote a very insightful paper about the influence of social capital on organisational advantage [16]. They introduce the very interesting concept of social capital as a lock and key mechanism and stress its importance. Essentially, knowledge provides the key to unlocking competitive advantage and it is people, particularly in networks, who hold the key through combining, exchange and translating knowledge. Sharing and transfer of knowledge is of pivotal importance when building social capital to further a K-Adv. The four sub-elements of this component identified by them have been used to develop Table 21.

Social capital is categorised into three dimensions. Structurally, social capital comprises network ties, network configurations and appropriate organisation for these networks. It is worth reiterating the part of the definition of [16] that relates to potential as well as realised benefits of social networks. When considering financial assets we accept that cash and cheque account bank deposits represent assets even though they are inactive in generating immediate wealth.

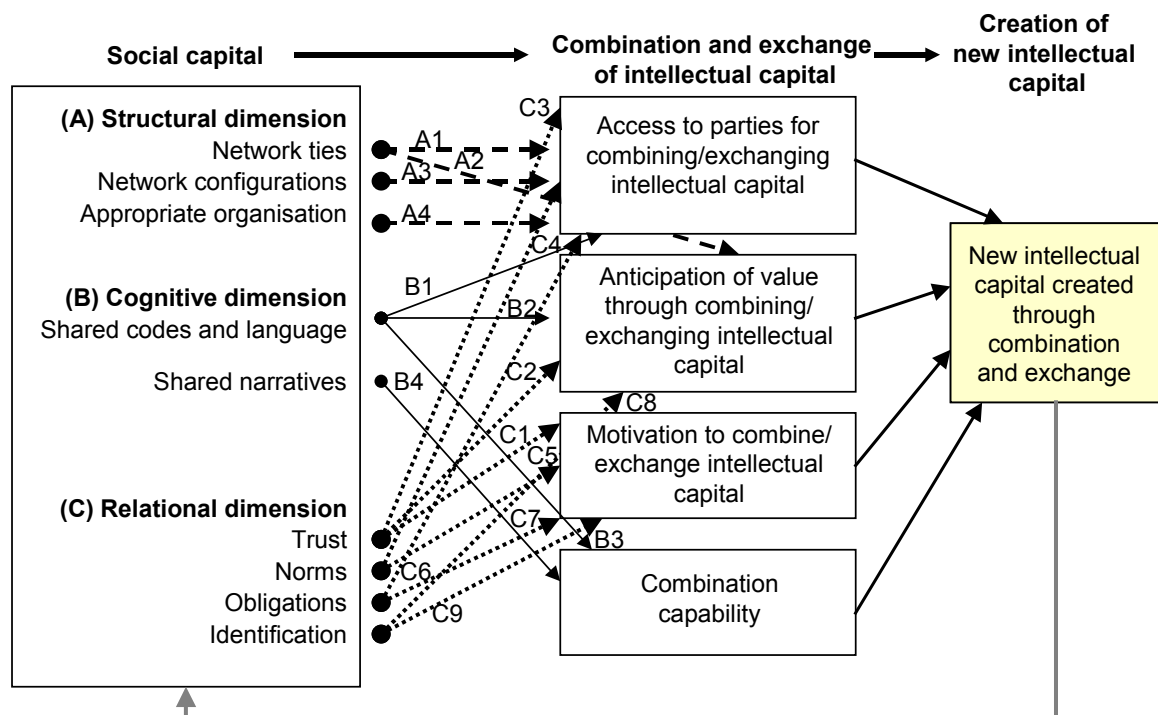
Similarly, we should recognise the intrinsic value of 'contacts' through clients, employees, professional associations and more informal communities of practice such as mates and colleagues that have built up a trusting long-term relationship from past/present employment encounters and continued mentoring. This latent asset is as potentially useful and potent as cash in the bank. The structural dimension of social capital infers that to develop and fully leverage social capital we need to understand, perhaps through mapping, network ties their nature, characteristics and configuration. If this is effectively done then there is an opportunity to adapt the business organization to best avail itself of the benefits to be derived from social capital with respect to knowledge and intellectual capital.

A second dimension of social capital identified by Nahapiet and Ghoshal [16, p251] is cognitive. This comprises firstly, shared codes and language and secondly, shared narratives. Shared codes and language is an easy concept to grasp. We all have felt at some time excluded by, jargon, forms of expression, or arcane language that seem to include some but not others. This is a natural part of forming cultures and sub-cultures. Such language contains subtle forms of communication, fine distinctions that mean something special to those using the words or terms. Often this subtlety is valuable as it embeds elements of tacit knowledge and/or powerful concepts. Networks also share codes. Many COPs have a code that requires anyone with specific

knowledge about a particular problem that they share it when asked. For example Teigland [62] draws to our attention that often in hi-tech organisations, such as internet developers, programmers may be working on the organisation's competitors' problems part of the time. This is apparently commonplace as software developers on 'bleeding-edge' projects run into a technical problem they often call on their COPs to help and that finding an elegant solution is part of the credibility and kudos gained within the COP. In a macro sense all organisations gain benefit because when they hire someone from a COP they also gain access to the entire COP's intellectual capital. Shared narrative have been also termed 'war-stories', however, shared narratives are more than empty boasting or bragging—they are shared examples of a particular problem under discussion so that the context as well as the story is explored often with alternative end-games, solutions or outcomes offered to provide a deeper perspective for those concerned. This is an example in action of that described as the socialisation process described by [29] in their model of tacit to explicit knowledge transformation. Figure 19 illustrates the three dimension of the [16, p251] model.

The third dimension of social capital is relational. This represents four elements. Trust as discussed in the previous section is vital for alliances and partnership whether this be a COP or more formal arrangement. Trust means an expectancy that promises will be delivered as well as a measure of knowing what any person within the social group may be expected to be delivered. Norms are the rules and degree of consensus about some important matters that concerns the social group. For example, the norms that when a group member sends out a general call for help on a specific matter that anyone in a position to help will volunteer to assist (rather than being dragooned into doing so). Obligations operate as a credit transfer system.

Having been helped or been in a position to expect help one puts COP members in position of being obliged to offer help to other COP members. Obligation thus binds members into mutual dependency which a very powerful force for maintaining and developing social networks because it is the whole point of their existence. Identification is a process whereby members of a group feel and believe that they truly belong to that group.



**Figure 19 - Social Capital in the Creation of Intellectual Capital**

Having described what social capital is comprised of and is characterised by; we need to know how it can be leveraged to generate new intellectual capital. Four conditions for exchange and combination of knowledge are described by [16] that draw upon earlier work on value creation developed by one of these authors [129].

They state that first there must be an opportunity existing for combination or exchange of knowledge through access to a social network with that knowledge and/or access in terms of appropriate information and communication technology to do so.

Second, there must be an anticipation of the value to be derived from the exchange or combining of knowledge. When you go to a meeting, seminar or conference you are much more likely to gain benefit from that experience if you started out with the goal of achieving something (even if that 'something' is vague or undefined) from the encounter. This can also be seen in the light of 'stickiness' of knowledge. McDermott views knowledge as the residue of thinking. He states "From the point of view of the person who knows, knowledge is a kind of residue of insight about using information and experience to think" [130, p106]. This view leads to the concept of thinking as a value-anticipating act. Thinking requires an investment in time and energy and the equation that can be subliminally calculated is that the expected value must at least equal value gained from the sticky residue of thought even if the value is not recognised immediately.

There also must be a motivation to share knowledge or to combine knowledge in creating new knowledge. This is where many organisations have encountered difficulties in setting the scene for extrinsic or intrinsic motivators for knowledge transfer and combination. Teigland [62] mentions, in some high-tech workplace cultures being perceived to be 'cool' through

finding elegant solutions to difficult problems provides a forceful intrinsic motivator to individuals.

The fourth condition identified by [16], is combination capability. Cohen and Levinthal [52] discuss 'absorptive capacity' as this capacity of an organisation (or individual) to absorb new knowledge. They argue that the precursor to innovation take-up includes a number of (cultural) organisational factors that indicate an organisation's capacity to absorb new ideas. These factors include openness, tolerance of mistakes (if recognised and analysed why the failure occurred and what may be remedied next time), having boundary-spanners (people that bridge several disciplines or areas of expertise so that they can 'see' the potential of one idea transferred to another context or use of cross-disciplinary teams that truly interact), diversity of participants in terms of their world-view, and also interestingly, past experience in having experimented and toyed with new ideas (again a measure of openness and preparedness to take risks).

These four conditions are highly challenging for the traditional construction industry organisation in particular. This may be the key to recognising how to best diffuse information and communication technologies (ICT) innovation and manage knowledge in more general terms. Often the 'culture' of the construction industry is blamed for its slowness in responding to innovation compared with say the automotive or aerospace industries [123, 124, 131].

From a technology point of view we can view how ICT can contribute through the three dimensions of social capital and then investigate how each of the parts of these dimensions impinge upon the four conditions illustrated in Figure 19 or we can look at both the technology and social drivers and inhibitors to knowledge exchange and combination. Figure 19 may look complex but it is worth persevering with it and just tracing a few of the illustrated connections to understand how this figure may be used in practice.

Take for example 'network ties'. These affect both access to parties and anticipation of value of exchanging or combining knowledge. Organisations can for example encourage the development and maintenance of these ties in a number of ways (obviously after having mapped and identified these ties). Contractor A has a number of staff that has worked in the past closely and fruitfully with Consultant B and Client group C. All these people are part of a community of practice through prior association with a professional body's interest group, several of these are studying part-time at university for higher qualifications and thus have access to electronic journals and other resources numbering in the thousands together with search engines and skills in their use to be able to link globally to a potential group of experts that would be almost impossible to imagine. Further, members of this group are informal members of a research reference group with several universities. What does this mean in terms of social and intellectual capital?

This scenario indicates that organisations A, B and C have a hidden asset that is access to literally 000s of experts, probably free of charge and at worst at nominal reward rates to help solve complex problems—all this through a small number of interested employees who have joined that particular COP. Moreover, if A, B or C were to individually subscribe to the data base of journals etc the cost would be prohibitive but the link between their employees undertaking further studies at universities who have access to this massive intellectual capital resource (current and past issues of professional and

academic journals) allows them 'free' access to this resource. What is the cost benefit ratio of underwriting a few employees study fees for access to this resource? It would be difficult to quantify but it must be highly significant.

What is the inhibitor to A, B, or C, gaining value from this network link? Probably a lack of A, B, or C, being able to anticipate what value it can derive from this particular network of professionals. We need not restrict ourselves to professional staff studying at university on higher degrees. The work of Orr [55] illustrates another important network that is often neglected these days—also see references to this seminal work in [56, 132-134] who acknowledge the role of war-stories in COP). His study of COPs in which photocopy service specialists met over coffee, lunch breaks and after work to not just tell 'war-stories' but to brainstorm and test through 'what-ifs' a range of solutions to perplexing and practical problems illustrates how the social network concept can be applied to construction operatives and supervisors.

Most of us in the construction industry will remember after work 'deep and meaningful' discussions over a few beers as well as recognise the social value of pre-amble discussions prior to more formal site meetings. While the debate about sports teams and stars may seem unproductive—and when the discussion is limited to 'hobbies' only, it is largely unproductive—nevertheless social capital being generated can be harnessed through increasing the quality of the anticipation of value being generated, ways of motivating people to discuss complex work related knowledge issues and preparing the groundwork for knowledge to be absorbed could yield substantial returns from actualised innovation.

I discussed the concepts of five types of knowledge transfer identified by Nancy Dixon [43] in the Knowledge Transfer for the K-Adv section. I noted that the 5 transfer types, serial, near, far, strategic and expert raised questions relating to the nature of knowledge transfer process. The nature of teams transferring knowledge affects how knowledge may best be transferred, whether it is tacit or explicit knowledge, whether the knowledge to be transferred affected the whole organisation or only a small part of it, and the degree of frequency of the task for which knowledge is being transferred .

**Table 21 – Knowledge Sharing and Transfer**

Maturity	Network Ties Configuration	Performance Characteristic		
		Anticipating Value	Desire to Share	Capacity to Share
How can we develop knowledge networks to share and transfer knowledge →	by developing the ways that people are tied together and the configuration of COP.	by providing sufficient information about potential benefits from sharing knowledge	by encouraging people to want to participate.	by developing the capacity of people to share knowledge .
Inactive AWARENESS	People are unaware of potential COP that they could participate in	People and organisations are vaguely aware of the existence of benefit	General lack of obligation and identification with a culture of sharing	There is little evidence of people sharing codes and language
Pre-active	Workplace	People and	Little or no	Isolated work

INITIATION	level internal informal knowledge networks with limited support	organisations can articulate some of the benefits	encouragement or recognition by colleagues of the value of sharing	units and groups share their own codes and language
Active ADOPTION	Organisation-wide level internal informal knowledge networks but with passive collegial and org. support	People are generally informally aware and can fully articulate benefit	People support and understand the value of knowledge sharing—in theory only	People have developed shared codes and language X-organisation
Pro-active ACCEPTANCE ADAPTATION +	Wider community level informal knowledge networks with active recognised support. Few boundary spanners	The organisation formally promotes discussion and exploration of the nature of benefit	A climate of trust and mutual dependency, and identification with COP is created	Organisation has developed initiatives for developing common codes. Sporadic internal R&D undertaken.
Embedded ROUTINISATION + INFUSION	Organisations strategically identify COP, encourage and maintain them with an appropriate hands-off approach. Effective gatekeepers linked to outside world. Many boundary spanners.	The organisation celebrates benefits and embeds the concept of COPs into its culture. Individuals have a thirst for knowledge.	Assumed and embedded culture of sharing is intrinsically maintained and supported by all	Organisation and individuals maintain shared codes and language initiatives. High levels of experience with research and reflection.

There is little evidence of people belonging to internal or external knowledge networks with *network ties and configuration* at the inactive/awareness level being weak and poorly developed. At the pre-active/initiation level, there is some (but only a small amount of) collegial support for developing knowledge networks, however this would be highly inward looking. At the active/acceptance level, there would be strong evidence of internal workplace and BU networks of knowledge sharing but weak ties and passive organisational support for sharing knowledge across divisions or other within-organisational boundaries. At the pro-active/acceptance and adaptation level, there would be actively supported collegial and organisational ties between and within the organisation and a wider knowledge community. There would be a few identifiable boundary spanners with cross-disciplinary interests. At the embedded/routinisation and infusion level, COP and knowledge networks would be viewed as strategic assets and would be proactively supported both collegially and organisationally. There would be an organisational policy to attract many cross-disciplinary people to span knowledge domain boundaries.

For *anticipating value* at the inactive/awareness level, there would be little evidence, only a vague awareness of people understanding the value of contributing to knowledge networks. At the pre-active/initiation level, people and the organisation would be able to articulate some of the more obvious benefits of being part of a knowledge network. At the active/acceptance level, people would be generally well informed of benefits but only by word-of-mouth with no organisational effort of energy being directed at promoting the benefit of knowledge networks. At the pro-active/acceptance and adaptation level, the organisation recognises interest in knowledge networks and reacts by supporting in a somewhat passive way to articulate benefits. At the embedded/routinisation and infusion level, there would be a proactive policy to articulate benefits and to promote membership of COP and other knowledge networks.

Linked to anticipating value is the action to moving from knowledge of benefits to wanting to participate in knowledge transfer and exchange. While I will later discuss the formal organisational processes for providing reward systems to motivate people to share knowledge, this category of performance characteristic relates to personal motivation and *desire to share* and exchange knowledge. At the inactive/awareness level, people will lack any real feeling of obligation or identification with the concept of being part of a knowledge network. At the pre-active/initiation level, any desire to be part of a knowledge network would be inhibited by the workplace culture. At the active/acceptance level, there will be an in-theory desire to contribute to knowledge sharing and transfer but there will be a tangible action between words and deeds. At the pro-active/acceptance and adaptation level, the desire for knowledge sharing will be evident from a climate of trust, recognition of mutual dependency between knowledge workers and identification with COP and knowledge networks.

The *capacity* to share and transfer knowledge will, at the inactive/awareness level be noticeably absent. People will be unaware of ways in which they can share and transfer knowledge mainly because of a lack of common codes, language or cultural norms. At the pre-active/initiation level, people will be sharing and transferring knowledge in isolated groups with many groups across an organisation 're-inventing the wheel' without realising it. This will be caused by a lack of common protocols, language (jargon related or linguistically speaking) and codes of conduct to know what is acceptable or can be expected. At the active/acceptance level, the organisation would have developed protocols to enable people to share and transfer knowledge and in a mainly re-active way, support the development of a knowledge transfer capacity. At the pro-active/acceptance and adaptation level, the organisation will be actively building capacity by initiating sporadic cross-disciplinary research and development initiatives that involves knowledge sharing and transfer. At the embedded/routinisation and infusion level, there would be frequent and ongoing research and reflective learning initiative taking place so that people involved find inter-disciplinary research and knowledge sharing and transfer second nature to them. Any protocols and shared language would be embedded in the organisational culture.

## Sensemaking

Karl Weick, a prolific and masterful writer on the subject of sensemaking, describes it as sizing up a situation, trying to discover what you have while you simultaneously act and have some effect upon what you discover. “It involves the ongoing retrospective development of plausible images that rationalize what people are doing” [24, p460]. He goes on to make an important point that sensemaking sets the frame within which decisions are made—while this may appear obvious it helps to explain how knowledge is used in action. People’s behavioural response to act in a situation is determined by *their* perception of what is happening and the match this with perception and its demands of them and the rules and responses that they have learned to respond to this perceived situation. Weick has studied and analysed many crisis situations in which a breakdown has occurred in people enactment of their learned responses and analysed these to postulate how people make sense of situations and when their sensemaking capacity is impaired at times with tragic consequences. Often when we see people behaving (in our view) strangely in a situation, the explanation of their behaviour can be perfectly rationally explained from their point of view—the way they have made sense of the situation.

Weick postulates seven properties of sensemaking [24, p461-463]. The first property is a *social context* in which people tend react to the way that people around them so that there is a continued dialogue often using hidden cues and signals, that are often absorbed and interpreted at the subconscious level, between the individual and those around them. When these ‘anchors’ or reality checks disappear people often feel lost and anxious.

The second property is a person’s *sense of identity* and who they are and what they feel should be an appropriate response. If this identity is either unchallenged or the person can withstand a challenge to their identity, then they can act confidently based on their sense of a situation.

The third property is *retrospect*. This interesting concept relates to the speed of perception. Things happen, we absorb the incident and then figure out a sensible interpretation. This takes time so sensemaking is always a retrospective process. Often we assume things and try to reconfigure the observed or enacted situation into our previous models that made sense to us. This explains why you can get so many varied accounts of any incident from different people—all convinced that their account is true and factual.

The fourth property is *salient clues*. People string together a bunch of salient clues to construct the sensible explanation of something. This response is vital to acting in an emergency when rapid action is called for and where there is insufficient time to reflect. Often this produces a self-fulfilling prophecy because the preferred response based on the interpretation of the salient clues and prior rules learned produces a trajectory towards a pattern of action that has been influenced by the beliefs of the person. In negotiation for example, one perceived suspicious or hostile act by one player can trigger a lack of trust and retaliation in the other player even if that had not previously been intended by the other player, this can then justify the belief in the first player that suspicion was a sensible response.

The fifth property is *ongoing projects*, the sensemaking is not only affected by past experiences but also by the flow of and its pace of current cues and interpretations. Sometimes the pace is so overwhelming that sensemaking



breaks down and people react to strongly pre-learned responses that are entirely inappropriate. Weick provides in one case study a tragedy unfolding around a bush fire in which people died from acting on an incorrect assumption about the nature of that fire—in this case thinking it was a small and containable one rather than a growing one of devastating scale [135].

The sixth property is *plausibility*, that is sensemaking is about coherence and judging how the elements form a pattern that can be made sense of. This links to both identity in which the inner personality and core learning hold sway and the social context in which the opinion and view of others act to validate and challenge assumptions made when making sense of a situation.

The seventh property is *enactment*, this involves experimentation, probing and feedback and reflection to inform sensemaking. When we act in a situation we generate the conditions for feedback and the degree to which this happens affects the quality of the sensemaking experienced.

Taking these seven properties into account, we can see how sensemaking can be linked to knowledge creation, sharing, transmission and transfer. It helps to explain how people have different worldviews and perspectives and why these are valuable in providing richness of knowledge. In the SECI model described earlier in Types of Knowledge, the socialisation phase involves making sense of tacit knowledge shared with others and then making sense of it so that it can be reframed and that richer knowledge made explicit, combined with other knowledge, reflected upon and then internalised as deeper and richer knowledge and mental models.

Nonaka and Takeuchi argue that knowledge creation is achieved through enablers or conditions that promote knowledge creation that are closely connected to the concept of sensemaking [29, p74-84]. First they maintain that a knowledge spiral is triggered by intent, a goal, aspiration or vision of an innovation for example. An initial shock by senior management in the form of a demanding innovation challenge is administered to set the scene for the establishment of a creative response. This was discussed earlier in Articulating and also in Knowledge Creation with the illustration of Matsushita's concept creation of the bread making machine example. The ambiguity and creative tension posed by a challenge to innovate created a rallying around and an intention to do something that made sense to the groups concerned. If the form of the shock is unclear or ambiguous it forces a creative response and the sensemaking involved is stretched to consider far more options and possibilities than would otherwise be the case for an automatic-pilot response to a less challenging problem or situation. This intention or vision could not be deployed until it gained stakeholder acceptance and this will not occur unless the intention makes sense to them.

Second knowledge creation requires a certain level of *redundancy*, that is slack resources and thinking time. This allows people the space and time to reflect and better make sense of the situation. Without this redundancy there will be lingering doubts and lack of commitment and when in crisis it will trigger regressive behaviours in which people revert to tried and true rules and templates that they have learned to respond to a situation. This can be fatal as people in a rush often make a poor interpretation of a situation and the implications can result in tragedy when the inappropriate response is instigated. Weick provides an example of this happening with an air collision, Tenerife Air Disaster, [24, Chapter 5]. Time to reflect, make sense of a

situation and then internalise this new knowledge is crucial for people's learning and their effectiveness when flexibility of response is required. Davenport and Prusak comment on the 3M policy of research staff are expected to spend 15% of their time on their personal research interests and to apply for internal research grant funding to develop promising ideas [18, p105].

For productive sensemaking to take place that enriches knowledge, there needs to be a variety of viewpoints to be available to challenge assumptions. Weick points out that *requisite variety*, enhances reliability of sensemaking [136, p333]. He points out that face-to-face communication is very rich in content providing many elements of requisite variety. Rich media provides multiple clues and quick feedback. He points out the dangers of screen based models of complex systems for example in control rooms of engineering plans because they engage only the sense of sight. For example, in the 3 Mile Island Disaster, Weick notes that warning signs were not heeded because of a belief that the system must be right [24, Chapter 6]. Where as a person hearing an unusual knock or rattle or 'something strange' that does not make sense may be prompted to investigate whereas this sign may be perceived as less urgent or even missed when dealing solely with a computer based system. Similarly, having a face-to-face meeting entails picking up body language as well as the meaning of what is said so that this richness of multiple media provides the requisite variety to enhance sensemaking.

Finally, the quality of reflection and the level of curiosity of an individual affect their capacity to make sense of a situation. Again this can be traced back to Weick's seven properties of sensemaking. The value of reflection has long been recognised [26] as a critical input to professional excellence. While it is advantageous to have slack time to reflect and think, obviously the quality of thought—the depth of insights gained through making sense of situations and thinking them through—has a critical impact on a person's capacity to help deliver a K-Adv.

Table 22 provides a means to assess sensemaking maturity levels.

**Table 22 – Sensemaking and its Contribution to the Knowledge Advantage**

Maturity	Ambiguity and Creative Chaos	Performance Characteristic		
		Redundancy & Thinking	Requisite Variety	Reflection & Curiosity
How can we make sense of our knowledge to best use it for competitive advantage →	by providing a demanding stretch challenge in ambiguous terms that provides creative chaos that people respond positively to.	by providing sufficient resources to deliver both time and a suitable venue to be able to think and explore mental models and hypotheses	by encouraging people to be open to a variety of views and channels of rich communication.	by providing sufficient time and space for people to contemplate and reflect so that they map consequences.
Inactive AWARENESS	People seem generally uneasy and unreceptive to unconventional thinking	The organisation pursues a lean-and-mean approach where all non-core activity has to be justified.	A strict code of business determines how things are done within the organisation.	Reflection and curiosity is regarded as indulging behaviours.
Pre-active INITIATION	Rigid rules and processes make it difficult and	As a by-product of keeping core ideas-people employed,	There is a chaotic ad hoc approach to forms of	Reflection and curiosity is supported in

	demotivating for people to offer creative ideas.	some level of individual time for regeneration is possible,	communicating innovative ideas. There are no rules.	theory but in practice is viewed as wasteful
Active ADOPTION	Small-scale local 'skunkworks' initiatives.	A formalised period of 'sabbatical' time-out is resourced through competitive proposal submission.	The organisation balances chaos with rigid processes for innovation exploration	People are encouraged to be curious and to reflect but only in their personal time.
Pro-active ACCEPTANCE ADAPTATION +	The workplace culture appears chaotic with a buzz of new and conflicting ideas being debated and explored.	All business units are expected to fund a set resource %age budget to enable new initiatives to emerge	The organisation supports a wide variety of forms of communicating and exploring new ideas.	The organisation facilitates presentations by thought leaders to stimulate reflection and curiosity
Embedded ROUTINISATION + INFUSION	Top management periodically creates crises and facilitates both senior levels management to deliver challenging goals and empowers the coal-face workforce to find delivery strategies.	The organisation sets aside a regenerative investment fund to support initiatives for emerging innovation development across the organisation.	The organisation links with outside agencies in strategic alliances and rewards individuals and BUs to collaborate with multi-discipline teams and diverse groups.	The organisation hosts and fully supports a corporate university that sponsor action learning internal research as well as participating in cross industry or sector research activities.

There is little evidence of encouragement or tolerance of divergent or unconventional thinking by people in the organisation at the inactive/awareness level of the organisation *creative chaos and ambiguity*, there is a palpable sense of people welcoming conformity and the comfort of the known. At the pre-active/initiation level, there are people who might respond to ambiguity and creative chaos but the organisation seems to micro manage everything and provide rules for every eventuality. At the active/acceptance level, there is evidence of piloting, small scale experimentation in the form of people forming skunkworks, that is small innovating experimental work that develops and tests out new ideas, generally on the basis of beg, borrow steal resources and request forgiveness of senior management after the event rather than seeking permission to experiment [127]. At the pro-active/acceptance and adaptation level, the workplace seems to be buzzing with creative chaos and discussion of research activities. At the embedded/routinisation and infusion level, senior management introduces shocks and stretch goals to improve and innovate. Employees respond with viewing the challenges as a game in which they apply their ingenuity and creative energies and welcome the ambiguity and empowerment to take the general challenge and shape it to present innovative solutions of with pleasant surprises for all. Challenges and ambiguity would be applying constructive pressure for organisational members to be making sense of not the current or immediate exigencies but making sense of the organisations potential and preferred future.

*Redundancy and thinking space/time* at the inactive/awareness level, is characterised by an organisation and workplace culture that subscribes to the lean-and-mean philosophy. This means that thinking time and spare

resources are considered a waste rather than an investment. At the pre-active/initiation level, key talent (recognised experts and top level performers) are retained in a lean-and-mean organisation but when not actively engaged in any 'productive' income generating work they may be allowed to develop and test innovative ideas, however, once an income generating task has been identified for them they would be required to divert their attention back to 'productive' work. At the active/acceptance level, the organisation would develop a formal process for key valued workers to apply for short sabbatical periods to take part in either 'skunkworks' type initiative or other knowledge related projects. At the pro-active/acceptance and adaptation level, each BU is expected to build into their budgets and business plans a set percentage of their budget to undertake knowledge related or innovation projects. At the embedded/routinisation and infusion level, there would be high levels of strategic focus by the organisation on the need to release talent and its sensemaking capacity to apply creative energy to map a path for making sense of future business product and service opportunities to deliver the required competitive advantage for both corporate survival and prosperity.

*Requisite variety* at the inactive/awareness level is characterised by a highly rules and procedures-bound organisation that purposefully restricts diversity of views on how things are done and the pace of change and adaptation to market forces. The prevailing impression would be of individuals being unaware of the need to attempt making sense of change—it is somebody else's job and responsibility. At the pre-active/initiation level, there are no rules or procedures about how to make sense of the challenge of change and need for innovation. At the active/acceptance level, the organisation has a desire to react to the need for innovative change and it balances the need for rules and standard procedures about how things are 'done around here' with emerging diverse alternative approaches so that conversations are encouraged even if the capacity is not evident to appreciate the full value of diversity. At the pro-active/acceptance and adaptation level, the organisation goes beyond a reactive response to actively encourage and engage with those with diverse views and communication messages about possibilities for making sense of the business environment and the external factors that impact upon it. At the embedded/routinisation and infusion level, the organisation proactively creates opportunities for fully scanning the environment for ideas and feedback so that a rich communication skein is harvested that is purposely diverse in communication channels and media.

*Reflection and curiosity* at the inactive/awareness level is regarded as an unnecessary indulgence. At the pre-active/initiation level, it is viewed as useful in theory but the support and application is so unstructured that often it is only plain lip-service—mostly it is still considered an aberrant behaviour and of n'th order importance in doing the job required to be addressed. At the active/acceptance level, the value of reflection and curiosity is well recognised but considered appropriate to be undertaken by people in their 'free' time outside work committed time. At the pro-active/acceptance and adaptation level, an active stance is taken. This may be manifested by the organisation bringing in thought leaders to address staff and stakeholders to engage them in reflecting and analysis of their actions. At a minimum, there would be programs designed and implemented to spark curiosity and support reflection. Developing a knowledge management initiative to harvest lessons learned

might be one typical example. At the embedded/routinisation and infusion level, the organisation will support reflection and curiosity as a matter of the highest priority to supporting sensemaking with perhaps a corporate university undertaking action research programs or by engaging with external research and reflection initiatives.

### ***Business Systems Supporting Rejuvenation***

Social capital realisation requires not only the valuable input from the individual but also institutional support to enable the unleashing of the potential that human capital can offer. Business systems need to be re-engineered to simplify processes and enable individuals to deliver their potential. I have identified four key areas where this can be achieved. The organisational structure needs to be supportive of the need for change, and flexibility of action to not only response to employees to empower them but also to contribute their energy and intellect to support an organisation's K-Adv. This will require a conscious design of the way in which individuals in their BUs and workplace groups interact. Finally, the organisational decision making process also needs to support flexibility of action so that the organisation remains dynamic and proactive in preparing the organisation for future challenges and sustainability of present exigencies. This sub-element of the people infrastructure is an important contributor to the development of people infrastructure process capital.

Limerick *et al* argue that the purpose of management approaches evolving over the last century was a response to varying and continuing levels of turbulence and uncertainty presented by the global competitive climate—they point to what they describe as the 4<sup>th</sup> management *blueprint* model for success [137, p30]. This fourth management blueprint direction for the immediate future may help to explain how managing to support flexibility is being instigated by leading edge organisations as we enter the 21<sup>st</sup> century.

**Table 23 The Four Management Blueprints [137, p30]**

	<b>First Blueprint</b>	<b>Second Blueprint</b>	<b>Third Blueprint</b>	<b>Fourth Blueprint</b>
	Classical	Human	Systems	Collaborative organisations
Organisational forms	Functional Mechanistic Organic	Inter-locking Matrix	Contingency Divisional	Loosely coupled networks and alliances
Management principles	Hierarchy	Supportive relationships	Differentiation	Empowerment and collaborative individualism
Managerial processes/ forms	Management functions	Democratic leadership	Open systems analysis	Management of meaning
Managerial skills	Person-to-person control	Goal setting Facilitation	Rational/ diagnostic	Empathetic Proactive
Managerial values	Efficiency Productivity	Self-actualisation Social support	Self-regulation	Social sustainability Ecological balance

The first blueprint is centred on a command and control structure and philosophy relevant in a stable and predictable business environment. The

second blueprint moves towards a controlled decentralisation of decision-making and initiative with its stronger emphasis on the people infrastructure. Many companies have moved to the third blueprint, which is focussed on the organisation as being part of a supply chain with both upstream and downstream 'customers' but have difficulty in moving forward. This may be due to fear of higher levels of management losing control over their management authority prerogative and fear over loss of competitive advantage through networking and outsourcing. The Fourth Blueprint relies upon considerable bases of mutual trust and respect requiring readiness or 'maturity' from management and partner organisations stemming from loosely coupled organisations. This requires a greater capacity for real rather than espoused empowerment than Third Blueprint managers can cope with. Indeed, Limerick *et al* [137] describes an uncomfortable staging post between Third and Fourth Blueprint organisations where the worst of cases prevail.

Another intrinsic element of the Fourth Blueprint focus upon the K-Adv its emphasis upon organisational learning and team learning. This is achieved through knowledge sharing with a diversity of available views within groups characterised by independent collaborative individuals with high levels of communication and people skills. Companies that get the most out of alliances are those that learn from each other [138]. Limerick *et al* [137, p179] argue that companies have to become action-learning organisations, that are self-reflective and can transcend and critique their own identity, values, assumptions and missions that are initiated and controlled by line managers. Such organisations do this through not only supporting critical appraisal but also, and more importantly, by providing feedback for lessons learned to be transformed into subsequent action. This requires organisations to welcome both challenge and experimentation through the establishment of the organisation as a learning community. This would be composed of both inside-organisation people and informed external participants who are free of the internal assumptions and mindsets of organisational members. The approach exemplified by the Fourth Blueprint is strongly supported by management theorists and commentators. For example, in the Karpin Report many examples are cited of a gradual global shift taking place towards this new paradigm [139].

Nonaka and Takeuchi critique the development of organisational structure to meet the demands of a K-Adv [29, Chapter 5 and 6, 140, p135]. They coin the term middle-up-down that is an interesting concept that was illustrated earlier with the history of the development of the Mitsushita bread-making machine. The traditional top-down model reflects an assumption that only senior management are able and allowed to instigate knowledge creation through setting the agenda for current strategy and the future directions of the firm. Bottom-up management reflects flat organisational structures with ideas and influence flowing upwards either in rapidly changing environments (such as the dot-coms of the late 1990's or 3M with its emphasis on private research to generate innovation) where those at the 'pointy-end' were considered to be best able to 'roll with the punches'. However, with a bottom-up framework it is very difficult to cross-level knowledge so that the entire organisation and its people can fully benefit from creativity [29, p126]. Further, the principal limitation that the two approaches just described exhibit is that they lack relevance to middle management who are often the very people who are in a

unique position as knowledge brokers to be able to inform senior management of the practicalities of the nature of changing markets and circumstances while also being able to be an effective person-to-person interface between senior management and the front-line workforce to make explicit the strategic intent of the organisation and its place in 'the system'.

A middle-up-down approach can be the most effective communication and influence channel in rapidly changing business environments. The middle management group are the ones that help solve the contradictions between ambiguous strategic intent promoted by senior management in providing a breakthrough-thinking shock and impetus to change and remain un-frozen in a mindset to respond to changing circumstance while managing the contradiction of how to practically respond to reality and model and help test practical solutions. The middle manager becomes a knowledge engineer who manages the environment in which knowledge practitioners (the front-line employees and line managers) and the knowledge officers (top managers) exchange energy in creating innovation and knowledge flows [29, p151]. Von Krogh *et al* take this idea forward with their concept of a 'knowledge activist' role—a person who works in the hub of an influence web within organisations helping to cross-level knowledge and the role that managing conversations has to play in facilitating knowledge creation and dissemination and use. They discuss the 'power of conversations'—"Forget who originally "owned" the idea or where it came from; community members provide the energy for an evolutionary process in which loosely formulated ideas turn into concepts, concepts are justified and turned into prototypes, and these may ultimately turn into innovative products and services" [12, p125].

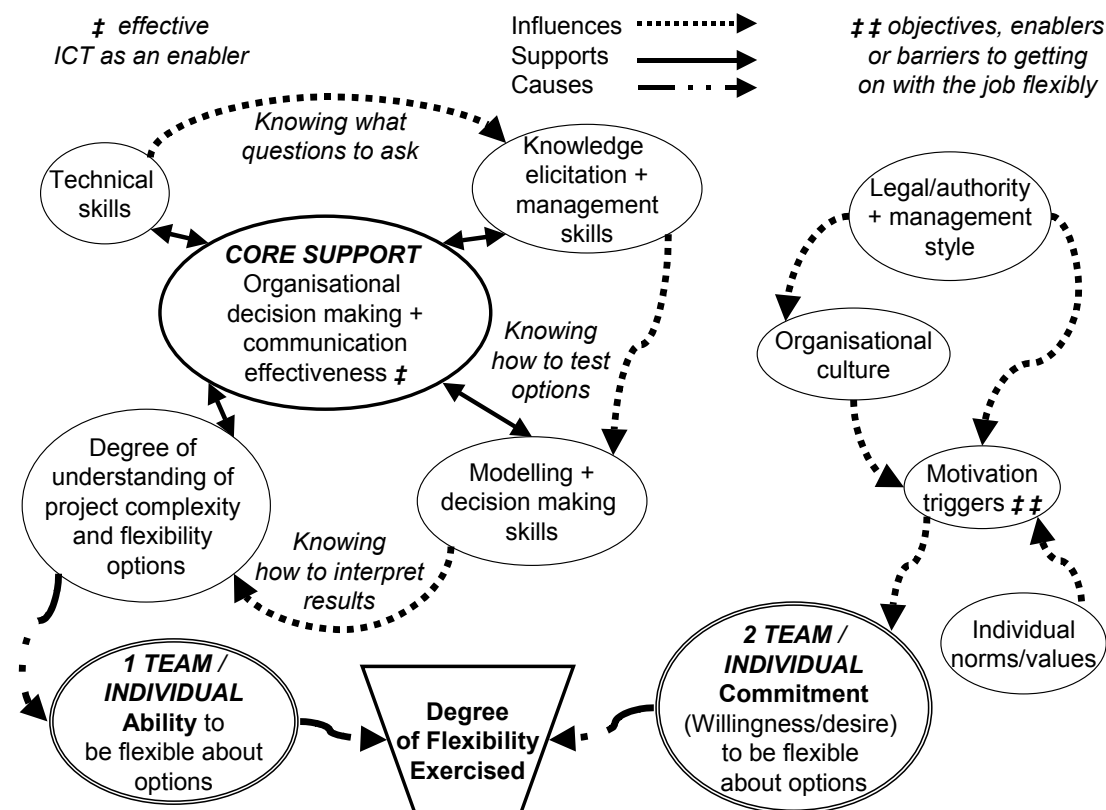
Another important aspect to the whole middle-up-down concept is that this facilitator role is responsible for also creating the most effective workplace context to create, share and transmit knowledge to be used. Furthermore, Nonaka *et al* introduce the notion of what they call '*hyper-text*' organisations in which there appears sufficient flexibility for members at different levels in an organisation to shift their context—being leader, follower, contributor, editor or reviewer etc in their task context within cross functional teams [29, 169]. The Internet provides a wonderful and highly effective tool for bring people together in a virtual space but as mentioned many times earlier, the role of face-to-face contact with all its rich subtextual messaging is a vital part of any knowledge facilitation process. Nonaka *et al* use a Japanese term "*ba*" to describe the concept of "a place where information is interpreted to become knowledge" [28, p22]. The key message they highlight is understanding *ba* as interaction both in a virtual, temporal and physical sense. What happens when people share the meaning of context of knowledge as it applies to them is that a wider appreciation grows between those sharing *ba* that opens up possibilities for growth and application not previously considered. This interaction or *ba* then moderates all the behaviours and cultural aspects that govern management of conversations.

Being flexible or agile is dependent upon organisational and people drivers and inhibitors. Agility drivers are those influences that encourage organisations and individuals to be agile (the competitive environment), the strategic intent to become agile, and the strategy adopted (reactive or proactive). Capabilities demonstrating agility include the practices, methods and tools directed towards being agile. This is enhanced and facilitated by

information for decision-making and includes organisational, technology, people and innovation information [141]. The ability to reflect upon theory (a plan) and practice (actions and consequences as they unfold) has been highlighted as a critical capacity for professional competence.

Understanding is derived from core support infrastructure influenced by three types of knowing. *Knowing what questions* to ask when planning requires technical skills and knowledge elicitation skills. *Knowing how to test options* for undertaking construction operations requires both the knowledge about the available options and an ability to model options and to make decisions. *Knowing how to interpret* planning and simulation test results is based upon modelling and decision making skills. An effective core support infrastructure provides effective ICT that facilitates both the understanding of the range of options available and their likely impacts. This underpins a flexible approach to planning and the ability to rapidly modify existing plans to take advantage of changed circumstances or to capitalise on opportunities that may arise for improving construction time performance.

Flexibility and agility, however, requires both an *ability* and *commitment* to be flexible/agile. It is unclear at present to what extent each of these two drivers influence the degree of flexibility exercised, however, it is proposed that without both flexibility ability and commitment, flexibility will not be likely to occur.



**Figure 20 - Exercising Flexibility Options Model**

Figure 20 illustrates a model of exercising flexibility as derived from a series of Australian studies in construction time performance of some 90 construction projects in total [53, 142, 143] in which the pivotal impact of flexible responses to planning and action became better understood. This led



to qualitative research on three projects and the following model was used to help explain the role of decision-making and flexibility of action upon effective management [144, 145] and a cross-industry study of one project from the engineering, building construction, shipbuilding and aerospace industries [99]. Figure 20 illustrates the pivotal role that core support for decision-making and communication effectiveness has on the degree of flexibility exercised [145].

Figure 20 also indicates the influence of ability and commitment as well as the role of teams and individuals. The extent of required skills, knowing what questions to ask, how to test options and how to interpret results determine enablers to be flexible while willingness and desire (resulting in commitment) to be flexible is a *ba* (relationship) between individuals and groups.

Table 24 provides a means to assess maturity levels of business systems and rejuvenation that support people to be creative and underpin the K-Adv.

**Table 24 – Business Systems and Rejuvenation and the Knowledge Advantage**

Maturity	Performance Characteristic			
	Organisational Structure to Support Flexibility	Supporting Management Style	Group and Individual Interaction	Decision Making Supporting Flexibility
How can business systems best support the K-Adv →	by providing a supporting a flexible organisational structure.	by providing a supportive management style	by encouraging people to be open and interacting to create, share and use knowledge .	by developing a approach that supports flexible decision-making.
Inactive AWARENESS	Top down functional focus with minimal discretion for taking independent action.	Hierarchy based on person-to-person control with a focus on efficiency.	Isolated islands of expertise coordinated by a liaison and linking-pin approach.	Rules rule, authority is difficult to challenge—not my problem.
Pre-active INITIATION	Matrix organisation links functions across projects and knowledge initiatives	Senior management generate ideas a 'sells' them by gaining group commitment.	Focus on either co-location or electronic virtual networking of people in discipline groups	Middle management has opportunities to influence policy—its everyone's problem.
Active ADOPTION	Bottom up ideas flow predominates. More chaos than flexibility	First amongst equals. Senior management sets the agenda and guides it.	Active focus on integrating face-to-face and electronic links in cross-discipline groups	All levels have the opportunity to influence decision-making. Its our problem.
Pro-active ACCEPTANCE ADAPTATION +	Focus on integration from a systems perspective. BPR to enhance emerging evidence of process simplification.	Self-regulation, empowerment team-based approach based on expertise with a shifting role of the team leader to be a facilitator.	Focus on workshop and collaboration to get people 'singing from the same hymn sheet'. Pressure for consensus and agreement.	Mapping and modelling to test potential impact of decisions. Low levels of re-work to overcome unintended outcomes.
Embedded ROUTINISATION + INFUSION	Middle-up-down focus with high levels of contingent action well coordinated across the enterprise	Focus on senior management of meaning, through collaboration of a wide group of stakeholders	Empathic collaboration with facilitating multiple perspectives understanding each others values.	Sophisticated modelling and testing allowing breakthrough thinking. Problem prevention.

There is little evidence of *organisational design to support flexibility* at the inactive/awareness level of the organisation with an emphasis on a top-down hierarchy approach providing minimal opportunity for independent unauthorised action. At the pre-active/initiation level, a matrix structure links functional specialised groups with workers reporting to a functional and project 'superior' before being able to take independent action. At the active/acceptance level, the bottom-up flow of ideas is structurally embedded through cross organisational committees and a need for widespread 'sign-off' from participating stakeholders but this generally results in chaos through reversal of decisions and conflicting policy. At the pro-active/acceptance and adaptation level, the focus shifts to developing a simplified organisation structure through business process re-engineering (BPR) that enables flexibility of action within the scope of a complex and inter-relating organisation. At the embedded/routinisation and infusion level, the concept of structure is more directed to influence rather than the rigidity of rules and procedures with a middle-up-down pattern of influence based upon contingency and the situational context. The structure as a formal organisational chart has given way to the notion of a web of influences facilitated by middle managers who orchestrate action and are supported by business processes that recognises the ascendancy of the balance between expert knowledge and the way in which influence is enacted in practice.

*Management style* at the inactive/awareness level is highly formal-control oriented a strong focus on task efficiency. At the pre-active/initiation level, the leader-follower paradigm is firmly accepted and the role of senior management is to develop policy. Middle management sells the ideas to be adopted in as palatable a way as is possible to the group so that they voice and swear commitment to that direction. At the active/acceptance level, the middle management role is one of guided agenda setting in a collaborative environment where the manager is recognised as the 'first amongst equals'. There would be much rhetoric about empowerment and appreciation of diversity but underneath this veneer of equality it would be clear who is 'boss' and how this subtle application of position power affects career advancement. At the pro-active/acceptance and adaptation level, the rhetoric is being matched by the reality. There is more transparent influence, empowerment and creative conflict apparent and debate is encouraged and rewarded. The skills and self-discipline of employees is such that managers see their role as removing roadblocks that hold back employees to fully realising their potential contribution. At the embedded/routinisation and infusion level, the focus is on the management of meaning so that employees are aware of how to be effective in their sense of achieving goals harmonisation of multiple stakeholders—the management style can be compared to attempting to 'herd cats'.

*Group and individual interaction*, at the inactive/awareness level is severely limited because people see themselves as entombed in silos of their own clan or tribal group. Communication links are limited to segregated island interacting through a liaison link-pin person who passes information second hand from one group to another. At the pre-active/initiation level, interdisciplinary teams are either co-located or electronically connected in a functioning single networked virtual workplace, however, this is undertaken as a reaction to the need for individuals to more easily communicate and so little

group though is applied to actively breaking down communication and cultural barriers. At the active/acceptance level, the approach is far more active with greater attempts to get to both electronically and physically collaborate. Conducting workshops and information sharing forums may facilitate this. At the pro-active/acceptance and adaptation level, groups socialising and sharing ideas and working together more visibly. There could be a series of joint badging or identity forming activities going on such as sports team games, newsletters/web boards or other team building devices. There would be a hidden sub-text that stresses the need for people being helpful, cooperative and consensual. At the embedded/routinisation and infusion level, the focus would be on people engaging in constructive conflict that unearths individual perspective as a precursor to being able to empathise and understand each other's value system and how that impacts communication between individuals and groups.

*Decision making flexibility* is not supported at the inactive/awareness level. It is characterised by being a rules-bound systems that encourages everyone to believe that problems belong to somebody else. Senior managers are poor at delegating decision-making and tend to micro-manage everything to a point of interfering with the capacity to be flexible. At the pre-active/initiation level, middle managers have some degree of autonomy but they are ineffective at empowering front-line employees. There may be plenty of discussion in groups but this results in a general belief that problems belong to everyone but no one group or person seems to take responsibility to follow through with solving them. At the active/acceptance level, all levels have the opportunity to contribute to problem solving and all share in the responsibility of ensuring that they are resolved. There is a reasonable level of flexibility in decision-making with people being motivated to take responsibility but the tendency of decisions to be reversed (restricting downstream flexibility) remains a problem. At the pro-active/acceptance and adaptation level, decision-making takes place after mapping consequences and modelling possible outcomes and so the quality of decisions made is sound. Each level of participants in the decision-making process are aware of what constitutes a well thought through decision and so they are fully aware of the limits of their ability to be flexible within the well known standards. This aids flexibility because of the tolerance within the parameters proscribed and the higher quality of decisions made result in few if any decision reversals—this promotes downstream flexibility because of drastic reductions in re-work and back-tracking experienced at lower levels. At the embedded/routinisation and infusion level, sophisticated modelling and simulation technology and techniques results in a superior standard of decision-making process that is exemplified by an ability for breakthrough thinking. Decisions are rarely, if ever, reversed because the emphasis is placed on systematically thinking through decision outcomes. Flexibility of action is increased, as there is a greater sense of certainty and stability of actions taken.

## **Reward Systems**

In Chapter 3 the Galbraith 'Star' model highlighted rewards as a critical element of the model describing the inter-connectivity of strategy, structure, people, processes and rewards. Developing a rewards approach is critical to achieving the people-supporting infrastructure necessary for realising the K-

Adv. Figure 19 - Social Capital in the Creation of Intellectual Capital indicated that anticipation of value through combining and exchanging intellectual capital as well as the motivation to combine and/or exchange intellectual capital are two of the four conditions for knowledge combination and transfer. I also discussed in Knowledge Sharing and Transfer, earlier in this chapter, and identified a number of motivations that can be rewarded through extrinsic as well as intrinsic means. The literature supports the very strong influence that incentives and rewards have on people's commitment to sharing knowledge, for example Pedler *et al* identify reward flexibility as a key driver of the Learning Organisation with a number of case studies to illustrate their argument [146, Chapter 13]. In a gender-balanced study of 48 professionals from a wide range of backgrounds participating in a Human Resource Development Master's Degree program that investigated predictors of organisational learning, Greigo *et al* found two significant factors. By far the dominant factor was rewards and recognition followed by training and education [147, p9], given that the sample were all part-time students the second factor being strongly identified is to be expected.

It is also useful to review what happens during knowledge creation, sharing and transfer. As Holden has pointed out much of the interaction energy expended by participants is invested in a translation activity [68, p244]. The whole process of 'reading' both explicit and sub-textual signals transmitted between people is a conversational process. One person tries to communicate their worldview on a particular subject and the other person tries to empathically translate the message and to make sense of it from their own point of view. In essence it is a negotiation exercise relating to an exchange of benefits whether that is transactional and immediate exchange or a more transformational exchange that would result in longer term or downstream benefit. Either way, reward is involved. This conversation as both Holden [68, p244] and von Krogh *et al* [12, Chapter 6], argue is one that lies at the core of knowledge management and the K-Adv. For readers that are particularly interested in the concept of knowledge markets, Davenport and Prusak's book working knowledge has an entire chapter devoted to "the promise and challenge of knowledge markets" [18, chapter 2].

Ruth Wageman in her analysis of case study work focused upon 43 team leaders at the Xerox Corporation Customer Service organisation, identifies seven critical success factors for creating superb self-managing teams. She argues the need for a strategic intent that links rewards to strategy and high levels of team reward and maturity for self-evaluation against goals [148, p56]. She stresses that rewarding team members at different rates was only advisable at the margin. She indicates that at least 80% of the reward should be awarded equally to individuals within a team with the residue being either used to reward team leaders for demonstrating supporting action such as coaching etc or rewards being divided unequally but on a transparent rational and generally agreed basis. She is clear about additional rewards being given to leaders being done so on their clear capacity to help and mentor others.

The important role of stretch goals as the trigger for incentive schemes cannot be understated. It has been used as a risk and reward driver for the enhancement of the concept of partnering to embrace project alliancing and was particularly successful in its application on the National Museum of Australia project [85, 149]. Further Anil Gupta and Vijay Govindarajan in their

paper on lessons learned from the highly innovative and successful US steel company Nucor Steel, acknowledge significant stretch goals coupled with high powered incentives sparks breakthrough thinking that moves organisations well outside continuous gradual improvement [150, p78].

Given the position that knowledge creation is a process of framing and re-framing knowledge in a SECI [29] cycle, it is difficult to determine exactly who owns the resultant knowledge and therefore who should be rewarded and on what basis. Argument surrounding the issue of awarding incentives for knowledge sharing prompts many difficulties.

In reviewing the literature that features key thought leaders in knowledge management, it is agreed that because knowledge sharing is a communal activity it could be problematic to reward individuals rather than teams for delivering knowledge assets that were developed by groups, particularly as people enter and leave teams through the life cycle of teams forming and disbanding when focused upon tasks. Balkin and Montemayor argue that financial capabilities relating to various stages in the life cycle and human capital capabilities leading to an organisation's absorptive capacity should have a major impact on the application of team-based pay [151]. Ron Cacioppe draws upon lessons learned by development of high performance teams at Motorola and Trigon that share knowledge and are highly innovative. He summarises six key points relating to reward systems [152, p325]:

- “Have a clear strategic purpose for teams and rewards;
- Communicate about the rewards and the team results;
- Plan the type, criteria and use of rewards and recognition;
- Have financial measures and stretch objectives;
- Include training in interpersonal and teamwork skills; and
- Evaluate and review the reward system’.

While this advice is consistent with all sound project management practice he provides some interesting insights. For example he lists team rewards and recognition in terms of a financial reward, recognition and praise, and development and empowering work. He places examples of these on a continuum stretching from an individual focus through to a team focus and also links this to a continuum with extrinsic to intrinsic rewards on another dimension. He also makes the point that in terms of teams (and individuals for that matter) there is a life cycle of engagement that affects the desirability of any given reward. Teams go through a classic forming, storming, norming, and performing stages [153]. At the first start up stage rewards can be provide incentive for what he calls direction, helping them familiarise themselves with the vision that drives the initiative. At the operational stage when work is proceeding there needs to be incentives to maintain support of the team's work and support for each other. Also during the latter part of this phase when the tasks driving the initiative are either nearing completion or hitting the doldrums there needs to be incentives to maintain momentum in team and individuals supporting each other. Finally at the end of the initiative it would be appropriate to celebrate successes and good performance or to forensically investigate failures or shortcoming to learn from experience.

Cacioppe also introduces the influence of organisational culture as an important factor affecting reward systems design. He notes five dimensions [152, p329] from hierarchical to flat, from individual to team, quantitative to qualitative validity, competitive to cooperative, and concern for the financial

bottom line to concern for the triple bottom line (financial, social and environmental). Seven questions posed by Cacioppe [152, p328-329] are:

- What key results and behaviours do we want to achieve that we are not achieving now?
- What team rewards will best motivate people to achieve these results and behave in these ways?
- What are the indicators of team and individual success? How and when will we measure and report progress and final results?
- What is the best way to celebrate success?
- What do we estimate each of the reward schemes will cost and what is the total cost of the reward program? How will we pay for these?
- Are there aspects of fairness, group norms, and cultural differences that need to be considered?
- How do we handle an individual, teams or the organisation when it does not meet its targets and there is no reward?

Clearly rewards and incentives require a great deal of thought and consideration. To summarise, there needs to be consideration of: the purpose and objectives of the knowledge sharing (the organisation's imperative), individual and team reward balance, personal and team motivational drivers, stage of the team's development, team and organisational culture and that rewards can be financial, recognition or developmental.

**Table 25 – Reward Systems and the K-Adv**

Maturity	Performance Characteristic		
	Rewards Strategy	Individual-Team Motivational Fit	Individual-Team Cultural Fit
How can process capital be improved, by ensuring that →	the organisation's reward strategy is clear, well understood and effectively implemented.	the individual's and team's rewards are in harmony with their motivation drivers.	the individual's cultural norms and values are in harmony with the teams and the rewards strategy.
Inactive AWARENESS	Rewards are provided in an ad hoc way	Reward systems pay little attention to what individuals or teams want or articulate	Reward systems pay no heed to the culture or values of <i>neither</i> individuals nor teams
Pre-active INITIATION	Rewards are designed as a 'one size fit all' and implemented in an ad hoc manner	Reward systems are focussed on either the team or the individual in an either/or manner.	The organisational culture dominates. Reward systems pay no heed to the culture or values of <i>either</i> individuals or teams.
Active ADOPTION	Rewards are designed as a 'one size fit all' and implemented in a rigorous manner	Rewards systems are balanced but do not consider the life cycle stage.	Group culture dominates. Reward systems focus on the culture and values of individuals and teams.
Pro-active ACCEPTANCE ADAPTATION +	Rewards are designed to motivate teams and individuals to share knowledge and ideas.	Reward systems are balanced between team and individual and life cycle stage motivational drivers in mind	Reward systems are harmonised with individual and team values and culture so that they focus on what is of real value to those targeted for reward.
Embedded ROUTINISATION + INFUSION	Reward systems meet strategic goals as well as respond to	Rewards systems are designed with team and individual development	Rewards systems harmonise and energise the culture of individuals, teams

	individual/team goals and are reviewed and assessed appropriately. Extensive use of stretch goals.	in mind to enhance their future value to the organisation in mind	and the organisation and also complement aspirations of other less obvious contributing stakeholders
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*Reward strategies* at the inactive/awareness level, is characterised by an *ad hoc* approach with no rationale or a proposed implementation plan. At the pre-active/initiation level reward systems emerge from a ‘borrowed’ manual or source of procedures with little or no attempt at customisation and little or no implementation plan. At the active/acceptance level, the ‘one size fits all’ approach is rigorously applied in a standard QA compliance model. At the pro-active/acceptance and adaptation level, rewards are customised from previous experience and ‘best practice guides’ are designed to ensure motivation of teams and individuals to fully share knowledge and ideas. At the embedded/routinisation and infusion level, reward systems meet strategic goals of the organisation as well as responding to the individual team goals including appropriate assessment real-time as well as at periodic cycles of development of motivational needs and wants.

The *individual to team motivational fit* at the inactive/awareness level is characterised by the organisation designing a reward system that does not consider what incentives motivates either the team or individual. At the pre-active/initiation level, there is a focus on what incentives and rewards motivate but it is directed at either the individual OR the team/group. At the active/acceptance level, the rewards system has considered harmonising BOTH individual and team interests but has not considered the stage of the life cycle of the team so that the incentive matches the stage of development of the team—for example having an incentive to begin a knowledge sharing initiative say for establishing links is appropriate at the start up phase but if that reward continues then the incentive is to continually initiate links that do not continue, this is where a maintenance incentive needs to be introduced. At the pro-active/acceptance and adaptation level, the harmonisation between individual and group/team is extended to address team life cycle. At the embedded/routinisation and infusion level, the reward system extends to enhancing the future value of individuals and teams, perhaps this could be delivered as providing sabbatical leave to join other organisations or to develop ideas or techniques elsewhere. One important reward that could be offered at this level is time to reflect and record knowledge in terms of after action reviews that the US Army use [18, p9] (short term) through to learning histories where accounts of up to 100 pages may be written to fully record and discuss lessons learned [154].

The rewards system should also address the *individual to host organisation motivational fit*. At its inactive/awareness level, the organisation is unaware and its reward system and makes no attempt, to address the cultural perspective of either the individual or team—for example financial rewards could be made as an incentive to a group who see their work as artistic where better material resources, workspace or access to subjects might make a better cultural fit. At the pre-active/initiation level, the organisational culture completely dominates the rewards strategy—a not for profit organisation for example may complete deny the validity of financial rewards because of its altruistic bias. At the active/acceptance level, group culture dominates over the organisation’s culture and the individual. This can

leave a group for example getting into trouble through providing inappropriate rewards in the view of the organisation and/or struggling to gain commitment from individuals within teams because the team decides on rewards that hold no interest to the individual. At the pro-active/acceptance and adaptation level, the individual and team culture is harmonised with that of the host organisation so that rewards have a cultural fit with each party. At the embedded/routinisation and infusion level, rewards also fit and are harmonised with other less obvious contributing stakeholders. We are seeing more interest in 'family friendly' rewards now being introduced such as provision of day care facilities, and the emergence of home help rewards as part of some executive remuneration packages. These may be further extended where organisations pay for internet connections and home office equipment to allow children who help parents get accustomed to this technology for knowledge sharing. This recognition of children as 'shadow stakeholders', who may be making substantial contributions to mentoring and technical support of parents employed by an organisation, is only recently being taken seriously.

### ***Problem Solving, Experimentation and Learning***

At the core of knowledge creation lies reflective learning and this often is derived from solving problems through experimentation. We saw how Nonaka and Takeuchi describe the knowledge creation processes in terms of the SECI model [29, p62]. In the socialisation phase (S) tacit to tacit knowledge is exchanged, often triggered through a joint problem-solving activity in which discussion takes place to see patterns, discuss options and both mentally model and perhaps prototype solutions. In their five phase model of the organisational creation process phases, phase four involves building an archetype or prototype involves a joint problem solving process involving experimentation and results in learning [29, p89].

Von Krogh *et al* argue that this phase requires particular focus on what they call 'managing conversations', that is providing an enabling and supportive environment in which the organisation encourages and resources people to come together to solve a problem and share their points of view to arrive at a plausible, workable and justified solution [12, p9]. This is similar to what is referred to as modelling knowledge in which the outcome of an experiment is a picture of how the innovation or knowledge generating process is affected by various identified factors that drive or resist the creative process [18, p80]. Change management models that Peter Senge has developed [27, 155] also explain how change is affected by various environmental factors. In these and other cases the focus is centred upon creating a K-Adv through the medium of learning from problem solving by capturing tacit knowledge and either maintaining this as corporate memory in myths, stories and narratives or better still codifying it and making it explicit.

Karl Weick offers interesting insights in the way that people and groups make sense of things through active participation in situations that we could imagine as daily experiments in living and working. He makes the point that if you were to place bees and flies in an opened glass jar, the flies are more likely to escape before the bees. Bees take a more rule-based approach (which might seem more deliberate and therefore more intelligent). Flies make seemingly random experimental attempts at finding way out of the transparent



container and eventually stumble upon the open top [24, p381-382]. He infers from this example that flexibility through experimentation (when rules appear to be inadequate) is a more powerful approach than being too closely bound to theories, rules and procedures. He discusses the concept of *improvised design* [24, p59-60]. In this discussion he contrasts the generally accepted view of design with an alternative view that relates very strongly to problem solving, experimentation and learning. He contrasts: design as a blueprint (rules and specifications) with being viewed as a recipe (a guide that uses tacit knowledge senses such as smell taste and touch); design as constructed at a single point in time to one that is continuously reconstructed and self-referential (often by the time the design has been modelled the circumstances affecting the design has changed); designs producing order through intention (containing categories and relationships) with designs producing order through attention (being blinded by a model's rules as being the reality rather than a simplification of reality); and design that creates a planned change with design that codifies unplanned change after the fact. When all the tinkering and modifications to fine-tune whatever is being designed (often having to make quite radical departures at times) have been made, the design actually documents the process rather than being the process. He also describes design as *bircolage*. The French term for *bircolage* translates to 'jack-of-all-trades'—the term really implies a more ingenious and creative way of finding solutions to practical problems through continuous experimentation and reflection that creates deep insights and ingenious solutions.

An organised approach to adaptation is another core dimension to experimentation and learning. The notion of the not invented here (NIH) is a powerful barrier to developing a K-Adv. By way of contrast some organisations revel in stealing the ideas of others and adapting concepts and reframing them in contexts, useful to them. The "Steal Ideas Shamelessly" (SIS) concept for example has been celebrated in Xerox [156, p64].

Fear of failure is a major weakness that impacts upon organisations and yet as Garvin argues, based innovation on his research of the organisational learning and innovation literature, that knowledge gained from failures is highly instrumental in gaining valuable knowledge that is later used to productive ends in another context or form. He also maintains "A productive failure is one that leads to insight, understanding, and thus an addition to the commonly held wisdom of the organization" [156, p63]. While failure can be an expensive teacher (and some might argue an indulgent one) the greatest expense and waste of resources is the lack of review of failures (and indeed successes). When failures are 'brushed under the carpet' a learning experience opportunity is missed. The cultural symbols of how failures are dealt with provide critical signals to employees to help them understand how the organisation operates in reality rather than in theory. If lessons from failure are recognised as a learning exercise and widely acknowledged as such, then people are more likely to discuss the reasons and causal factors behind the failure rather than invest their energy on concealing failure, covering up and obscuring the resultant aftermath.

Organisations can facilitate learning in a number of ways. They can create contexts and support mechanisms for people to reflect and learn and share their insights. They can also ensure that 'blue sky' research is not only linked to practical product/service/process design research but is also linked to

education and training. One pertinent way that learning can be achieved is through an action learning approach where learning and reflection are inextricably linked [25, 157-159]. Further, through use of rapid prototyping and simulation in developing innovations jointly with users, a process of “enlightened experimentation” can be pursued, as has been the case with BMW’s product development for example [75, 160].

The notion of ‘corporate universities’ may seem a little like academic hegemony, but if organisations can incorporate reflection and derive lessons to be learned from their experience, they are going a long way towards double loop learning [25]. Single loop learning addresses the symptoms of problems as a ‘quick and dirty fix’ while double loop learning probes deeper to determine causes of problems and then finds ways to obviate them. A number of organisations have established such learning institutions ranging from substantially a training focus to ones centred on leadership development, examples have been cited earlier, other documented include Boeing, British Aerospace, and Motorola [72].

Another approach to learning can be observed in the concept of ‘demonstration or model projects’. These are projects and/or initiatives where: they are often the first to embody principles, practices and approaches that the organisation might wish to try out, provide sufficient resources and management energy and publicity to create high levels expectations that attracts the most creative people to contribute to the initiative so that others can learn from these demonstration projects; provide strong multi-disciplinary teams to bring the maximum of diversity of approach and insights into learning from them; and they also are used to test-bed and trial proposed ideas that organisations may see as their future so that they can conduct small scale experiments to gauge the likely impact on the organisation if the pilot becomes mainstream [156].

The benefits to be gained from learning and innovation have been previously noted as being affected by the organisational approach to the ‘stickiness’ of knowledge and the ‘absorptive’ capacity of the organisation in Chapter 6 section Knowledge Sharing and Transfer with reference to knowledge combination capability for generated human capital illustrated in Figure 19 - Social Capital in the Creation of Intellectual Capital.

Stickiness of knowledge refers to the difficulty of transfer [161]. Often this is because tacit knowledge is deeply embedded in individuals and it is extremely difficult to extract this knowledge and share it because some tasks have to be experienced to be fully known. For example champion sports heroes can be interviewed rigorously and can write books and manuals and even feature in multi-media training materials, yet their knowledge of how to perform is so deeply embedded in their knowledge of their own body and how it reacts to various physical and mental stimuli that it is all but impossible for them to transfer their unique knowledge advantage even if they crave to do so. Similarly, some knowledge is deeply culturally bound and very sticky, that is difficult to transfer—it gets stuck to the knowledge object such as skill or a product like a work of art.

Cohen and Levinthal coined the phrase ‘absorptive capacity’ to describe how readily knowledge can be absorbed by an organisation [52]. They see this capacity being a feature of an organisations prior related knowledge. Thus if an organisation has embraced experimentation then it has built up and

created an experience base and repertoire of responses to solving that kind of problem. It has a running start on any further experimentation of this nature. If the organisation has undertaken more formal research and development then its key researchers would have established background knowledge of the relevant literatures and have not only been exposed and introduced to these ideas but also would have gained an appreciation of critical features of benefits and limitations of this knowledge. This history and prior learning builds its capacity. Cohen and Levinthal provide the example of language learning, if one has some experience of a related language Spanish or Italian for example, then learning a new one in that family group French for example or Portuguese is less difficult and even learning one in an entirely different group such as a Slavic language is somewhat easier because basic patterns of expectation of what needs to be known are known so again the learner is better prepared and primed for the occasion [52]. This absorptive capacity influences the ability of organisations to take great ideas from elsewhere and reframe them to build a K-Adv. A prime example of this is learning from competitors and learning from customers [73-75, 77, 78, 162].

A good example of learning by critical observation was the development of improved surgeons operating procedures. When critical observers watch and learn they are in a position to see people they observe interact with their environment and thus have an opportunity to ask them how they see their world from their point of view, they see how users customise and change products to suit their purposes, they gain an impression of intangible attributes of the product and have the chance to probe users to explicate hitherto unarticulated needs [79]. By having a trained product design observer from Hewlett-Packard watch how surgeons and nurses interact in operations using TV screens and monitors to visualise the patient's internal organs and body using cameras and scopes inside the patient and other ways of 'seeing' inside them, it became clear that a tiny monitor mounted on a surgeon's helmet as a permanent display system would be far more advantageous for surgeons than peering at TV monitors that can get blocked out by the transit of passing people during the operation [44, p201]. What is necessary in creative dialogue with users is that the articulated needs of a potential customer is linked with an empathic design framework to pre-empt and understand that customer need before the customer can describe it. This is often the result of an individual's strong absorptive capacity as well as the organisation being open minded enough to have a strong multidisciplinary team to tackle complex problems and to raise challenging questions.

Finally, organisations need to be prepared for disruptive change. Clayton Christensen and Michael Overdorf argue that sustainable innovation advantage must be accompanied by occasional or sporadic radical shifts in direction. Breakthrough technology, processes and cultural mindsets often make existing ways of doing business redundant [163, p72]. This may require establishing separate competing BUs one with an existing state-of-the-art technology/process etc. and another as developing the challenge to that product or position leadership. The ICT enterprise Cisco Systems does this a great deal of the time [163, p76] but it needs management and the workforce to have an open mind and be highly responsive and adaptive. Organisations that rely on loyalty and commitment to a particular product/services or technology risk being marginalised. Sometimes the best organisational

response may be to institutionalise the competition for ideas [164]. This is a strategy that may be behind the Leighton Holdings competitive advantage approach where three subsidiaries (Leighton Contractors, Theiss and John Holland Group) are engaged in intense internal competition. This approach and ethos is often seen in high technology fast-moving industries, however, unstable or turbulent markets rather than the more stable business sectors such as construction engineering.

Some companies embrace the opportunity of change and leveraging on its evolving learning culture to reinvent itself. On relevant example is in the aerospace industry where Boeing is going through substantial changes and organisational reinvention as it experiments and develops itself into a significant service industry with knowledge product spin-offs complimenting its manufacturing and maintenance activities [13]. This trend is evident in other industries for example in the oil and gas industry. In an interview published in the Harvard Business Review, John Seely Brown the head of BP maintains that organisational reinvention through improved knowledge management has made BP more attractive to investors, its supply chain partners and its ability to attract high performing talent [59]. Clearly there are advantages to dynamic ever-vigilant organisation being unafraid to experiment, evolve and reinvent itself [165].

**Table 26 – Problem Solving, Experimentation Learning and the K-Adv**

<b>Maturity</b>	<b>Performance Characteristic</b>			
	<b>Experiential Learning</b>	<b>Organisation Response to Failure</b>	<b>Organisation Linking R&amp;D to T &amp; D</b>	<b>Change Adaptation &amp; Re-invention</b>
How can process capital be improved, by ensuring that the organisation→	stimulates people to learn through joint problem solving and testing ideas in developing or adapting ideas.	minimises the –ve and accentuates the +ve impact of learning from mistakes	supports and sustains learning through “blue sky”, applied and action research	encourages and sustains an adaptive capacity to change k-approaches and business focus when necessary
Inactive AWARENESS	Adapting from others with ad hoc uncoordinated problem solving for “fixes”. Experimentation seen as a cost.	Failure is punishable. Little tolerance for taking risky experimentation that might fail.	Little or no link between R&D activities and subsequent T&D. Focus on T&D is based upon past successes.	Fear of the unknown inhibits adoption of new ideas and adaptation of good ideas from others
Pre-active INITIATION	Takes a not invented here (NIH) mind set and only develops in-house solutions	Failure tolerated but rarely forgiven. Lessons learned are lost in cover-ups.	R&D and T&D are considered as cost-centres and so compete for resources.	Management understands the need for adaptation and takes ad hoc initiatives often viewed as fads
Active ADOPTION	Followers in taking existing systems from others and applying it with minimum thought of how to adapt it	Forensic examination of failures for lessons learned but non-standard format for reporting these.	R&D and T&D are coordinated and focuss on organisational needs. R&D is mostly applied research.	Continual change, restructuring and renewal to cope (reactively) with need for innovation. Poorly strategised.

Pro-active ACCEPTANCE ADAPTATION +	Scans for good ideas and plans and prepares for their implementation and adaptation. Encourages piloting and trialling	Failures are valued as learning opportunities. Rigorous methods are used for reporting and categorising lessons for k-transfer.	R&D activities span the supply chain and T&D likewise. There is a strong focus on getting user T&D to help with feedback to R&D after design	People selected & promoted on the basis of their capacity to adapt and help re-invent the organisation.
Embedded ROUTINISATION + INFUSION	Co-develops with lead customers and supply chain partners through piloting. Continually tests and probes for new ideas.	Harvesting lessons learned from all projects. Identifying critical lessons learned as a k-creation activity and rewarded as such	R&D and T&D are linked through action learning with feedback from users to idea generators so that both groups jointly develop and learn during design	Aims for disruptive change. Uses iconoclasts to challenge and trigger organisational reinvention. Co-opts customers and supply chain in reinvention.

*Experiential learning* at the inactive/awareness level, is characterised by blindly following the innovations of others (often competitors) with uncoordinated problem solving to obtain quick fixes when the innovations does not match the organisation's needs. This places members of the organisation under constant pressure of 'fighting fires' and not understanding why an innovation that works for one group and not for others. This is largely a consequence of experimentation as being seen as a cost and so piloting and trials are seen as a waste of money and/or time. At the pre-active/initiation level, outside innovations are rejected because of a 'not invented here' (NIH) mindset. Experimentation becomes fragmented, uncoordinated and in-house solutions have limited lucidity across the organisation. At the active/acceptance level, the organisation is a late adopter but willing of innovation and follows others and takes little heed to the wisdom of experimenting and adapting the innovation to the organisation's unique circumstances. At the pro-active/acceptance and adaptation level, the organisation actively scans for good innovations and plans and prepares for its implementation including piloting, experiencing it through trials and piloting and prepares for wider adaptation and adoption. At the embedded/routinisation and infusion level, innovations are co-developed with customers and supply chain members. Because the organisation at this level has gained a reputation of being a good beta test site or if instigating innovation is regarded as a good research partner, it is sought after by highly innovative partners. Employees are encouraged to continually test and probe ideas and re-visit their experience for inspiration.

The *organisational response to failure* of experiments and pilot programs at the inactive/awareness level, is characterised by hostility and punishment. There is little tolerance for taking risks not virtually guaranteed to succeed. This results in a highly conservative and wary attitude by the organisation when responding to the prospect of having to deal with change and experimentation. At the pre-active/initiation level, Failure is tolerated but rarely forgiven and so any lessons learned are covered-up as a result of the sense of denial that accompanies fear of long-term memory of the incident being a failure (but with no rigorous concept of the reasons why). At the active/acceptance level, there is a forensic examination of failures and their

likely causes and consequences but there is no agreed standard way of reporting these for re-use of a lessons learned knowledge bank. At the pro-active/acceptance and adaptation level, failures while not encouraged, are welcomed as a useful learning opportunity to be made available across the organisation. An agreed procedure for monitoring and analysing experiment outcomes allows for organisation-wide transfer of lessons learned for both successful and unsuccessful experiments and pilot trials. At the embedded/routinisation and infusion level, the lessons-learned system is widely used throughout the organisation are acknowledged and those responsible for generating valuable knowledge capital are rewarded.

There are little if any *links between research and development (R&D) and training and development (T&D)* at the inactive/awareness level, so that R&D, production and T&D staff have little or no contact to learn from each other. At the pre-active/initiation level, R&D and T&D both compete for the same resource base and so there is competition and systemic incentive for lack of cooperation. At the active/acceptance level, R&D and T&D are well coordinated with a focus on organisational needs. The nature of R&D being undertaken is mainly applied. At the substantial level R&D is balanced with study of both organisational and supply chain research questions. At this level, users are encouraged and facilitated to provide feedback. R&D and T&D staff interacts to jointly evaluate research outcomes. At the embedded/routinisation and infusion level, R&D and T&D are linked through a culture of action research and joint learning. The research focus is to integrate users in applied research as testers and independent evaluators. The culture of customer/user as valued knowledge asset is firmly embedded.

*Organisational adaptability and capacity for re-invention* at the inactive/awareness level is characterised by a trepidation about change and the unknown. Any new ideas or attempts to changes in approach, experimentation or reinvention are strongly resisted. There is little history of experimentation with which to draw any comfort or learning from. At the pre-active/initiation level, management understands the need for change and reinvention of the organisation. It takes initiatives from time to time but they are *ad hoc*, poorly planned and implemented and are generally regarded as passing fads and therefore not well supported. At the active/acceptance level, there is continual change; restructuring and evolutionary renewal of the organisation but it tends to be reactive in its response to a turbulent business environment and poorly strategised, thus employees tolerate but do not embrace such change. At the pro-active/acceptance and adaptation level, people are selected for promotion and their abilities to help the organisation adapt to change and reinvention is fully recognised. The workplace culture accepts change, adaptability and reinvention as inevitable and healthy. At the embedded/routinisation and infusion level, the organisation not only tolerates dissent but positively encourages iconoclastic behaviour by those who can constructively question the status quo. This creative tension is recognised as the key to forcing management and the workforce to challenge commonly held beliefs about the organisation's direction and 'think outside the box' when seeking to visualise a preferred future direction. This forces the pace of reinvention and evolution that provides differentiation and competitive advantage through developing distinctive competencies [165].

## **Knowledge Sharing Processes**

Few if any organisations are self-sufficient in creating the required knowledge for their business. Thus, apart from transferring knowledge within their organisation, they will have to share and transfer knowledge with both their business partners and customers. This is what Nonaka and Takeuchi refer to as their fifth phase of creation knowledge, cross-levelling [29, p88]. Sharing knowledge either within the organisation or between organisations requires person-2-person as well as group-2-person and person-2-group knowledge transfer. In the section entitled 'ICT and the K-Adv' I discussed the impact of ICT on knowledge creation and transfer and in the section entitled 'Knowledge Transfer for the K-Adv'

I also discussed Nancy Dixon's work that identifies 5 types of knowledge and how that knowledge transfer might be best activated. To recapitulate, the 5 transfer types are:

- *serial* (using tacit and explicit knowledge for doing the same task repeatedly);
- *near* (explicit knowledge being passed to others doing similar work);
- *far* (tacit knowledge for non-routine work to others in another part of the organisation);
- *strategic* (using both tacit and explicit knowledge for infrequent but critically important different functions to others in the organisation); and
- *expert* (using explicit special expertise to do a different task but in a similar context) [43, p144-145].

From this discussion we can see that there is no one best way of communicating knowledge and throughout this guide I have stressed the importance of richness in information and knowledge transmission variety as well as a multiplicity of distribution channels.

Tacit-2-tacit knowledge transfer requires the richest and most interactive media and transfer style. This is where people need to not only tell someone something but to also listen and clarify. Thus, mentoring, demonstration, engaging in dialogue, and describing concepts in metaphors is vital. How do people locate each other to do this? This is where a network of people such as communities of practice and an ICT 'yellow pages' type system shorten the search time to reach the appropriate person for mentoring and/or coaching and peer-2-peer dialogue.

Tacit-2-explicit and explicit-2-explicit knowledge transfer requires a storage media for channelling the knowledge. Media can include text, data, sound, image and even more tactile representation such as smell and feel either through real or synthetic means. A critical need for this knowledge exchange is a good annotation and peer review system to ensure that only relevant knowledge is made the most readily accessible and available at the shortest possible access time [46]. A good peer review system can add value through ensuring clarity, brevity and usable links where applicable between explicit knowledge sources.

Whatever the media or channel might be there will need to be a facilitating cataloguing arrangement to produce easily searchable taxonomies (sets of terms that are context sensitive) using indexes and meta-data (information about information) with functional search engines and mechanisms to shorten the search time and improve the quality of search results.

Much knowledge will be embedded and making this explicit takes a high level of skill and forethought. I can still remember my own first week as an undergraduate in Wales UK when I met two Geordies (people from Durham, UK) and a Lancashire lad. We all used the word 'flog' differently. I used it to mean 'sell', The Lancashire lad used it to mean 'borrow' and the Geordies used it as 'steal'. We were all English speakers and yet even this common language term threw us completely into confusion. Rapidly changing technical terms, jargon, and misuse of the meaning of language contribute to the need for a reliable taxonomy. Further, the above example illustrates just how context sensitive language can be and the need for classification of knowledge categories to enable better quality communication of meaning

Explicit-2-tacit knowledge happens when socialised and combined knowledge is internalised. This is generally accomplished through experience and problem solving. To maximise the value of this kind of transfer a joint problem exercise is appropriate, a suitable search facility to locate and bring together the optimal group of people can be invaluable for this purpose. An excellent example of how experts were able to collaborate on jointly solving problems and addressing the challenges of develop the Andrew oil field in the North Sea by the BP exploration group. This group was 'virtually' brought together from across the world using a variety of communication tools including email, video conferencing and shared interactive software whiteboard tools [59, p152]. Another ICT facilitator is the development of simulation software with embedded knowledge that uses rules to simulate the modelled situation being tested. In this way tacit knowledge is created as the user 'plays' with the simulator and better understands the modelled situation. However, as Carl Weick cautions us, simulators and computer-based programs have generally limited sensory representations in which the full range of sounds and smells and inconsistent cues (that would develop to linger in the back of one's mind under 'real' rather than computer simulated conditions) tend not to be developed [24, Chapter 6].

Kasra Ferdows illustrates the way in which knowledge can be developed as an evolution of developing skills and knowledge from an organisational development point of view. His paper is mainly related to manufacturing expertise development and technology transfer but it is also highly relevant in terms of organisational knowledge transfer strategies. He charts the strategic role of foreign factories from an *offshore* factory where low-cost is the defining competitive advantage through to *outpost* and *lead* factories that have greater knowledge input embedded in their delivery. The *outpost* factory gathers knowledge from local customers while the *lead* factor works with customers to develop specific product applications that meet their needs [166, p76].

I have already discussed the role of communities of practice in detail and in the 'Knowledge Sharing and Transfer' section of this chapter. I also discussed how knowledge networks could build social capital. The extent to which knowledge can be transferred across the supply chain is linked to that element generating social capital. The process capital aspect is the motivation and application of supporting and encouraging cross-organisation knowledge transfer (including the supply chain). For example in Dorothy Leonard-Barton's book "Wellsprings of Knowledge" she details how innovation is enhanced by members of supply chain teams being seconded to learn how the supply chain partners do business and how to best integrate knowledge



and processes to realise innovation and improvement [44], indeed much of the literature on alliances and long term relationship based procurement is centred on this concept of shared learning [1, 109, 138].

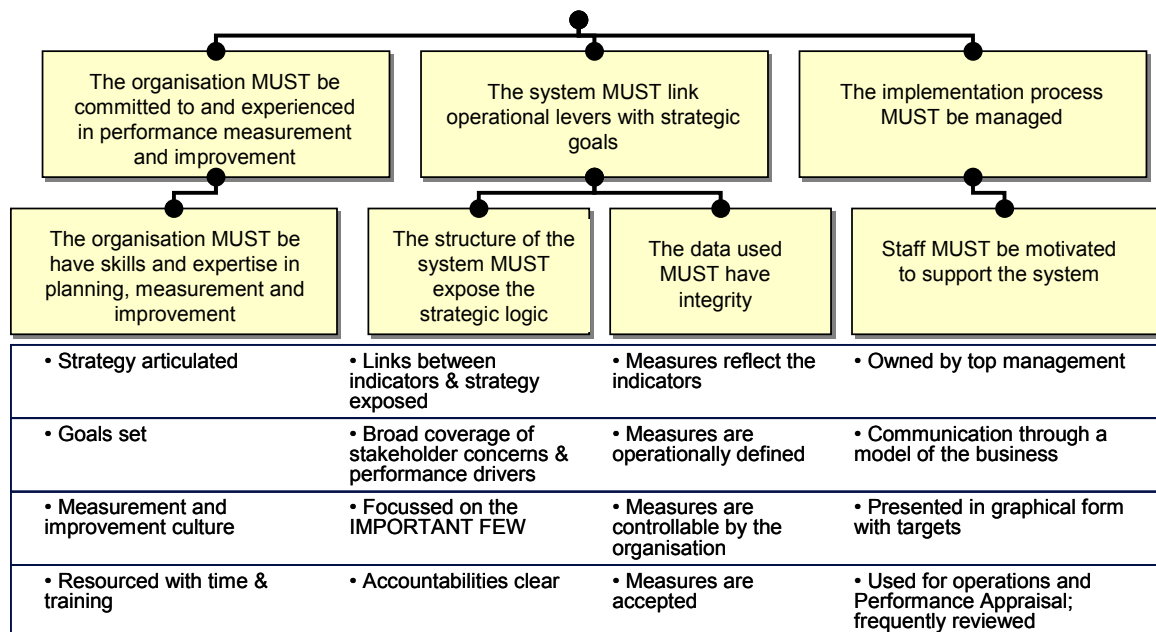
The literature quoted thus far has overwhelmingly stressed the value of knowledge as a vital and key component of competitive advantage and business sustainability. However, Measuring the value of knowledge has been problematic. A number of leading knowledge management thinkers have highlighted the value of knowledge as an intangible asset. Karl Sveiby for example provides a balance sheet model of a knowledge organisation in which he draws our attention to intangible assets including the external and internal structure of an organisation—its relationships and internal business processes and embedded knowledge in manuals, systems and culture [11, p11]. This Scandinavian school of thought has led the world with its appreciation of the value of knowledge. The Scandia value scheme [9] has been offered as a leading and innovative way of providing a way to value knowledge that moves beyond subtracting the tangible asset value of an organisation from its market share price value and re-conceptualise 'goodwill' as intangible assets that include (in a major way) knowledge and intellectual capital. Edvinson had the task of developing knowledge measurement tools and he and his group of colleagues developed the Skandia IC-Navigator this is a useful devise that has at its core, a human focus and views the lag, current and lead performance indicators with a balance between a financial, customer, process and renewal and development focus [12, p93]. The financial focus for example has one measure on \$ market/value per employee and another as premium income resulting from \$ new business operations. The customer focus has measures such as number of customers lost, days spent visiting customers and a satisfied customer index. The process focus measures applications filed without error (the instrument is for the insurance division). The IC Indicators are Empowerment Index, time training in days/year, motivation index and employees working home/total employees. The renewal focus measures include such things as satisfied employees index, training expenses/employee and an interest one competence development expense/employee. While such measures are always highly debatable in what they measure and how these variables are measured it nevertheless attempts to gain amore holistic picture of performance and is linked to knowledge valuation.

An interesting aspect of this component of a K-Adv is that a balanced scorecard approach (BSC) can be applied. The BSC is not becoming a mainstream advanced way of measuring business performance. Interested readers should refer to the seminal work of Kaplan and Norton [32, 37, 97] and Eccles [33]. A number of academics and practitioners have offered ways in which the BSC can be used to link measurement with strategy. A good reference for this is Andy Neely's work [34, 35]. A useful model of how this may be applied is presented in Figure 21. The rationale is very close to the requirement for defining a K-Adv and its strategic use.

This provides a valuable model of best practice for developing measures of knowledge and innovation, though it does not provide the key measures as this is beyond the scope of this publication.

The final sub-element in the process capita element of the K-Adv is the organisational response in supporting cultural awareness. This enables the

cross levelling of knowledge across teams both within an organisation and cross the supply chain.



**Figure 21 - An example of a Balanced Scorecard Approach Link to Strategy**

Geert Hofstede, an acknowledged expert in the study of national and organisational culture, has stated that there are three levels of the way in which human cultural behaviour is determined. At the universal level human nature is inherited. Specific groups within the human population acquire culture through learning from their environmental surroundings, the influence of those around them and their history. Individual personality is specific to the individual and is both inherited and learned from the taproot of their cultural group, their family and proximal communities [122, p6]. He goes on to link that with the concept of symbols, heroes and rituals influencing practices that are perceived from an underlying set of core values. Edgar Schein provides a simple model of culture. He talks about artefacts as being the visible but often-undecipherable things that are generated from core values, however, beneath these are cultural assumptions that are ingrained [167]. The interesting part of these notions of culture is that values and assumptions are collective or social tacit knowledge.

The ability to be empathic in design and dealing with knowledge creation and development has been already explored in this text. One of the key issues relating to this has been the ability to actively perceive another's point of view. This goes to the core of culture, be that national or organisational. Charles Hampden-Turner and Fons Trompenaars developed a six dimensional way of explaining cultural diversity [121, p11]. In one dimension of this model they see at one end of it, a focus on rules, codes, laws and generalisation (universalism) while at the other end of that dimensional continuum they see exceptions, special circumstances, unique relations etc. (particularism). So for example you might have a particularism-oriented person getting highly frustrated trying to explain some knowledge about how to do something and the message not reaching its target because the other person is highly universalism-oriented. Another continuum dimension is individualism versus communitarism—personal freedom as opposed to a social responsibility. The third dimension is specificity

versus diffusion—atomised, reductive and objective as opposed to holistic and relational. The fourth relates to status, achieved status (based upon a track record) versus ascribed status (who you are being defined by connections or birthright). The fifth dimension is inner versus outer direction or orientation. The sixth relates to an attitude towards time. A sequential time orientation views events as being planned to occur across specific time lines and being bound by these constraints whereas a synchronous time orientation sees event occurring within seasons and unfolding in some natural pace or order.

The purpose of this brief sojourn into the literature of culture is that we frequently talk about a workplace culture or national culture or stereotyped people by our perceived cultural norms or expectations without really understand what we mean by culture. Even if we define culture in the often-expressed terms of “the way we do things around here” it still does not explain how things are done in any particular way. The above concepts help us to think of this in terms of a model or framework within which we can better understand how root assumptions and values are formed. It helps to unpack some of the tacit knowledge that is embedded in communities and ourselves so that we can start to actively listen and actively observe.

Nigel Holden is a linguist and student of culture that has written extensively in the field of management. He provides some very fascinating insights into culture as an object of knowledge management. His ideas help to clarify what is meant by contextual knowledge. He discusses *thin knowledge* which he defines as “the minimum knowledge required by a user to be necessary for a specific objective, that is to support a decision” and *thick knowledge* which is “very rich, very wide-ranging, and is arcane, that is ‘requires secret knowledge to be understood’” [68, p95]. This perspective is useful because if a transactional approach is taken to developing a K-Adv then thin knowledge is required—you just get on with the task of knowledge management. However, if you consider the K-Adv from a relational perspective then thick knowledge is required because knowledge management is more concerned with continued interaction and mutual understanding as part of the knowledge work. Taking this idea further, part of the K-Adv requires development of process capital to facilitate knowledge sharing and transfer. Members representing organisations need to be aware of the advantages of cultural diversity in terms of gaining access to a wider pool of knowledge about core assumptions and values of different cultural groups so that they can better frame communication media and channels. They also need to be culturally literate to be able to better ‘read’ the subtextual signals and body language or even literary styles of those that they deal with. In doing so they enhance the knowledge sharing process. As McDermott and O’Dell explain, “overcoming ‘cultural barriers’ to sharing knowledge has more to do with how you design and implement your knowledge management effort than with changing your culture” [168, p84].

**Table 27 – Knowledge Sharing Processes and the K-Adv**

<b>Maturity</b>	<b>Performance Characteristic</b>		
	<b>Cross-Levelling Knowledge</b>	<b>Valuing Knowledge</b>	<b>Supporting Cultural Awareness</b>
How can process capital be improved, by ensuring that →	the organisation’s approach to supporting the knowledge transfer process across	knowledge is not only valued as a concept but that it is measured to facilitate development	the individual’s cultural assumptions and values are understood and considered when designing

	organisations.	of reward systems.	and implementing knowledge transfer.
Inactive AWARENESS	There are no procedures or guides to help in any form of k-transfer	There is no way to define knowledge as being a valuable asset within the organisation	There is no explicit or implicit understanding of the role of culture in k-sharing and transfer
Pre-active INITIATION	Procedures, guidelines and experience for 1 or 2 of the 5 types of K-transfer	Explicit knowledge is generally valued and its impact is tacitly understood	The organisation is aware of the role of culture in knowledge sharing and transfer but takes no action on it
Active ADOPTION	Procedures, guidelines and experience for 3 or 4 of the 5 types of K-transfer	Explicit knowledge is generally valued and its impact is explicitly understood with measures to report and act upon	The organisation has many policies to do with cultural diversity and its impact upon k-work but plans are ill-prepared and not effectively monitored.
Pro-active ACCEPTANCE ADAPTATION +	Procedures, guidelines and experience for all 5 types of K-transfer within the organisation.	Both implicit and explicit knowledge is generally valued and its impact is understood explicitly with measures to report and act upon	The organisation has advanced plans and policies relating to cultural diversity based on its understanding of k-work. Plans are monitored and controlled with targets etc
Embedded ROUTINISATION + INFUSION	Procedures, guidelines and experience for all 5 types of K-transfer across the supply chain.	A full BSC approach to knowledge has been established that links knowledge as a valued asset to strategy of dealing with the supply chain	The organisation's cultural diversity strategy has been implemented and refined over time and is firmly embedded in the organisation's dealings with all stakeholders

*Cross-levelling knowledge* at the inactive/awareness level, is characterised by no organisational guides or procedures to help people find the best way to transfer knowledge. At the pre-active/initiation level, one or two of the five knowledge transfer types (serial, near, far, strategic and expert) have organisational guides or procedures to help people find the best way to transfer knowledge has been developed through experience and both knowledge for these transfer types and the process for transferring it is well established. At the active/acceptance level, this organisational capacity and knowledge transfer performance is extended to three of four of the knowledge transfer types. At the pro-active/acceptance and adaptation level, all five knowledge transfer types have been experienced and procedures well established. At the embedded/routinisation and infusion level, this has been embedded into the organisation culture so that organisations easily find the best approach to automatically transfer and deal with knowledge transfer.

*Valuing knowledge* by the organisation at the inactive/awareness level, is characterised by little or no organisational access to the concept of what knowledge assets are, or their nature. At the pre-active/initiation level, there has been a protocol developed that has been implemented to audit explicit knowledge but the value of this knowledge is only implicitly and tacitly expressed. This makes it difficult for the organisation to move beyond reporting on and rewarding individuals and/or groups for the transfer of explicit knowledge value. At the active/acceptance level, the value and impact of explicit knowledge is well understood and measures have been developed to explicitly record and act on these. At the pro-active/acceptance and adaptation level, the value to the

organisation of both explicit and implicit knowledge is generally valued and understood so that a full appreciation of the value of its knowledge assets can be recorded and acted upon. At the embedded/routinisation and infusion level, a full balanced scorecard of knowledge assets has been developed and is in use to monitor performance and drive knowledge strategy across the supply chain.

*Supporting cultural awareness* at the inactive/awareness level, is characterised by an implicit or explicit understanding of the role of culture in effective knowledge transfer. At the pre-active/initiation level, the organisation's procedures seem to indicate some awareness of the role of culture but there are no policies of action plans to ensure that knowledge transfer is taken into consideration. At the active/acceptance level, the organisation has many cultural impact policies relating to knowledge work but plans, if prepared, are in a nascent state or poorly prepared. Any actions resulting from these are *ad hoc* and not monitored for feedback and improvement. At the pro-active/acceptance and adaptation level, the policies and plans for considering culture within knowledge work is well advanced with monitoring and feedback systems in place to improve and develop these. At the embedded/routinisation and infusion level, cultural diversity and awareness of its impact upon knowledge work is so refined and firmly embedded that people deal with all stakeholders as a matter of course with sensitivity to their cultural framework. Finding out within the organisation how to best deal with cultural impact issues is well known, highly accessible and ubiquitous.

## **Chapter Conclusion**

This has been a long and intensive chapter. The importance of the people infrastructure framework on developing and sustaining the K-Adv is critical and often overlooked. The discussion in this chapter has been focussed around the individual's role and part in building social capital and the organisation's role and influence in enabling this social capital to flourish and to be realised through the organisation's process capital.

Trust and commitment was first discussed because the individual is the principal actor in any knowledge exchange. This was followed by a review and discussion on exactly how the SECI knowledge process works. Focus on the individual naturally shifts to the individual's interaction within groups and so a section on knowledge networks was explored. Another key element of knowledge work is the individual's ability to making sense of knowledge and its implications upon them and their organisation.

There must be helpful processes in place for an organisation to fully support the individual. This will also lead to the rejuvenation of the organisation as it takes advantage of unfolding opportunities offered by capitalising on individual knowledge strengths. The organisation needs also to adopt a sophisticated view of resourcing and rewarding the development of social capital to drive the K-Adv. The organisation will also have a view on how it encourages and sustains problem solving, experimentation and learning to support people building social capital. Finally, there needs to be an organisational response to knowledge sharing that facilitates building social capital.

This chapter brings together management and social theory to substantiate the models proposed. While this may seem to be overly academic it is necessary because the whole K-Adv rests on wisdom and a deep understanding on how knowledge work functions.

In the next chapter, I will discuss the drivers and barriers to achieving the K-Adv and the impact that this has upon the organisation and its part in the supply chain as it is substantially based upon the people infrastructure element of the K-Adv though both leadership and ICT infrastructure support plays its part.

## **Chapter 7. Implications of the K-Adv for the Construction Industry**

Derek H.T. Walker and Vachara Peansupap

The following will be discussed in this chapter:

- Purpose of the Chapter
- Power and Influence Implications for Implementing the K-Adv
- Anxiety and the Change Process
- Drivers and Barriers to Innovation
- Innovation Diffusion and the K-Adv
- Chapter Summary

### ***Purpose of the Chapter***

The purpose of this chapter is to explore and explain the relevance of the K-Adv's and its relevance to the construction industry. The chapter deals with practical issues of facilitating change, such as changing the mindset or paradigm that currently prevails in most of the construction industry. The K-Adv paradigm relates to the primacy of knowledge as a critical asset to be nurtured and effectively employed.

### ***Power and Influence Implications for Implementing the K-Adv***

One of the major challenges that organisations face today is adapting to change, particularly through innovation. Whenever change is suggested or a new innovation introduced there always seems to be some level of resistance—often greater than expected and also from unexpected quarters. Further, as the rhetoric of empowerment of the workforce is realised so that they can unleash their latent creative energies those who help positional power feel threatened by the 'new' power base of expertise or connective influence from being part of well-recognised communities of practice. Thus, when embarking on the chase for the holy grail of the knowledge advantage there may be greater passive and/or active resistance from the levels of management that feel that they have the most power and influence to lose than from the workforce. Why is this so? This chapter provides some useful insights that might help to explain this all-too-regular reaction.

I have used some terms here relating to power and influence that need explanation. Raggins defines power as "the influence of one person over others, stemming from an individual characteristic, an interpersonal relationship, a person's position in an organisation, or membership of a societal group" [169, p96]. The implications of this is that those with power are interested in maintaining their influence and resources, and may do so by supporting policies, practices, and prescription that exclude other groups from power (such as an empowered workforce). Society and those in the organisation with power substantially shape power relationships among groups in organisations.

In *People Enabling Infrastructure* and the K-Adv I discussed at length the impact of culture on the development of human capital. Some organisational cultural cultures, like national cultures, are collectivist in nature. Hofstede argues that in this environment there are strong distinctions between

members that create in-groups and out-groups [122] when the power base shifts (such is the case when expertise is more highly valued than formal position) those who are in the in-group feel threatened that they may become banished to an out-group. Powerful individuals are in a position to shape culture through influencing values, assumptions and ideologies. Building shared mutual goals is a leadership exercise using power and influence constructively to convince others that they share project objectives that coincides with their own individual interests. Leadership under these conditions requires considerable energy and intellectual pursuit of argument to build consensus and align interests with those of project outcomes. This was discussed at length earlier in Leadership Enabling Infrastructure and the K-Adv, the implication of this view is that the organisations leaders' mindset can determine, to a large extent, the nature of power behaviours exhibited in teams, projects or within an organisation.

*Power*, has also been defined as an agent's (person wielding power) capacity to influence a target's (person subject to this power) attitude and behaviour. Authority is concerned with perceptions about the prerogatives, obligations and responsibilities associated with particular positions in the organisation. Influence is restricted by the target's willingness to do what is asked, if this conflicts with the target's moral code then the target will not accept the agent's right to compliance [170]. The way in which authority affects behaviour is important in an organisation as it impacts upon the effectiveness of this action. Commitment results when the target has absorbed and accepted suggestions of the agent. If this acceptance is grudgingly given or is not wholly accepted then the result will be compliance. If the agent disagrees with the agent then overt/covert resistance will follow. Yukl describes three levels of reaction to authority [170].

- *Instrumental compliance*: the target is willing to do whatever the agent requests, but only for reward. Power used by the agent is fear/punishment or reward. If the agent loses power to reward or the value of the reward ceases to be attractive, compliance will cease;
- *Internalisation*: the target becomes committed to support the agent's proposals aligning goals/vision accordingly. Commitment is independent of rewards offered as values and beliefs are the driving forces; and
- *Identification*: target complies to curry favour of the agent. Relationship and affiliation motivate this behaviour. If the agent becomes less attractive then commitment is withdrawn.

The implications of these reactions are highly pertinent to developing a K-Adv through cultural change. Yukle also defines three source groups of power and describes their characteristics.

*Position power* derived from statutory or organisational authority:

- Formal authority;
- Control over rewards;
- Control over punishments;
- Control over information; and
- Ecological (physical/social environment, technology and organisation) control.

*Personal power* derived from human relationship influences or traits:

- Expertise;



- Friendship/loyalty; and
- Charisma.

*Political power* derived from formally vested or conveniently transient concurrence of objective and means to achieve these:

- Control over decision processes;
- Coalitions;
- Co-option; and
- Institutionalisation.

The way that these raw forces are to be used or abused are deployed explains the dangers of brainwashing, the reality-rhetoric gap and the failure to maintain a consistent and empowering attitude to deal with talented knowledge workers with much to offer [171, 172].

Greene and Elfrers [173, p178 ] have offered us a taxonomy of power based upon seven forms of power:

- Coercive - based on fear. Failure to comply results in punishment (*position power*);
- Connection - based on 'connections' to networks or people with influential or important persons inside or outside organisations (*personal + political power*);
- Reward - based on ability to provide rewards through incentives to comply. Is expected that suggestions be followed (*position power*);
- Legitimate - based on organisational or hierarchical position (*position + political power*);
- Referent - based on personality traits such as being likeable, admired etc thus able to influence (*personal power*);
- Information - based on possession to or access to information perceived as valuable (*position, personal + political power*);
- Expert - based on expertise, skill and knowledge which through respect influences others (*personal power*).

The nature of power and influence, the sources of this power and the way in which it is used to contribute to or manipulate cooperative relationships underpin all relationships that develop from these.

Several options to assert influence and enact change, particularly in workplace behavioural patterns, can be considered. These include presenting ideas in a rational and clearly communicated manner, challenging alternative ideas, and threatening to actually withholding crucial information. Likewise, other team members can apply the same tactics when dealing with the project manager. Thus communication and power/influence are closely linked.

Lovell models willingness to comply with authority and to assert authority in a project management context in a matrix of likely reaction quadrants [174]. Change management has been defined in terms of project management because it represents a change project [82].

- When acceptance of authority and assertiveness is high, *active consensus* takes place in a mature and productive manner.
- When acceptance of authority is high but assertiveness is low, *passive loyalty* results. In such cases, project goals may appear to be mutually arrived at but are not. This can result in project goals being half-heartedly supported.

- When acceptance of authority is low but assertiveness is high, *covert resistance* results. As in the second case above, project goals may appear to be mutually arrived at but in reality, are not. In this situation, project goals may be covertly rejected and secretly undermined.
- When acceptance of authority and assertiveness is low, *peer rivalry* takes place in an immature and unproductive manner. Project goals may be actively sabotaged as each party attempts to win at the expense of others or if not totally rejected then passively compromised through inertia.

This helps to explain the symptoms of what may be termed as 'team' or 'non-team' playing, 'playing the system', or 'playing political games' in which authority is subverted through the system of governance and organisational style [106, 175]. These sorts of power reactions take place at all levels, which may account for varying quality of relationships between teams and individuals when a change management project is undertaken. The above also helps us understand the underlying mechanisms taking place during negotiations and mutual adjustment when making agreements and commitments. This is particularly true when establishing the relative importance of issues to negotiating parties, appreciating the needs and pressures of others and establishing and maintaining trust. The two dimensions under scrutiny are the degree to which each team attempts to satisfy its own concerns and the attempt to satisfy the other party's concerns.

Useful categorisation of peers can be based upon degree of trust and agreement with *high trust/low agreement* leading to opponents and *low trust/low agreement* leading to adversaries. The significance of this to partnering issues such as continuous improvement and problem resolution is that opponents can make a positive contribution through effective argument and casting perceived problems in a number of different lights. This can lead to a better understanding, which may produce a better decision or outcome with *high trust/ high agreement*—representing allies in quadrant 1. Opponents can be constructive whereas adversaries are generally destructive, as their aim is to thwart the intended outcome. This is where much of the trust required in relationships breaks down and where the quality of communication deteriorates.

Lovell offers useful techniques for influencing individuals and groups including the use of:

- *Assertiveness* - using power of logic, facts or opinion;
- *Reward/Punishment* - using pressure and persuasion to control others;
- *Common visioning* - identifying a shared or common vision for the outcome; and
- *Participation and trust* - involving others in the decision making and problem-solving process to gain commitment [174, p76].

Also, interrelated factors determining appropriate selection of influencing tactics for a particular influencing attempt require consideration of:

- consistency with prevailing social norms and role expectations about use of tactic (that is the societal view of power pointed out by Raggins [169];
- the influencing agent possessing the appropriate power base for use of the particular tactic;
- appropriateness for the objective sought;

- level of resistance encountered or anticipated; and
- the cost of using the tactic in terms relation to benefit [170].

While the above provides a somewhat alarming and daunting prospect to instigating cultural change or realignment, people naturally form groups or communities and when these are focussed on learning [176], particularly with a sophisticated appreciation of the implications of their actions, they can be positive in their self-adjustment. Power and 'pecking order' issues can be subsumed as will be discussed shortly.

Richard McDermott argues that knowledge management is more about creating learning communities than applying any ICT technical support infrastructure—though he acknowledges the usefulness of ICT support. He also argues that the learning community as the “owners” of knowledge need to be fundamentally involved in deciding what to share and how because they become organic self-adjusting entities that can best work out the practicality of knowledge work [130, p112]. The implication of this is that learning communities that are facilitated to function well they demonstrate resilience, flexibility and redistribution of power remarkably effectively.

### ***Anxiety and the Change Process***

Having raised the spectre of the difficulty of organisations and individuals ceding power and influence as part of a cultural change project, I feel obliged to discuss how people can be motivated to change. This is where the seminal work of Edgar Schein, a renowned academic and guru from MIT's Sloan School of Management, becomes vital to our understanding of the psychological process of change motivation.

Schein undertook his initial research into behaviour in Korea after the end of war there in 1953 through studying how American POWs had been brainwashed. His texts have been adopted as one of *the* standards in the field of organisational psychology. It might seem somewhat crude to use an expert in brainwashing to start this discussion about change management but he has some intriguing theories about motivation for change that are worth a brief review. He concludes that companies do indoctrinate employees in subtle and sophisticated ways [177, p102]. He uses the term '*coercive persuasion*' to describe the state where people are in a situation from which they cannot physically escape and/or are pressured into adopting new beliefs. This can be described as 'brainwashing' or in other less complimentary terms, however, he also points out that good parenting and instilling family, community or corporate values also use similar processes. The interesting part of his ideas lies in the notion that two types of anxiety govern people's willingness and commitment to change.

He believes that change is a painful prospect for most people because either it is imposed from the trapped situation mentioned above or it is painful to replace something that has been learned (with all the energy and effort that the learning process involved) with something new. In energy terms, change demands more energy to both un-learn something (extra energy needed in terms of perceived wasted energy as well as the effort required to reject previous learning) and to then replace that learning with new learning. So change is actually more invasive than initial learning. However, updating non-relevant learning and knowledge is vital for organisational and individual

survival. Schein has identified two types of anxiety behaviours that are triggered by the prospect of change.

Anxiety 1 is the feeling associated with an inability or unwillingness to learn something new because it appears too difficult or confronting [178, p86]. In this situation we deny the problem, search to blame others for the symptoms requiring the change, or simplify the perceived problem triggering change in terms that when seen in retrospect, appears ridiculous. The phrase “*who would have foresaw this ... or who could have anticipated that...*” are often used, yet in such cases the problem and change action is often quite clear to those not clouded by Anxiety Type 1. Unfortunately, Anxiety 1 behaviours are universal and all too evident with a management response to mount more pressure to conform to the expected response. This can exacerbate the situation as it drives people towards panic. Another leading management thinker, has brought to our attention that when people are under severe stress (panic) they revert to earlier patterns of learning even when these patterns are no longer effective or appropriate [24, 136]. This leaves us in a bind. We need to change and update our knowledge but this is a painful and energy absorbing process.

Anxiety 2, the fear, shame, or guilt associated with not learning anything new, particularly when survival is challenged without action being taken, [178, p88] is the type of anxiety that change activists *need to* cultivate. Moreover, change agents need to ensure that Anxiety 2 pressure is greater than Anxiety 1. This is confronting to many organisations because it requires expensive and extensive support and resourcing to provide the escape route from this form of anxiety. It is easy to see why many organisations would opt for a strategy of putting pressure on individuals or business units (BUs) and then leaving them to sort out the dilemma ‘on the cheap’ by not providing adequate support systems. It is instructive that this strategy seems to almost always cost more through failed plans, dreams and commitments inhibiting delivery of the expected results. The result is frequently blame and negativity. If Anxiety 2 is responded to, then we may see that change agents can make a positive difference through providing enabling support systems. Creating Anxiety 2 grabs attention and is consistent with what knowledge management gurus [29] refer to as providing a shock impetus to trigger improvement. The short, sharp, shock has been promoted for many decades as a the prescription for generating improvement from the 1960’s of Harold Wilson (UK) to Paul Keating’s recession that we had to have (Australia). Anxiety 2 provides a trigger to search for a way out of the Anxiety 1 dilemma. Anxiety 2 impacts must be greater than Anxiety 1 so that the change agent prepares a general outline for a solution to the problem that enables people to find their own way to channel their energies and commitment to move from a position of defensiveness to one of confidently addressing the change deployment.

Kotter, another well respected writer on leadership and change management, proposes an 8-step process for successful change that is worth considering when thinking about diffusing innovation or knowledge management initiatives [179]. These can be summarised as follows:

1. Establish a sense of urgency
2. Forming a powerful guiding coalition
3. Creating a vision
4. Communicating the vision

5. Empowering others to act on the vision
6. Planning for and creating short-term wins
7. Consolidating improvements and producing still more change
8. Institutionalising new approaches.

Without spending too much time on elaborating on these, the pattern is clear. Change management requires considerable willingness to commit from senior management as well as the workforce. It becomes obvious that this is a two-way-street with senior management inextricably linked to the workforce—many of these justifiably labelled as knowledge workers because they deploy skills and knowledge personally owned and controlled rather than physical corporate infrastructure assets.

Kotter and many other experts in this field, stress the need for corporate commitment. Take for example the implication of the above 8 steps. Establishing urgency requires a well-thought through communication strategy that has, as a precursor, a need for rigorous investigation, thought and analysis of what *needs* to be done. Point two requires high levels of sophisticated lobbying and influencing skills. Steps 3 and 4 require a high level strategic planning exercise. Step 5 requires another strategic response that is by no means easy to achieve if an organisational culture of command-and-control is evident. Step 6 can be argued to involve some element of public or corporate relations at one level but with a deeper commitment to a rewards and corporate recognition policy to remain credible. Step 7 builds upon step 6 as does step 8. Kotter's focus is directed towards a corporate response that is by no means easy to achieve without desire and commitment for allocation of resources that might otherwise flow as profits and dividends from a short-term financial bottom line apparent success.

### ***Drivers and Barriers to Innovation***

The previous section indicated that the implications for change require recognising the drivers and barriers to change. Further, much of the driving force derives from forms of commitment. Maslow [39] was one of the pioneers of the study of motivation and his hierarchy of needs place extrinsic reward systems (such as money, working conditions etc) at a lower level of driving or inhibiting power than intrinsic factors (such as self-esteem, affiliation and self-actualisation). These notions of motivation have been applied to the concept of commitment by many researchers in this important area. One of these teams whose work is representative of that school of thought is Meyer and Allen who developed a typology of three forms of commitment [116]. They categorise commitment into three forms each with a different set of drivers that power this intrinsic force.

The highest level of commitment is referred to as *affective* (the want to force) and this is manifested by a deep-seated drive that aligns and deeply bonds the goals of the individual concerned with the organisation. Because these goals are indistinguishable they are completely internalised by the individual. Thus, the organisation need only ensure that barriers to fulfilling the committed actions are removed or at least minimised. An important driving force for this is self-worth and so the organisation can nurture and maintain this through having transparent and fair processes when dealing with the individuals and other organisational units. It also can feed and maintain this form of self-worth through ensuring that effort and success are rewarded. The

management style is also highly relevant because a principal part of the reward that the individual experiences recognition of their value and worth through achievement and celebration.

*Normative* (ought to) commitment relies on a sense of duty, purpose and group identity (as opposed to individual identification). In such conditions this translates into a desire to 'not let the side down' or 'doing your bit/fair share'. While these are noble and powerful sentiments rooted in a group identity and wish to remain part of an identifiable group it often lacks the extra power that *affective* commitment does. However, this may be culturally biased and in many national cultures the group ethic is a more powerful force than the culture of the individual favoured in Western Society. Organisations can influence this sense of commitment through focussing on management style and corporate governance issues. The organisational reputation for example is particularly important as is the way that teams and groups within the organisation socialise and develop their culture through group norms and behaviour.

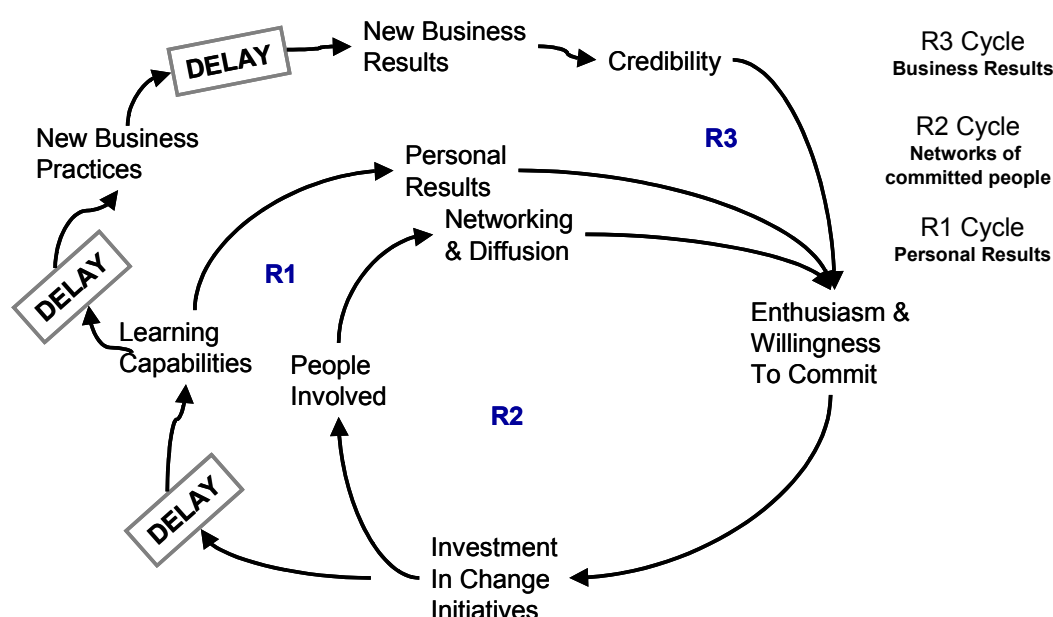
The third form of commitment is more instrumental in nature. *Continuance commitment* (need-to) relies on the sunk investment cost that an individual has invested and the psychological calculation that is made when conducting a cost/benefit analysis about whether to remain commitment or to withdraw commitment. This sunk investment costs can be financial, as is the case with deferred remuneration and reward systems, or they may be energy related (such as the effort put into building up a team, establishing systems and the like). Organisations retain this kind of commitment by making the cost of leaving or withdrawing commitment more than they perceived value of the benefits still to be realised.

Thus commitment is inextricably bound up in organisational behaviour and its impact upon the individual. Mere compliance lies at the lower interface of *continuance* commitment in which the individual does only that which has to be done. Many management processes require only compliance to minimum level standards even though the management rhetoric is focussed upon commitment. Under this regime, management style is focussed on ensuring that compliance is adhered to and this often presents barriers to commitment.

Peter Senge is one of the more authoritative writers on links between enthusiasm and commitment and performance through change management. His work on identifying patterns that control events is based upon systems thinking [27]. He provides some useful insights into drivers and inhibitors of change that are useful for helping us understand how an environment for improving project performance can be created and maintained. I bring this into the discussion because where as Schein's insights are about the deep seated drives of both management and the workforce, and Kotter's work as described above is focussed on required corporate behaviours, Senge's work focuses on what happens at the coal face. These insights will be briefly reviewed.

Figure 22 indicates three reinforcing driver cycles identified for sustaining enthusiasm and commitment based upon Senge's work [155, Adapted from p46 p48 p51]—these have significant implications for designing a work environment that supports commitment within and between teams. All three cycles begin with enthusiasm and commitment as an outcome from a positive working environment that supports and motivates individuals and teams.

Cycles R1 and R2 lead to an investment in change initiatives by both the organisation and individuals—primarily the investment is in education and training including mentoring and both official and unofficial support. Cycle R1 then moves after a delay in absorbing the investment into an increase in learning capabilities. These generally lead to personal results including: expansion of competencies; making tasks easier to accomplish; building confidence and generating feelings of self-worth. Reward systems may provide concrete benefit. These build enthusiasm and commitment because the initiative is proved to be of value. Cycle R2 leads from the change investment to greater involvement with people, which leads to networking and diffusion of the change initiative. This positive socialisation of tacit knowledge helps to make knowledge explicit [28, 29] and this further reinforces a sense of worth and value for knowledge workers. This builds enthusiasm and commitment.



**Figure 22 - Driving Cycles for Enthusiasm and Commitment**

Cycle R3 builds upon the learning capabilities after some time delay. Benefit of the changes are realised and absorbed into the workplace culture after a short time delay translating into changed work practices. After a further delay, this drives improved business performance. This boost to productivity and other positive outcomes drives organisational confidence in the change initiative, which in turn builds upon the enthusiasm and commitment of team members. If the cycle is not subject to atrophy then success will build upon success. This would be an ideal condition that is rarely fully experienced because of restraining cycles that adversely impact upon this virtuous cycle.

Enthusiasm and commitment is unlikely to be sustainable unless there is positive behavioural change in the way that people interact to realise project improvement. Senge *et al* [155] identify a number of restraining cycles inhibiting effective change initiatives that provide restraining forces impacting upon trust and commitment. These traps are manifested as a gap between anticipation and reality. They include a results gap where new business

practices and perceived results appear to be insufficiently realised either by the organisation or individual. Such gaps may evolve due to a time lag between effort being expended and results becoming apparent.

Traps that emerge through time comprise: a time, reflection and commitment gap; a help gap; a trust gap; and a results gap. These gaps indicate how enthusiasm and a willingness to commit undermine a change initiative.

Reflection and commitment to changed behaviour is influenced by insufficient time being given to provide the necessary investment in changed initiatives. A gap is experienced between the time required to reflect upon the changes (so as to accommodate their impact) and the available time provided for reflection. Thus the perceived relevance of the proposed changes may not be reinforced. Two problems become evident. One is providing insufficient time for staff to take advantage of the investment made in training and development. The other is providing inadequate support for developing sufficient energy and effort to build effective team relationships.

A time gap may develop through a combination of lack of flexibility of time and unavailability of time. This leads to frustration, enthusiasm and commitment being dampened. This in turn leads to a reduction in effectiveness of learning capabilities.

A further identified trap that restrains a reinforcing virtuous cycle is a commitment gap emerging through perceived lack of relevance of the commitment either to the team participants or more commonly by those in leadership positions on projects [155]. Relevance may be perceived as diminished if either personal or business benefits appear marginal or negative. This is the 'what is in it for me or my organisation' syndrome. Commitment to change or changed approaches requires continual positive feedback that either leads to improvement through identified ways to improve or confirms the nature and/or extent of benefits derived.

From the business driver perspective, clear motives for the change need to be understood and probably articulated through a sound business case. The reason for enduring any 'possible pain' needs to be clear for management to support the initiative therefore feedback on what works or does not appear to work is important. Benefits need to be demonstrated, as much of the motivation to continue putting energy into the change initiative is both intrinsic and extrinsic. Tangible benefits and rewards will help to satisfy extrinsic motivational factors including praise and celebration of success. Intangible benefits need also to be addressed. These may include the job being easier to do, that additional useful skill sets are developed, or that individual interests are satisfied with aspects of the work being treated as if it were a hobby.

Senge *et al* [155] also hypothesised a help gap barrier to the virtuous cycle that influences commitment. This results in a help gap (through insufficient quality or quantity of help provided) that in turn impacts upon the effectiveness of the support for a change initiative. Existing or temporarily available resources can be positively used to reduce the help trap by potentially developing compensating forces that reduce the impact of the time gap. The help gap can (and usually does) negatively influence commitment.

The link between the time gap and help gap is subtle. It is essential when designing systems to provide resolution to the help gap problem so that the time gap is not exacerbated. Frustration and burnout are serious



consequences of the time trap that may be caused by positive efforts to address the time trap through providing inappropriately or poorly thought through help. Mutual adjustment (colleagues providing help through informal mechanisms based upon effective negotiation techniques) may help resolve some of the time trap problems without raising additional burdens associated with reallocating resources. Such mutual adjustment may also be assisted by an ability to call on additional help or resources to be applied seeming outside the help-trap identified area. The mindset of a project 'pool' of resources (rather than individual team pools of resources) may be of assistance because self-adjustment and help can be switched in more creative ways.

Investment in change initiatives such as training and development naturally leads to expectations of results at both the personal and organisational level within the implicit time horizon. A problem that often occurs is that this time horizon is too optimistic. In change initiatives concerning project work (such as the engagement of various teams and their joint operation, perhaps from a communication and decision making perspective) the level of trust and cooperation necessary for this to happen takes considerable effort over a long period of time while team members build a trust bank [180, p49].

Evidence of success may be expected far too soon when change initiatives investments are introduced. These might include training programs to align project objectives with that of the various teams and individuals or ICT systems for shared communication and decision-making. The time gap, help gap, or one of the other gaps identified later in this paper may well exacerbate this. This will lead to a results gap between what was expected of the new business results and what was delivered. When this occurs within a blame-oriented organisational culture the natural reaction will be a search for a scapegoat, defensive routines and systems of deception aimed to mislead and obfuscate [181, 182]. These outcomes have been well described in some of the texts on organisational behaviour and organisational learning. One of these has been Type I and II behaviours [31] in which espoused theory (or that which is put forward as the operating paradigm) can be contrasted to theory-in-use (or the actual behaviour based upon theory as used). When this occurs, defensive routines (through negative assessment behaviour reducing credibility) are quickly established. These undermine the virtuous cycle of building commitment and this then leads to a dampening of enthusiasm and commitment.

Even if expectations were realistic, credibility of business results can be undermined by the use of inappropriate performance metrics for measuring business results. This frequently happens when small business units or teams have their performance assessment based upon short-term output or efficiency outcomes relating to a small part of the system rather than their contribution to the whole system or their long term impact of the change initiative. The change initiative may be likely to produce a temporary drop in perceived efficiency, perhaps it is part of a learning curve effect or because the cycle time of the output or outcome lengthens. If the metrics used to assess results is wrongly aligned then the reward/punitive system may actually penalise effective adherence to the changed process thus undermining the change initiative.

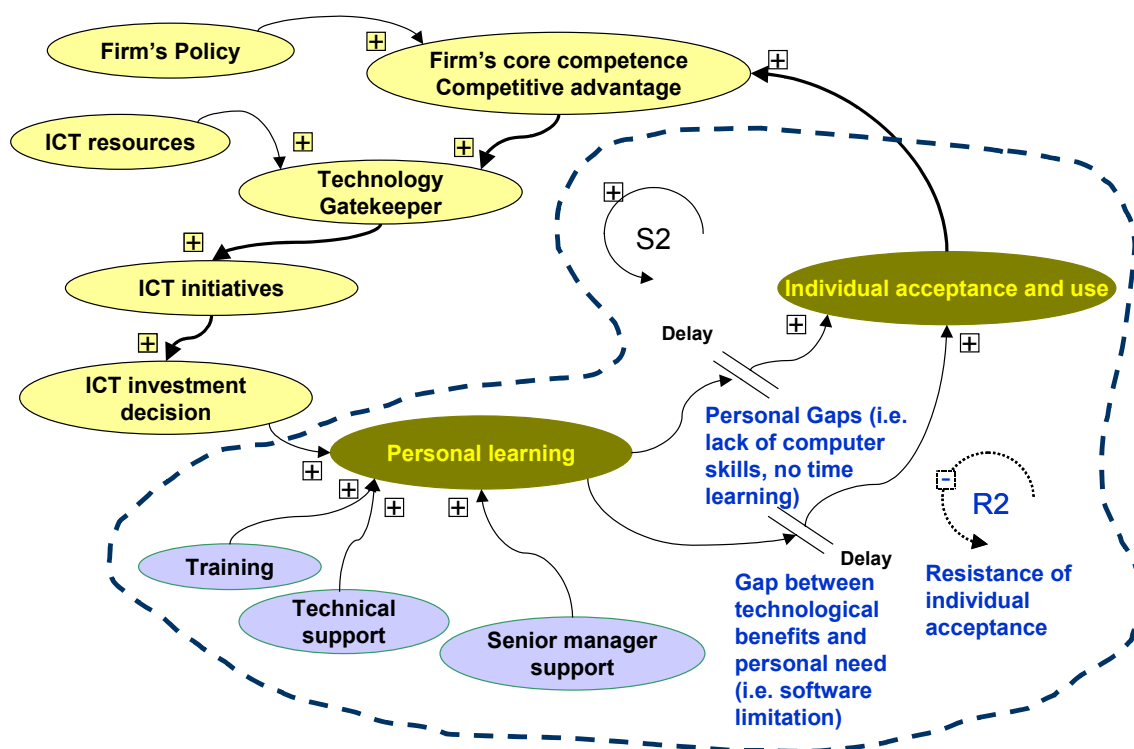


initiative. However, before the organisation adopts the innovation there will be a delay because it takes time for all this change to take place.

A cycle of support revolves around the organisation's policy and vision, top management support, encouragement of the technological gatekeepers, and building internal knowledge management support staff and taking advantage of social capital embodied in networks of professional, university and institutional knowledge networks.

Organisations adoption gaps emerge. One may be a lack of technological awareness and this is directly affected by the implementation of the knowledge leadership infrastructure identified in the K-Adv. The technology initiative may have some inherent maturity problems particularly if it is a very new one of has not been experienced before in the particular context in question. There may also be related adaptation issues relating to the industry itself. For example recent research comparing the aerospace and construction industry adaptation of knowledge management indicates that the fragmented nature of the construction industry makes many of the supply chain change initiatives adopted by the aerospace industry in the UK difficult to implement [183]. Also financial constraints may impose a gap in support funding necessary for a variety of elements of a diffusion process.

Similarly business results gaps may become evident. The expected benefits of the technology may be less than anticipated or counter productive, or fail to enhance the organisation's competitive advantage. Users of the initiative may resist implementing the innovation and the diffusion process itself may be inadequate to realise expected benefits.

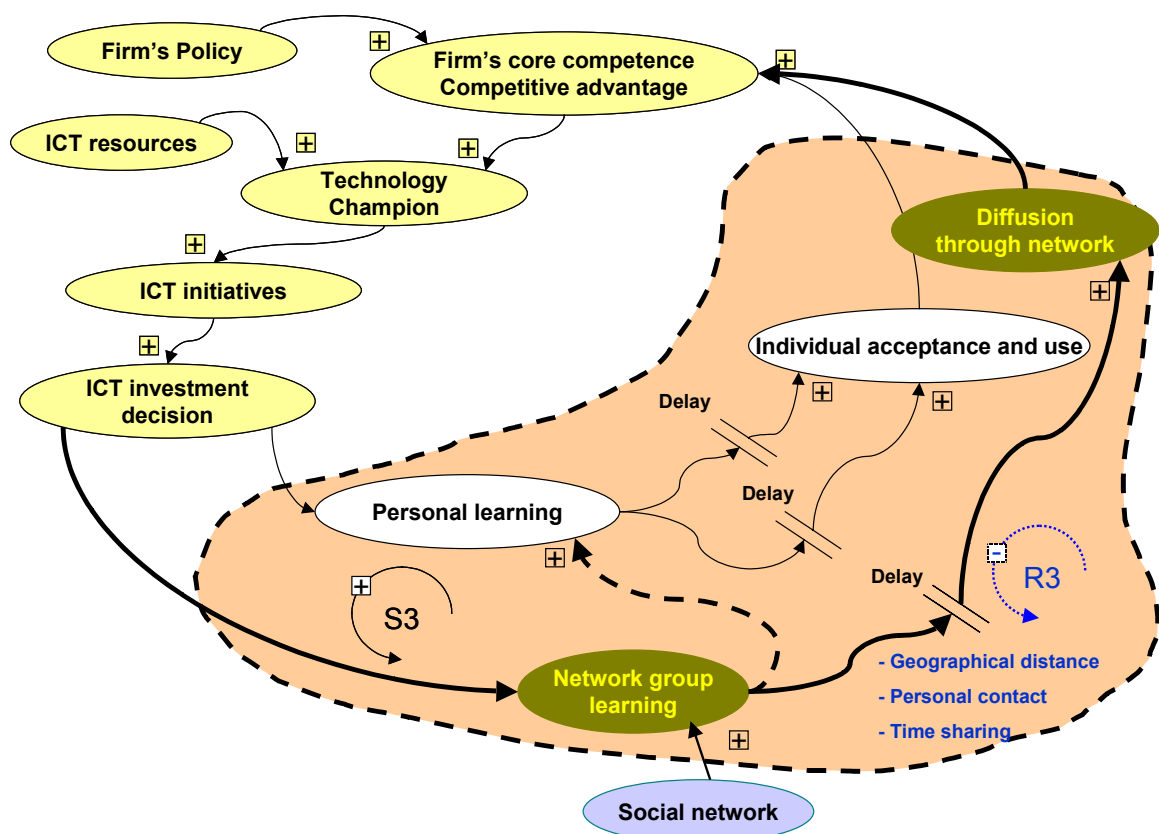


**Figure 24 - Restraining Forces Acting Upon the Reinforcing Cycles Generating Enthusiasm and Willingness to Commit at the Individual Level**

Figure 24 Illustrates how personal learning can be enhanced in the ICT diffusion process and how this links with the 'personal assistance' part of the

ICT supporting infrastructure for the K-Adv. Training, technical support and senior management support all can help drive the initiative in a facilitating way for individuals. After some adjustment period, individuals will accept and use the innovation, once they see that it has relevance and benefit to them in their work, however, restraining forces could undermine this commitment. Personal gaps may develop where the personal skills of the individual are less than that required or they may have hardware or software inadequacies.

The third type of implementation in organisations is at the group/team level. At this level people in near or remote locations work together and form binding relationships that can result in mutual adjustment help and exchange of other types of support. A technology champion emerges as a more personalised gatekeeper role and the effectiveness of this person or small team is critical in advancing K-Adv leadership infrastructure deployment. Figure 25 illustrates the way that social networks and communities of practice interaction with the individual also affect personal learning. This provides a network group-learning environment.



**Figure 25 - Restraining Forces Acting Upon the Reinforcing Cycles Generating Enthusiasm and Willingness to Commit at the Group/Team Level**

The principal resisting cycles to diffusion relate to delays between learning and perceived benefits of results. The group elements impacting on the diffusion process relates to the strength of network ties. These are dependent in large part upon the breadth and depth of trust developed within these groups through their network connections. Associated with this social capital bank deposit and withdrawal system are geographical separations (face-time is important in building trust), the quality of personal contact and time

available for sharing experiences, perceptions and debate about the contextual nature of knowledge as being applied.

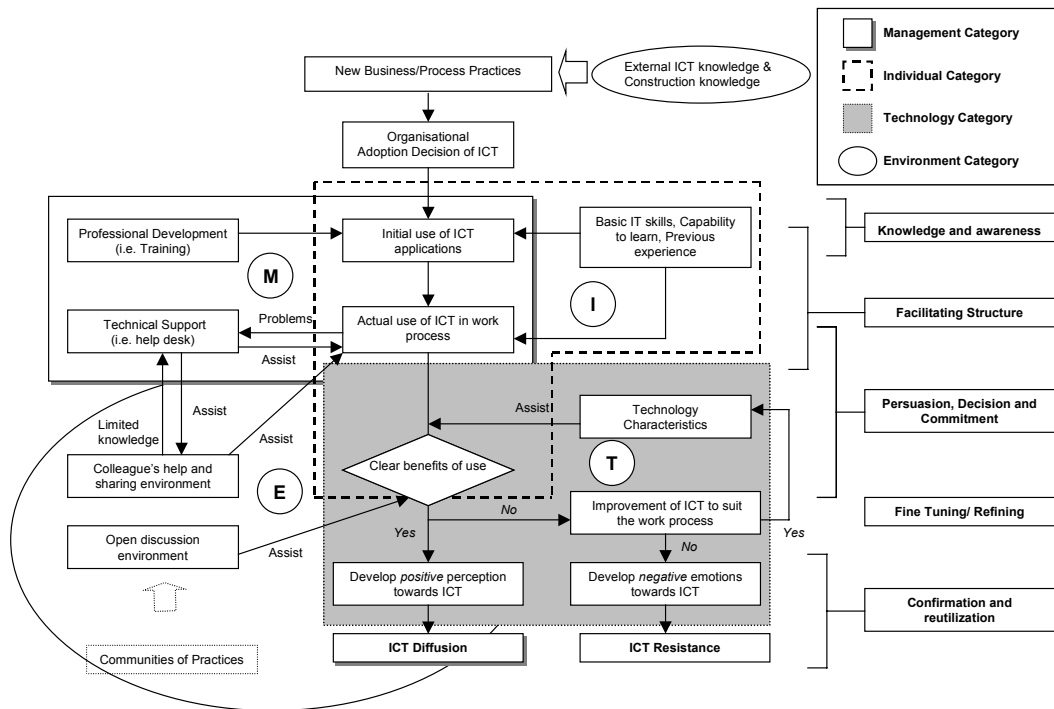
### ***Innovation Diffusion and the K-Adv***

In a recent study of ICT innovation among 117 experienced ICT users from three Australian construction industry organisations (one a state government department, a leading global engineering consultant, and a leading construction contracting company) 11 factors affecting ICT diffusion were identified. A total of 46 statements associated with the use and adoption of ICT based on these areas was used to test respondents' perceived assessment of these statements. Variables were described as statements related to individual's feelings about factors influencing their ICT applications use. The perception scale consists of self-assessment terms describing individual as follows 1= very low, 2 = somewhat low, 3 = neither low nor high, 4 = somewhat high, 5 = very high and x = not applicable. These factors were derived using factor analysis (applying varimax rotation) on the data set and rigorous analysis established the validity and reliability of the results [184].

These eleven factors can be further grouped into management (M), individual (I) and technology (T) factors that all impact upon ICT diffusion and that each of these is influenced (surrounded) by the impact of the workplace environment (E). Individual and Environment factors generally have a high impact upon ICT diffusion with Management and Technology factors have a slightly above moderate impact. Results represent the perceptions of experienced ICT users in organisations that have a reputation for being experienced ICT users. While results cannot be generalised across the construction industry, they may be good indicators of experienced users and useful for understanding how the K-Adv may be influenced by effective ICT innovation diffusion supporting the ICT Infrastructure component of the K-Adv.

Additionally, the mean results from the data provide an indication of the strength of connection between the factors and ICT diffusion. These provide support for the K-Adv framework as an exercise in applying a K-Adv as well as helping to explain how the elements of the ICT Supporting Infrastructure impacts upon the K-Adv of an organisation. Figure 26 provides a model that indicates how these results may be interpreted.

The model appears complex at first sight but is both logical and able to be easily understood. The core of the model is its relationship to ICT being used to enhance business processes. Organisations are first triggered into using any new ICT application as a result of a desire or need to improve a business process, for example groupware to improve communication and coordination between teams in a project environment (top centre portion of Figure 26). The above model also links concepts of general innovation diffusion [40] with the maturity of organisational excellence [185]. In developing business maturity and evolution of competence, organisations go through five phases: knowledge and awareness; developing a facilitating structure to accommodate an advantageous change; developing arguments required to gain commitment to the changed state; adopting and then adapting the change through refining the adapted the change initiative to fit the prevailing circumstances; and to then embed the change into the organisational norms including a process of review and continual adaptation and renewal depending upon changing circumstances.



**Figure 26 - ICT Diffusion Model (Source V. Peansupap 2003 PhD thesis )**

The model suggest that once the adoption decision has been made by management (initial use of ICT application box in the figure), there is a management sponsored period of training and induction (items within the 'M' boxed area) and this combined with the user's prior level of ICT application experience and expertise (items within the 'I' dotted boxed area) leads to a user experience of the ICT application being diffused. This experience is mediated by management directed support mechanisms such as training, development and help-desk and other support. This influences the user's perception of how useful the ICT innovation is to the task in hand. The management interface here provides a fertile seeding ground for a good or bad experience, as does the user's prior experience with similar technologies. Further, the work environment has a significant impact upon ICT diffusion because it provides either the means for enhancing this experience or provides barriers to effective adoption and adaptation. Colleagues helping and the development of communities of practice affect this process (within the environment 'E' ellipse lined area). Technical issues also intervene at this stage, such as connection speeds, degree of availability and reliability of both hardware and software (within the shaded 'T' boxed area).

Along the right hand side of Figure 26 are mapped five stages of maturity of ICT diffusion. The initial stage is knowledge and awareness in which users perceive the need for an ICT application and gather information and tap into knowledge about its applicability and usefulness. When this initial phase is substantially complete a facilitating structure will be put in place by both individuals and the organisation's management through applying learning from past lessons learned and more formal training and development mechanisms. This primes the next stage of maturity of the diffusion process. Persuasion, decision making and building commitment for the innovation's use is developed through the interaction of all four categories M, I, E and T in

focussing all concerned with adopting the innovation. The workplace environment is critical, as will be shown shortly, as is also the functionality and technology characteristics so that not only is the innovation adopted but that it becomes adapted and specialised to meet the needs of the organisation and its individual members. This fine-tuning maturity stage is where the available explicit knowledge relating to the innovation is combined with tacit knowledge developed in trial and error experiments in the adaptation of the innovation. If the knowledge management process is well advanced then this tacit knowledge will be combined with explicit knowledge and organisational routines and processes so that the knowledge base becomes richer, deeper and more extensive relating to the innovation. Finally, at the confirmation and realization phase of the maturity level, the innovation is completely internalised, becomes 'part of the furniture' and is continually improved as the level of experience of its use is broadened and deepened.

Factors identified below contribute to user's perception of an ICT application's benefit. Mean values for high (that is  $\geq 4$ ) statements presented for assessment in Vachara Peansupap's PhD study (submitted for examination in late 2003), are presented in Table 28.

**Table 28- List of Perceived Factors that have High Influence on ICT diffusion <sup>1</sup>**

<b>Perceived factors within a public client organisation</b>	<b>Mean</b>
Personal capability to learn ICT <sup>2</sup>	4.74
Personal commitment <sup>2</sup>	4.43
<i>Personal confidence</i> <sup>2</sup>	4.40
Relevance to personal job <sup>2</sup>	4.29
Trust with supervisor when making mistakes	4.29
Person openly discusses issues about ICT difficulties <sup>2</sup>	4.26
Clear advantage of using ICT for communication between teams <sup>2</sup>	4.24
Enjoy learning from others	4.20
Receive professional credibility	4.17
Clear advantage of using ICT for communication within team <sup>2</sup>	4.14
Enjoy exploring new tools <sup>2</sup>	4.14
Supervisor openly suggests issues about improving using ICT <sup>2</sup>	4.09
Basic skill of using ICT	4.03
Mentoring program	4.03
<b>Perceived factors within a contractor organisation</b>	
Relevance to personal job <sup>2</sup>	4.41
Personal commitment <sup>2</sup>	4.38
Personal capability to learn ICT <sup>2</sup>	4.33
Organisation commitment (resources)	4.31
Clear advantage of using ICT for communication within team <sup>2</sup>	4.26
<i>Personal confidence</i> <sup>2</sup>	4.21
Clear advantage of using ICT for coordinating teams	4.18
Receive professional credibility	4.18
Clear advantage of using ICT for communication between teams <sup>2</sup>	4.16
Supervisor openly suggests issues about improving using ICT <sup>2</sup>	4.03
Person openly discusses issues about ICT difficulty <sup>2</sup>	4.00
Enjoy exploring new tools <sup>2</sup>	4.00
Work procedure support	4.00
<b>Perceived factors within an engineering consultant organisation</b>	

Personal capability to learn ICT <sup>2</sup>	4.40
Relevance to personal job <sup>2</sup>	4.26
Colleagues informally provide help on using ICT	4.24
Personal commitment <sup>2</sup>	4.23
Clear advantage of using ICT for communication between teams <sup>2</sup>	4.23
Clear advantage of using ICT for communication within team <sup>2</sup>	4.17
Enjoy learning from others	4.14
Personal confidence <sup>2</sup>	4.12
Clear advantage of using ICT for coordinating teams	4.09
Enjoy exploring new tools <sup>2</sup>	4.07
Person openly discusses issues about ICT difficulty <sup>2</sup>	4.05
Mentoring program	4.02
Organisation openly suggests issues about improving using ICT	4.00

<sup>1</sup> List of variables that have a mean value above 4.00

<sup>2</sup> Display of variables that have similarly perceived values among three firms

Table 28 lists perceived factors that have highly influenced diffusion from these three organisations and are consistent across all three organisations:

- Personal capability to learn ICT
- Personal commitment
- Personal confidence
- Relevance to personal job
- Person openly discusses issues about ICT difficulties
- Clear advantage of using ICT for communication between teams
- Clear advantage of using ICT for communication within team
- Enjoy exploring new tools
- Supervisor openly suggests how to improve using ICT

These support the K-Adv model. A detailed case study investigation of 3 leading Australian contractors followed the quantitative study—this time using a qualitative approach specifically for a groupware application. The contractor in the initial study was included with two other first tier Australian major global contractors. The three contracting organisations were compared using the framework of the 11 factors arrived at through factor analysis from the first study. This study provided richer contextual data that is best gathered from qualitative rather than quantitative research data. The results provide further interesting insights into ICT best practice.

Rather than summarise the interview findings for each of the three contractors separately we have presented the findings for case study organisation A (CSA) in Table 29 followed by a comparison of the findings across the three contractors for the 11 factors in Table 30. CSA is a large construction contractor with well over AUD\$ 1 billion in annual global turnover. The chief executive officer of CSA established an IT quality assurance strategy vision in 1996. He envisioned IT assisting integration of construction information within CSA. From this vision, the group of regional managers and quality assurance managers had meetings to discuss and explore ICT that could be used for effective communication and coordination between project members within CSA. During the development period, IT staff in CSA worked closely with managers, key end users and champions who have an experience on construction work processes.



**Table 29 - Findings of Perceived Present Factors Influencing ICT Diffusion CSA**

<b>Factors</b>	<b>Interview Findings Case study 'A' (CSA)</b>
F1: Professional development and technical support	<p>Participants received internal training from people in the IT department. The training provides the basics and the concept of using this application. The training session took approximately 3-4 hours. Most participants were satisfied with the training, however some mentioned that the content of the training should be more specific and updated if the application was upgraded to the new version.</p> <p>Two principal methods used to contact help desk people were phone calls or electronic emails to the help system. Participants were moderately satisfied with the help desk facility because responses to their problems needed time to process, depending on the priority and the problems.</p>
F2: Clear benefits of use	<p>Most participants understood the benefits of using this application. By using it, they found that it assisted communication and coordination within their project. In addition, they also recognised that this application provided a benefit in terms of developing a knowledge repository. These helped them for future decision-making.</p>
F3: Supporting individual characteristics	<p>Participants demonstrated adequate personal characteristics such as basic computer skills, enjoyment of learning, self-confidence and commitment to the use of IT. Basic computer skill and self-confidence were considered as the fundamental criteria for individual use. Furthermore, some mentioned that they enjoy learning and commitment to its use provided the essential momentum for their individual use.</p>
F4: Supporting technology characteristics	<p>This application consisted of several modules to assist construction processes such as correspondence, site instruction, tenders, and site diary. The application was considered a good tool to help their work processes. Participants mentioned that the function of the application was compatible with their Internal work processes. However, there was a need to improve in low-level areas such as user interface and functions.</p> <p>The application was classified as an Intranet platform because it was designed to be used only by people within their organisation. Therefore, users needed to connect with the organisation network. There were two methods for connection (1) Local Intranet network and (2) Dial up network. Within the organisational network, there was a main server at head office that was linked to the sub-servers in many construction sites and regional offices.</p> <p>The speed of this application was dependent on the network connection because all information was transferred from an individual computer to the main server in the head office. In the case of connecting through the local Intranet network, its speed was faster than connecting via dial up networking in which the speed was limited at 56 Kbps. Although there were several modules in ICT users believed the concept of using them is quite simple.</p> <p>Participants mentioned that the use of ICT is by a reliable connection. In addition, all information was backed up through the main server at the head office. Thus it is very hard to lose the information on ICT.</p>
F5: Supporting supervisor and organisation	<p>It was mentioned that the supervisor was a positive influence in the use of the application. Most supervisors encouraged their subordinates to use it as they play an unofficial role in helping their subordinates.</p> <p>In addition to supervisor support, the organisation also supported the use of the application by providing enough software, hardware, and training. They provided a computer notebook for people who use the ICT.</p>

F6: Supporting open discussion environment	<p>There is an open discussion environment regarding the use of ICT application, however not everybody can dedicate the time for discussion because they have their own responsibilities.</p> <p>This organisation also created a virtual discussion environment by allowing the user to discuss and make suggestions about the problems of using this application through the electronic whiteboard system.</p> <p>Some participants mentioned that they were involved in suggesting use of the application. When they found problems or had suggestions, they would discuss them with IT people. However, one participant claimed that not all people in the organisation have sufficient concept of the application to the level that they can discuss issues of improvement in detail.</p>
F7: Supporting rewards	<p>In terms of using this application, suggesting a reward is not an imperative for implementation of the ICT.</p> <p>A tangible reward did not seem to be the key factor for use of the system because the use of ICT application is simply the tools they use for assisting them in their work. Therefore there was no need to provide a tangible reward to users of the application. However, some participants felt that intangible rewards to use it, such as profession standing and pride, are moderately important for them.</p>
F8: Colleague helps	Under this contractor type organisation, most of the respondents mentioned that they helped and supported each other in any problems that they face. This strong culture helped to underpin the use and the diffusion of this application throughout this organisation. Currently colleagues help each other on an unofficial basis. Although some participants have a limited knowledge of ICT use, they will find out the way to assist or suggest ideas or expert persons who can help solve the problems.
F9: Positive feeling towards ICT use	Strong positive perception on the use of the application. Participants felt that it assisted communication and coordination within their project teams. They believed that the application was compatible with their traditional work processes and assisted their communication.
F10: Negative feeling towards ICT use	There were low levels of negative perception relating to the use of ICT application.
F11: Frustration with ICT use	Frustration may occur in the case of people who may not have adequate computer skills. Also, low connection speed also produced frustration, as they needed to upload and download attachment files from ICT.

**Table 30 - Comparison of Perceived Presence of Factors in Three Case Studies**

Factors	CSA	CSB	CSC
F1: Professional development and technical support	• • •	• • •	• • •
F2: Clear benefits of use	• • •	• •	• • •
F3: Supporting individual characteristics	• • •	• • •	• • •
F4: Supporting technology characteristics	• • •	• •	• • •
F5: Supporting supervisor and organisation	• • •	• •	• • •
F6: Supporting open discussion environment	• •	• •	• •
F7: Supporting rewards	•	•	•
F8: Colleague helps	• • •	• • •	• • •
F9: Positive feeling towards ICT use	• • •	• •	• • •
F10: Negative feeling towards ICT use	•	• •	•
F11: Frustration with ICT use	•	• •	•

- Low level of perceived present factors      • • Medium level of perceived present factors
- • • High level of perceived present factors

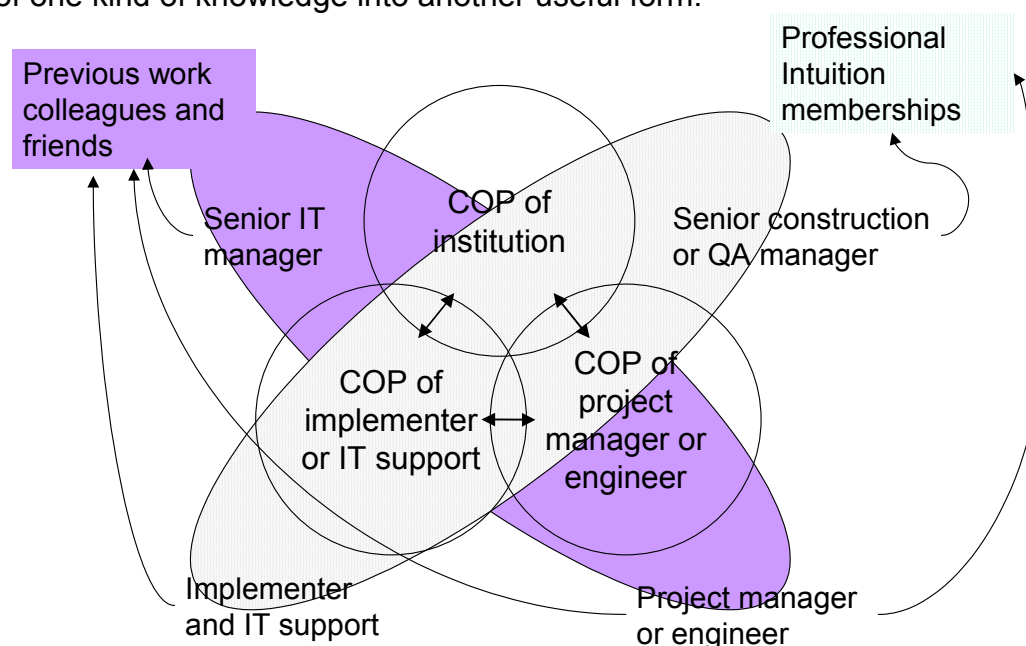
Several impressions from the results are relevant to the concept of the K-Adv. Each of the three organisations has a strong organisational culture for supporting ICT application innovation. Moreover the personal characteristics of those interviewed indicates that they generally have moderate or high skills in general ICT application use, are sufficiently aware and motivated to take advantage of the perceived benefit of use of these applications, and are willing to share and pool knowledge about how, why and where these applications may be usefully deployed. The low level of frustration of ICT use indicates that technology support is generally well thought through. Follow up discussion and feedback confirmed that on some smaller construction sites, there was inadequacy of hardware capacity such as hardware, data line speed, and associated rapid response for help at times, but on most sites the hardware and software infrastructure was generally well developed.

Thus, for these three major contractors, whom we argue would be representative of the top tier of Australian contractors; research findings indicate that they have a solid grasp of the ICT infrastructure, leadership infrastructure that determined the knowledge strategy for ICT diffusion, and the people infrastructure that provides a supportive workplace. Before concluding this section, we believe that it is relevant to focus upon one of the important ways in which this people infrastructure was supported. Earlier, the concept of communities of practice (COP) was introduced as an important aspect of knowledge management. We also studied, through undertaking interviews with ICT users from each of these organisations, the presence of COPs and how they were used to support ICT diffusion.

People are naturally social animals and have evolved in history through cooperating, collaborating and sharing knowledge [7]. When attempting to implement the people infrastructure aspects of a K-Adv it is wise to recognise and nurture those assets that naturally exist and need only to be supported rather than build from scratch. In seeking help, people rely on their past and present colleagues, their affiliated professional mentor groups as well as the formal personal ICT diffusion assistance mechanisms in place. A good start is to map these relationships in order to better understand them and to harness their energy potential to advance the organisation's K-Adv. Conceptually, the unintended but nevertheless hidden COPs, together with those COPs that are more visible, designed and developed by an organisation or that have evolved out of necessity, can be visualised as presented in Figure 27. Previous colleagues are often part of the current organisation in question but also include those outside the organisation and these may be competitors. Similarly, members of professional institutions form close associations and share knowledge in a formal or informal COP that evolves from that professional associations and again these include members from competing firms that choose to collaborate and exchange valuable knowledge. Teigland [62] argues that this situation does not pose a significant competitive advantage threat in the highly competitive ICT development industry because people engaged in such cross-organisational COPs have a natural balance between giving and receiving help. While an individual may take time out from a specific project to help a competitor from that COP solve a technical problem, and this may seem to be counter-productive if not disloyal to the paying organisation, this behaviour in fact *enhances* competitive advantage. This is because the organisation that employs individuals with access to such

COPs also has access to a wider pool of experts through that COP than it could ever afford to commission to help solve the many problems that naturally arise.

Within any organisation, there will be a COP that has been institutionalised by the organisation such as a help-desk facility with wider and proactive contact between the experts at the help facility and those served by the help facility. Organisations that have well-developed ICT personal assistance infrastructure take advantage of user feedback to proactively provide knowledge transfer through gatekeepers at the help facility that either can put people within the organisation in touch with expert users or can pass on knowledge made available to them through feedback by users. Further, many organisations have an ICT implementer person responsible for diffusing ICT application knowledge and these people become gatekeepers and develop a COP around the ICT application support role. Additionally, each workplace, particularly project sites, have teams of individuals working together solving problems, sharing knowledge and centred around a key gatekeeper who is often a project manager or site engineer leading that workplace team. Not all members of a team may be active members of a COP because they may not be active knowledge creators, sharers or transformers of one kind of knowledge into another useful form.



**Figure 27 - COPs Existing in Most Organisations**

Our research into these organisations led us to believe that their senior managers had a sound grasp and understanding of formal COPs that they had encouraged and nurtured but would be only partially aware of the internal-external COPs that exist. This is natural unless the workplace environment is sufficiently trusting to not only tolerate but encourage its members to disseminate potential intellectual property (IP) associated with ICT application use with competitors. The trust aspect here, relates to trust that there will be a swings and roundabouts effect where leakage of time, energy and knowledge out of the organisation to competitors are reciprocated to balance and in fact enhance the organisations K-Adv. We were left with the

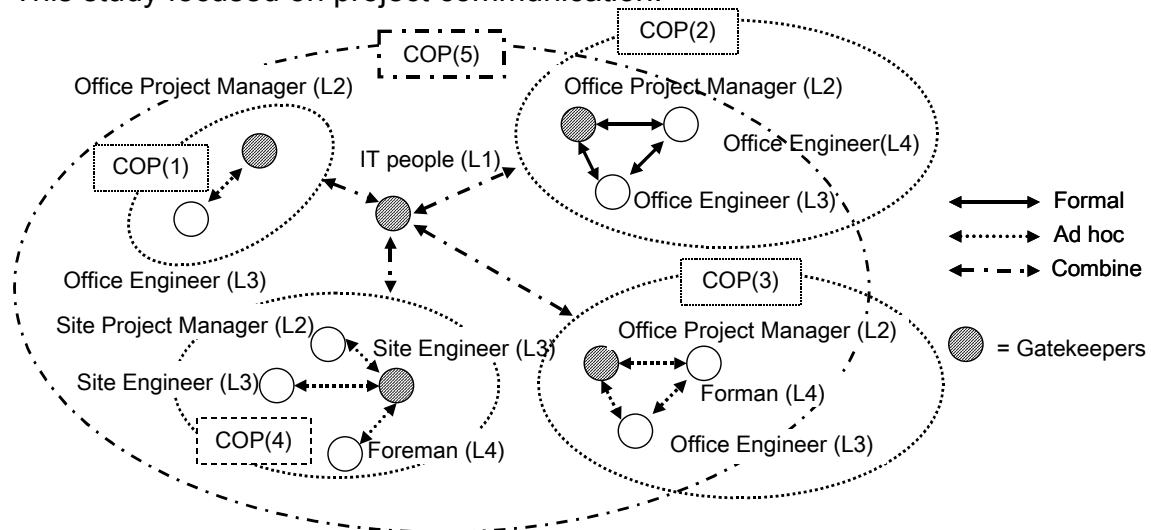
impression that the organisations were concerned that they would lose out from any such effect and did not support such behaviour (even though they recognised that this is what happens in practice).

Table 31, presents a summary of those interviewed by Pensupap in his PhD study. These are grouped into five levels: IT strategists (senior level management champion and initiative driver) implementers (given the task of encouraging diffusion of the ICT groupware initiative), project managers (responsible for construction teams on projects using this technology), site engineers, and site foremen (both direct users of the technology in coordinating the physical and administrative work being undertaken on-site). The reason for this approach is to gain understanding the factors influencing ICT diffusion from multiple perspectives

**Table 31- Categories of Interviewee in the Three Case Studies**

Interviewee	Case study		
	CSA	CSB	CSC
<i>IT strategist</i>	1	1	1
Implementer (L1)	1	1	1
Project/Engineering manager (L2)	4	1	1
Site engineer (L3)	1	3	2
Foreman (L4)	1	1	1
Total	8	7	6

The development of the ICT application under study was based on a software package that provides the basic communication functions for general business needs. Traditionally, most construction information transfer relies on paper-based systems so the software package required design and customisation of user-interfaces to suit the traditional construction approach. The ICT application under study had been customised to be compatible with organisational forms and work processes and this encouraged users to familiarise themselves with entering information using ICT instead of paper. The modules of ICT used by CSA consisted of main processes such as tendering, project communication, and construction database applications. This study focused on project communication.



**Figure 28 - Case Study A's Communities of Practice**

Figure 28 illustrates five examples of COP that facilitated the ICT diffusion. One of the senior engineers had a role in validating the ICT initiative and informally created the development of COP(1) with staff from the firm's IT department. When he experienced problems with using ICT applications from a practical and/or technical perspective, he would resolve them with the IT people. One office project manager helped establish COP(2) by providing time in the morning to talk and exchange ICT knowledge with his colleagues. He spent his morning time providing specific training and discussion about ICT problems with his subordinates and encouraged their feedback and participation. COP(2) assisted the diffusion of ICT through this team because it shared problems and new ideas on how to apply ICT to assist traditional work processes. In addition, COP(2) facilitated additional feedback to be channelled between users and ICT tool developers. COP(3) is a different group of individuals that often communally solved *ad hoc* problems through the gatekeeper, usually by phone, and if they could not through IT people. COP(4) also solved *ad hoc* problems, but on a one-to-one basis through the gatekeeper linked to IT people. COP(5) used an email discussion group to facilitate ICT use, to communicate with each other to get help. COP(5) helped users who had problems with relation to the ICT use. Members post their questions and the IT staff for other COPs to respond to. Users shared their experiences and problems and also suggested solutions. This reduced repeated questions on the use of ICT and reduces IT staff workload in repeatedly responding to the same problems.

While the above map is of little immediate practical use it nevertheless represents value in converting tacit or embedded knowledge about 'how the organisation's ICT diffusion works' into a more explicit form of knowledge. Thus when COPs are mapped in this way these maps can be evaluated and analysed to determine whether they are productive, effective or need immediate or planned modification. Just as formal organisations undergo restructuring, COPs can be influenced by organisation through support and resourcing to better align themselves with the organisation's K-Adv leadership infrastructure [186]. Thus, at least in terms of the within-organisation COPs, these may be influenced and shaped in a strategic manner to enhance the K-Adv of a firm. Additionally, if the internal-external COPs are well mapped then they too may be subject to limited influence, mainly through incentives and resourcing to accentuate the positive flow of knowledge entering the organisation so that it comes a net importer of valuable knowledge rather than net exporter.

## **Chapter Summary**

I have explored the implications for mounting a change initiative in terms of culture and change in this chapter. What I have tried to impart is a sense that organisational change, innovation is something that requires large amounts of energy to be devoted by both high-level management and those enacting the changes. It is simply an inadequate response to extol the need for change to survive (as indicated by the [178] Type 2 Anxiety) without senior management taking note of Kotter's 8 steps for achieving this end. Further, without recognising the drivers and barriers to change as described by Senge *et al* [155], then attempts to plan, implement and deploy change initiatives (especially process innovation) are at best a marginal success prospect.

I also refer to a recent highly successful project, the National Museum of Australia<sup>9</sup>, in which a radically different workplace culture with high levels of information and communication technologies (ICT) innovation and a quality culture was evident [99]. This project indicated that success is dependent upon both a high-level management commitment plus the intrinsic and extrinsic motivation of the workforce. The lessons learned from the National Museum of Australia is that transformational change is possible, that teams can work together to accept and embrace innovations that pose severe potential challenges and anxiety, and that facilitating this requires an understanding of the ideas promoted by Schein, Kotter and Senge in this chapter.

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<sup>9</sup> This was a project in which I was a research partner with Dr Keith Hampson CEO of the CRC in Construction Innovation. We with others, studied this project over its construction phase and were able to deliver significant research finding including much of the material that formed the basis for our book Walker, D. H. T. and Hampson, K. D. (2002). *Procurement Strategies: A Relationship Based Approach*. Oxford, Blackwell Publishing.

## **Chapter 8. K-Adv Development and Application Tools**

Derek H.T. Walker, Andrew Finegan and Tayyab Maqsood

The following will be discussed in this chapter:

- Purpose of the Chapter
- General Tools for Developing and Measuring the K-Adv
- Specific Tools – Soft Systems Methodology (SSM)
- Specific Tools – Case Studies
- Specific Tools - Shadowing
- Using the K-Adv Model for Competitive Advantage
- Chapter Summary

### ***Purpose of the Chapter***

Thus far this book has presented a theoretical model of the K-Adv and explained its purpose and usefulness. The major question remains how to actually develop a framework for measuring the K-Adv 'state' of an organisational unit—tools are needed for this purpose.

The purpose of this chapter is to provide guidance on how to develop a consistent approach to analysing an organisation's K-Adv approach and tools that may be used to enhance the organisation's competitive advantage through analysis of its K-Adv.

### ***General Tools for Developing and Measuring the K-Adv***

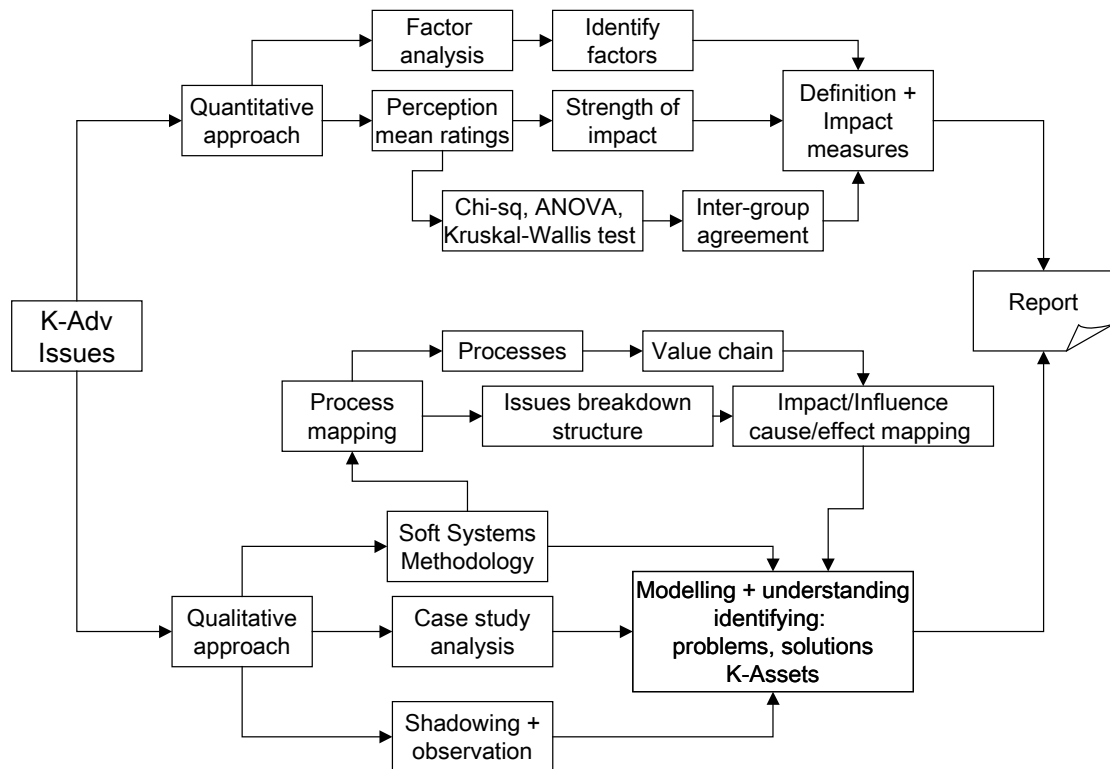
Figure 29 indicates a general approach to undertaking a K-Adv survey of an organisation. It is broken down into a quantitative and qualitative approach. While quantitative data has been recognised as providing 'hard' facts it is limited in its value for application of a K-Adv. Peansupap as part of his PhD study reported upon earlier used a quantitative approach. It was used to gain an understanding of the factors that affect ICT diffusion in targeted organisations and it was highly effective in that regard. Sufficient data about user perceptions of their response to issues highlighted in a questionnaire developed from the literature that were believed to affect ICT diffusion was gathered to enable factor analysis to be undertaken. This tool, factor analysis, allows for a wide array of issues to be grouped into logical clusters and so to better summarise these into 'factors' that affect in this case ICT diffusion.

These factors can then be used as the basis for evaluating how well ICT diffusion is undertaken (and this is one part of the ICT supporting infrastructure of the K-Adv). In fact, this analysis, together with the extensive review of the literature allowed the K-Adv concept to be developed.

Another quantitative tool used and described earlier in this chapter was the comparison of between-group assessment of factor ratings. This tool is very useful when for example benchmarking between organisations, BUs or workplaces, or classes of individuals within an organisation. For example an important K-Adv question may be 'how do engineers versus administrative staff view the level of ICT support provided in this organisational unit?' A survey may be undertaken based upon those factors that have been highlighted as relevant to the research question. The between-group tests may be undertaken using a variety of statistical tools that are beyond the scope of this book to describe more fully—readers should refer to the large



array of books available dealing with the subject of statistics. However, these test can be grouped as those with an assumption that the data distribution is normal, or skewed in some way or where an either-or test can be applied—for example that ICT is more effectively diffused by engineers than administrators. Thus, these quantitative tools can be of great value as the basis for further evaluation of the way in which the K-Adv has been deployed.



**Figure 29 - Tools for Conducting a K-Adv Survey**

A qualitative tool that was used in this Cooperative Research Centre in Construction Innovation research project reported upon in this book used another approach referred to as soft systems methodology (SSM). This will be discussed in more detail later in this chapter. The SSM tool is particularly useful for knowledge management assessment work [187]. This tool allows us to better understand complex problems and issues and can provide a unique opportunity for mapping processes, logging relevant issues influencing the situation being observed, assessing its impact upon a value chain that relates to the K-Adv and can be used to evaluate impact and influence as well as assist in cause and effect mapping.

The use of case study work also yields similar outcomes to shadowing. In this instance the case study focus may be a group of individuals in a workplace setting, an organisational unit, a process, or a project for example. Case study research generally requires a theoretical model or concept against which to make sense of the data though often a case study (such as the shadowing exercise) merely describes what is appearing to happen in order to develop a theory about what is causing or influencing that which is observed from the group up so to speak [188].

The other class of research tool identified in Figure 29 comprises qualitative research. These are indicated as shadowing, whereby an observer

watches and shadows a group of people undertaking their normal daily routine for a period of time to be able to collect data that can be used to measure K-Adv implementation. This is the fly-on-the-wall approach and will be described in more depth shortly. This yields and delivers the basis for developing models of what appears to be happening, an understanding of underlying issues and the logging of problems, solutions and knowledge assets deployed in resolving issues that emerge.

Both quantitative and qualitative research output provides the basis for a report that evaluates the deployment of the K-Adv for its supporting ICT Infrastructure, Leadership Infrastructure and People Infrastructure elements.

### ***Specific Tools – Soft Systems Methodology (SSM)***

SSM provides a useful qualitative tool for developing maps of processes and investigating problematic issues. It has also been shown to be useful in mapping knowledge assets and modelling problems and solutions related to an organisation's K-Adv [187]. We see it being particularly useful for K-Adv analysis for identifying stakeholders with knowledge that can be harnessed by organisations and for better understanding the organisation's people infrastructure elements. It is very effective at identifying often hidden social networks and other people-related knowledge assets.

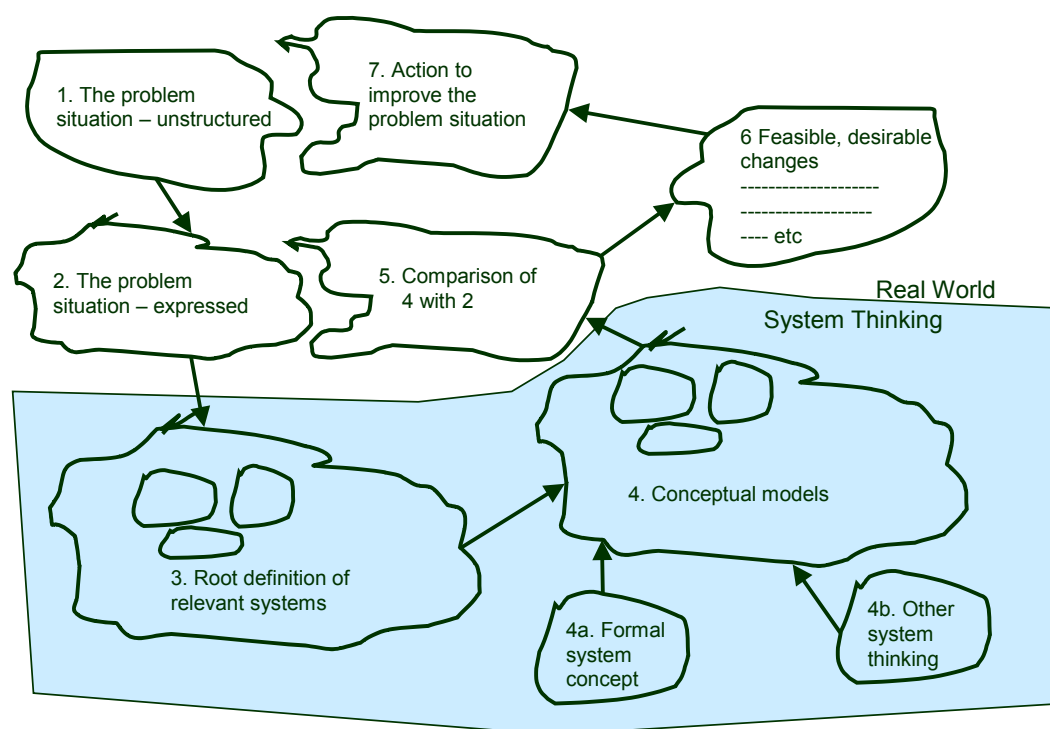
The traditional systems approach to problem solving is generally based on a reductionist technique in which problems are solved by a fragmentation through a one stage at a time approach. This technique is appropriate in complex and highly structured situations that can be well defined, particularly in terms of inputs and outputs. In information systems, this is formalised in the system development life cycle (SDLC) and the alternative method of prototyping. However, complex and poorly defined systems often conceal interesting hidden sub-text issues that are difficult to readily unearth. Understanding these contextual issues requires a pathway by which a joint exercise of sensemaking is embarked upon to fully understand the situation environment and dynamics. SSM has been also usefully employed in conducting value analysis exercises in the construction industry [189] and in a similar way it can be used for developing a robust understanding of an organisation's K-Adv elements to facilitate the evaluation and benchmarking exercises referred to earlier—the SSM as a tool provides a fruitful option.

Assessing an organisation's K-Adv is a knowledge elicitation process. Studies in knowledge elicitation have focussed upon the need to use systemic and psychological foundations to develop models of human knowledge representation, acquisition and processing [190-193]. We support Checkland's argument [96] that the standard formal logic of the accepted reductionist or mathematical systems theory may be inappropriate for knowledge elicitation, and that SSM provides a more suitable theoretical framework. While builders of expert systems in the late 1980s and early 1990s generally adopted prototyping as the preferred model of system development, there was strong evidence of limited success in adopting this approach because human factors and poorly defined complexity issues confounded acceptable definition of how knowledge experts actually address problems [194].

The principal failing of previous attempts to capture knowledge in expert systems (an early manifestation of part of what we now recognise as

the study of knowledge management) was the appreciation of context, the validity of a wide range of perspectives of the described situation and the whole concept of reality as some form of independent truth. SSM addresses these problems through its inherent acceptance of multiple realities experiences by different people with different worldviews and experiences that have formed the lens in which they perceive any given situation. SSM is claimed to be a more holistic and valid approach to viewing problematic situations that need addressing because it has the potential to unearth causal issues through its rigorous pursuit of a range of views of the situation. It provides not only a richer exposition of the situation but it allows a more rich set of images to emerge that better describes what is going on—these are illustrated by what is called ‘*rich pictures*’ [96].

SSM works within a seven-step framework. However, it must not be assumed that these steps are sequential; generally the first four steps are undertaken with a number of iterations and overlaps. Figure 30 illustrates the general SSM framework [96, p163].



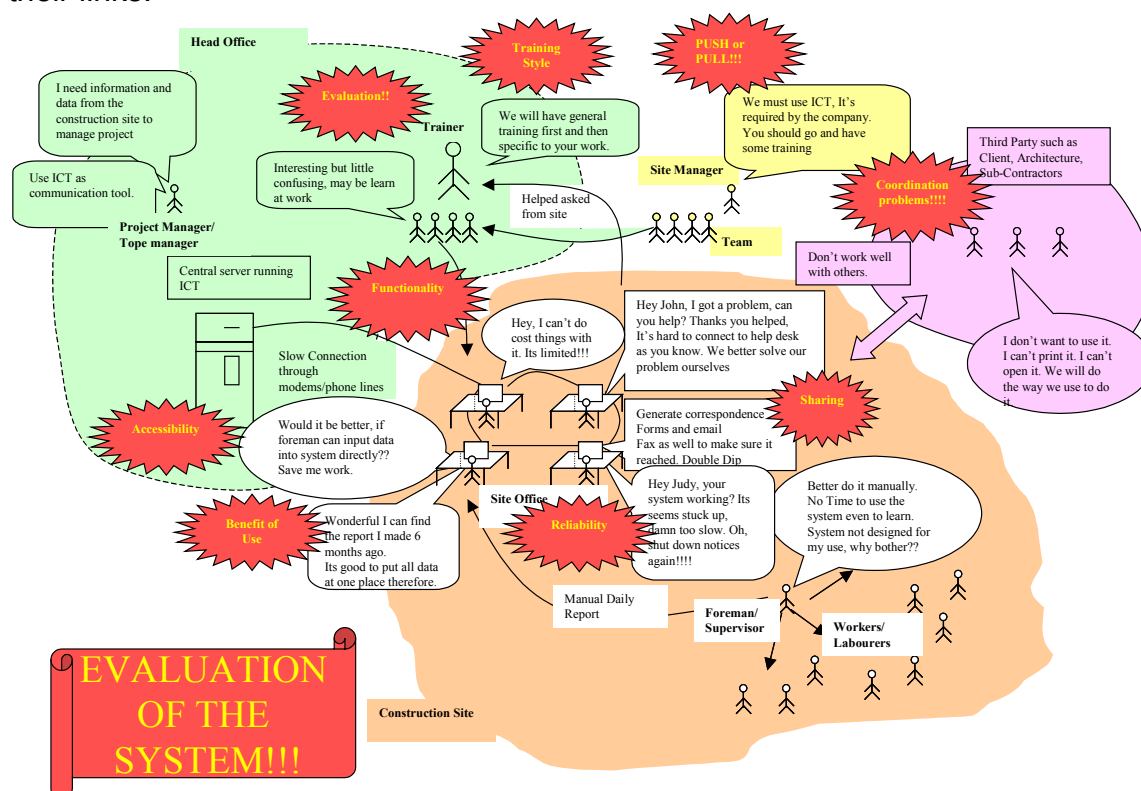
**Figure 30 - the SSM Model**

In step 1 the situation or problem is identified in an unstructured form as a problematic situation. In the problem addressed by this particular paper, the situation is identifying business opportunities worth submitting a proposal on. The choice of whether to respond to a tender or request for information on a project or potential project requires a great deal of consideration because the cost of responding is often high and the chances of successfully winning the opportunity necessarily more modest (if say 3 responses are sought then there is a *prima facie* chance of one in three for success).

In step 2 the problem is expressed. This is where explicit knowledge must be effectively unearthed through a SECI process. In SSM the usual techniques used to interview as many participants in the situation as is practicable who can explicate their tacit knowledge about the situation. This is

made explicit through an interesting medium, rich picture. These are interesting and deceptively puerile at first sight because of their child-like interpretation of a situation. This format however, conceals a sophisticated attempt to inclusively garner impressions and interpretations of experiences, feelings, and manifestations of driving and inhibiting forces that create the situation dynamic. These are the illustration of stories that help in the sensemaking process so vividly described by Weick [136].

The rich picture illustrated in Figure 31 is provided as an example of the methodological approach. It is included here as an indicative impression of the style adopted rather than important content, and would normally be formatted at a much larger scale for clarity of communication and ease of use. This rich picture comprises a narration of a story as told by interviewed participants from their perspective and worldview. People are shown in child-like sketches of stick-people to de-sensitise personal accounts and to provide an holistic interpretation. Flows of dialogue and action are also represented with key issues highlighted, in this case in starbursts. Relationships between key elements and perceived sub-systems are also indicated together with their links.



**Figure 31 - Example of a Rich Picture**

This rich picture represents a connective human communication channel that expresses the situation through an elicitation process (resultant from interviews and possible surveys) in ways that are reminiscent of Ice Age or Aboriginal Cave Art or the hieroglyphs of ancient runic languages. Often unstructured interviews are conducted where respondents are encouraged to express their unease in graphic and often therapeutic means. The principal is to unearth sub-textual information and knowledge rather than to stick to factual or 'hard' data because those interviewed generally have valid tacit

knowledge to offer that is difficult to explicate in more conventional means. While an ancient precedent is used, the underlying simplicity and human connection provides a powerful voice in explaining the situation.

Step 3 comprises the interpretation of the rich picture into a root definition. This is where high perceptive skills are called upon to take the rich picture and offer a more systemic and formulaic summary. This is the formulation of a "good" Root Definition and it is decisive to the creation of the conceptual model in Stage 4. A Root Definition is tested against a group of elements known by the mnemonic CATWOE, that defines a checklist for:

- **Customer** (beneficiary or victims of the situation),
- **Actors** (those directly affecting the situation),
- **Transformation process** (what is happening in terms of inputs being transformed into outcomes in this situation),
- **Weltanschauung** (worldview of participants – the underlying narrative that addresses the question “why bother with this situation of endeavour?”),
- **Owner** (the entity most affected by the particular situation), and
- **Environment** (what lies outside the situation).

The Root Definition is the chosen system is expressed in statements, which incorporate the points of view that make the activities and performance of the systems meaningful, and the CATWOE provide the analyst with a framework for ensuring that all points of view and interest are considered in the knowledge elicitation process. It should be a concise description of a human activity system which captures a particular view of it as a transformation process **INPUT / TRANSFORMATION / OUTPUT**.

Step 4 is the development of an account of what must be done to achieve the transformation described in the Root Definition. This is generally illustrated as an activity model and uses an eclectic approach to use whatever techniques may be available so that ‘hard’ systems may be used in the form of flow charts, simulations, animation, statistical or mathematical models or even theatre/performance. By comparing what is perceived to be the way things happen including subtext and the full picture with the conceptual model – you can reveal in Step 5 a lot of interesting questions to be addressed, assumptions to be re-visited and dysfunctional behaviours/actions that need to be remedied. This step provides the reality check for stage 4 but also throws forth a challenge to the owners of the situation, to rethink and re-analyse underlying assumptions in order that a more creative and fulfilling outcome can be reached.

This leads to Step 6 in which specific recommendations are made and plans for their implementation formulated. This may trigger changes to organisational structures, changes to procedures and/or changes to organisational culture. The format of these recommendations requires careful considerations because as Schein [178] has argued, change triggers two types of anxiety. Anxiety 1 is the fear associated with an inability or unwillingness to learn something new because it appears too difficult or disruptive. Anxiety 2 is the fear, shame or guilt associated with NOT learning something new. The valence of Anxiety 2 needs to be greater than Anxiety 1 so this implies that communication strategies for the need for change need to form an important part of any set of recommendations.

Finally in Step 7 action is taken to make changes and/or restart the process using feedback loops to test and monitor the changes. In this way it can be seen that SSM is a reflective learning process as well as an action learning approach to problem resolution [26, 31].

We have argued that the SSM is not an unreasonable approach to addressing difficult situations and employs a *bricolage* approach which involves an creative and adaptive and flexible response to problems using whatever is of use at hand. The bricoleur is a thinker who makes creative use of situations to find innovative fixes to problems and as Weick argues, “What makes for skilled bricolage is intimate knowledge of resources, careful observation, trust in one’s intuitions, listening, and confidence that any enacted structure can be self-correcting if one’s ego is not too heavily invested in it” [24, p63]. SSM offers the opportunity to become bricoleurs out of those seeking solutions to problem situations. We have endeavoured to explain how intellectually and practically demanding this task is.

In using SSM as a tool for understanding the K-Adv we have identified stakeholder analysis as an important element of defining the leadership infrastructure for the K-Adv. SSM provides a framework for investigation, understanding and analysis of stakeholder environments, as well as for identifying stakeholder knowledge assets as illustrated in Figure 32 below.

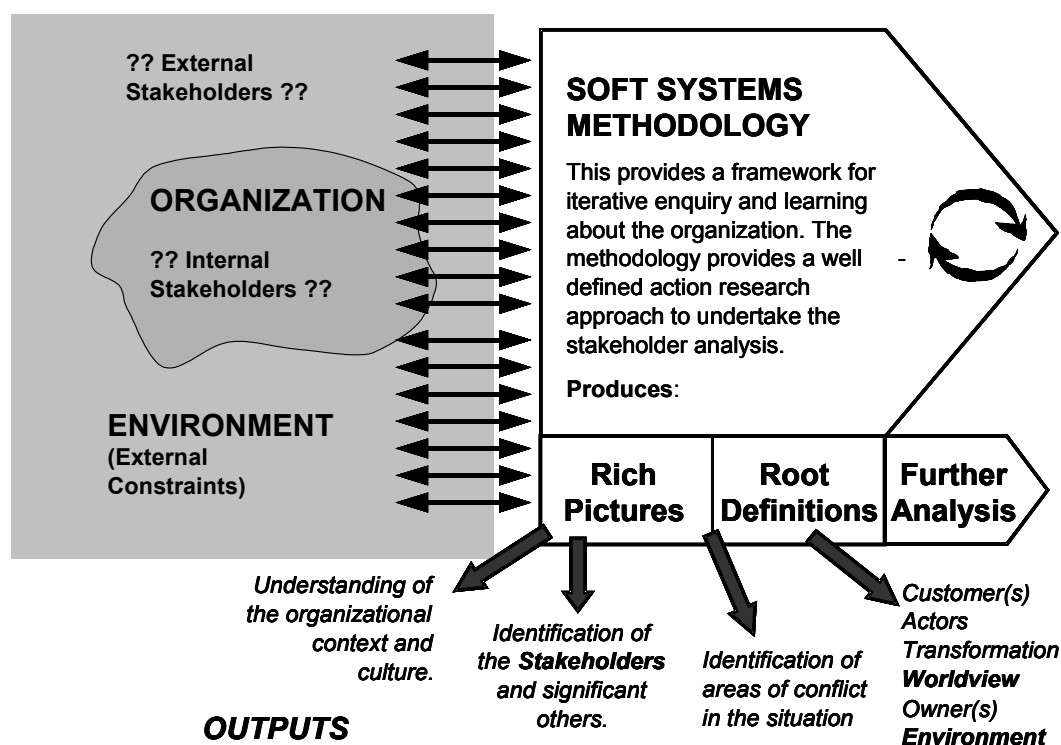


Figure 32 - Applying SSM as a method of Stakeholder Analysis

In using SSM for stakeholder analysis, there are three outputs that are particularly relevant.

- The Rich Pictures provide an opportunity to identify specific stakeholder – and significant others – within the context of the area being investigated.

- The Root Definitions include a statement of the worldview of each identified stakeholder. This is an expression of why the stakeholder has an interest investigation or intervention.
- The Root Definition also defines the environment of the organization and the stakeholders. This is significant as it helps to understand source and nature of any external constraints upon the situation, and its possible solution.

### ***Specific Tools – Case Studies***

Thus far we have indicated how both quantitative and qualitative research can be undertaken to better understand the underpinning framework of an organisation's K-Adv. We will now introduce how knowledge about an organisation's K-Adv can be used in practice.

The highest strategic level of understanding the K-Adv is the Galbraith 'Star' model. Case studies of this kind can be used to provide a coarse level of benchmarking of how change management may be applied in developing the K-Adv. This approach was used to undertake an inter-organisation comparison of ICT Diffusion in four organisations. While ICT diffusion relates to one aspect of the K-Adv this type of analysis can be used for the other two supporting infrastructures.

**Table 32 –Using the Galbraith 'Star' Diagram for Benchmarking the K-Adv**

<b>Star Element</b>	<b>Organisation A</b>	<b>Organisation B</b>	<b>Organisation C</b>	<b>Organisation D</b>
Strategy and Task Action	Refined + proactive consensus on vision, many years experience	Refined + proactive consensus on vision, 2+ years experience	Active + developing vision + consensus X-BU fragmentation	Re-active to market, underdeveloped vision, low consensus
Structure	Well-defined, highly established, highly experienced	Well-defined, well established, developing experience	Well-defined, central, X-BU case-building, developing experience	Poorly-defined, outsource dependency
People	High level technical support + training, developing supportive culture	High level technical support + training, medium developed supportive culture	High level technical support @ centre + training, developing supportive culture	High dependency on external experts bought-in, low level developing supportive culture
Processes	Advanced and refined	Developing and refining high COP use	Advanced and refined @ centre, not in BUs	Ad-doc on JIT basis with outsourcing
Rewards	Intrinsic + career advancement. Reputation working with excellent ICT.	Intrinsic + career advancement. Reputation and gaining ICT expertise.	Intrinsic + career advancement	Intrinsic + career advancement. Tacit organisational expectations

X-BU = cross business unit, COP = communities of practice see [54], JIT = just in time

Table 32 provides a benchmarking result that this is using a coarse grained top-level approach and as such must be considered as a starting point on the journey to discovering answers to the question "how is work group X performing with respect to their K-Adv". The starting point is a sound and robust theoretical framework that can be used to compare groups or compare a group over different time slices. The example illustrated in Table 32 was the resulting analysis of comparing 4 Australian top-tier major

construction organisations [195]. The theoretical framework provides comparative elements, in this case the 'Star' model identifies strategy, structure, people, processes and rewards as interdependent elements that affect an organisation's change management process. Facts, information and knowledge would be methodically gathered about the units under comparison so that each group may be compared on the basis of how they undertake each of the 5 elements and their response to these elements. For example, the strategic and task action undertaken by organisation A was judged on the gathered evidence to be refined and proactive with a consensus on its ICT diffusion vision over many years of experience. Organisation C was active in developing its vision but with cross business unit fragmentation about what that vision actually represented.

While it is beyond the scope of this book to provide details of the content description of the table it is presented to illustrate how business units, organisations or members of a supply chain may be benchmarked.

Case study work relies upon a purposeful exercise in gathering data, information and knowledge about a focus for study (say an organisation's innovation diffusion or K-Adv approach). It tests what is observed against a theoretical framework. It makes sense out of the conversation between what is expected in theory and what is seen to exist. It then provides the basis for action to be undertaken or it provides the foundation for further study that will result in action being taken. This benchmarking example would be used for decision-making relating to relative competitive advantage or perhaps decisions about which group to form a learning alliance with or make some other strategic decision about the findings.

The use of a case study approach is well established in the research methodology literature. Readers wishing to learn more about the techniques and approaches should refer to the most widely cited authorities on this such as [188] or [196]. In developing this case study approach further to better understand an organisation's K-Adv, data may be gathered based upon the tables of maturity measures for each of the K-Adv elements and components.

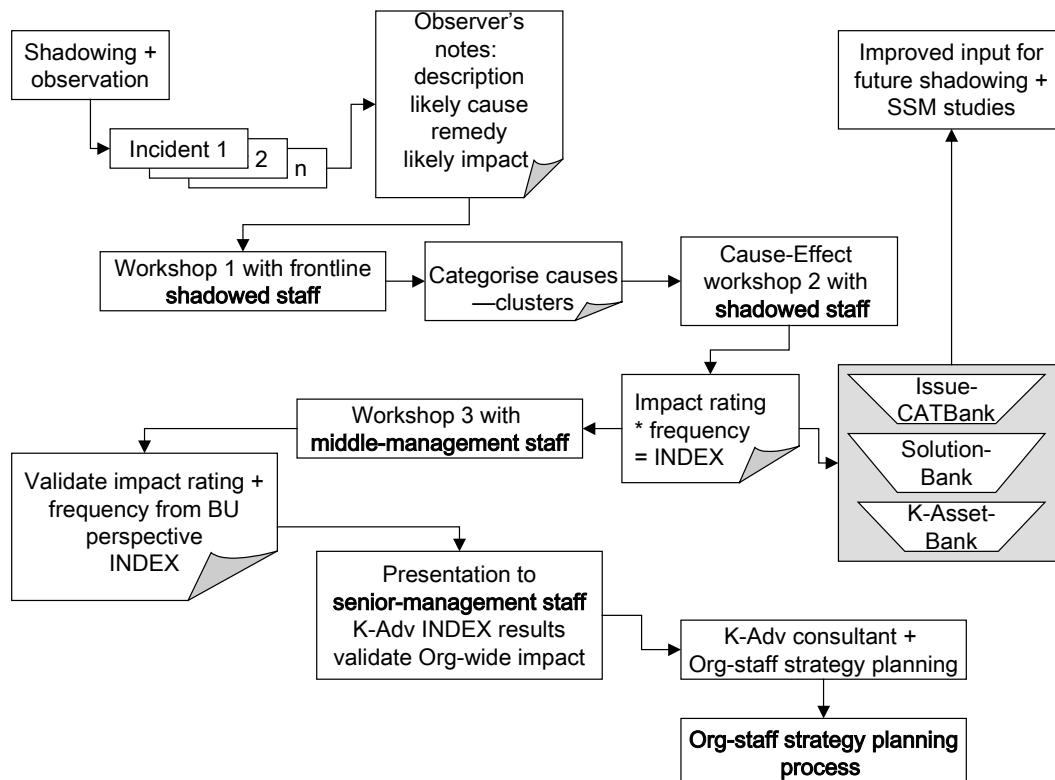
### ***Specific Tools - Shadowing***

Shadowing is a useful tool that can be used when no assumption or presumption of what is happening in a workplace that affects the K-Adv governs analysis of observed action.

Figure 33 illustrates the process. The person shadowing individuals simply become a 'fly-on-the-wall' observing and logging important insights and actions and perhaps minimally interjecting to discuss these with the person being observed. The objective of the exercise is to see what typically is going on so that issues and problems that emerge and perhaps are solved, can be analysed and placed into a framework that makes sense and helps improve understanding of how that workplace deploys the K-Adv (or at least one of more of the supporting infrastructures). The observer records details about various incidents that emerge that relate to the three supporting infrastructures of the K-Adv. Typically these are problems and irritations that impede the effective work of the observed person. The observer would log the incident in a database that could identify the organisation, its unit of focus, key words for later searching, the issue brief description, the observed strategy for



resolving it, and contextual notes, including the observer's assessment of potential impact and other pertinent data.



**Figure 33 - The Shadowing Approach**

Figure 34 provides an idea of how such a form might look though it would be best to have it linked to a database application so that entered data is automatically stored in the data base. The advantage of this approach is that it would form a source of knowledge (due to its contextual information) and could be mined when required for analysis and synthesis.

Organisation: [ . . . . . ABC Corp . ] Business Unit: [ . . . . . Civil Design . ]

Date: [ .24/ July /2003. ] Issue Number [ . . . . . 11 . ]

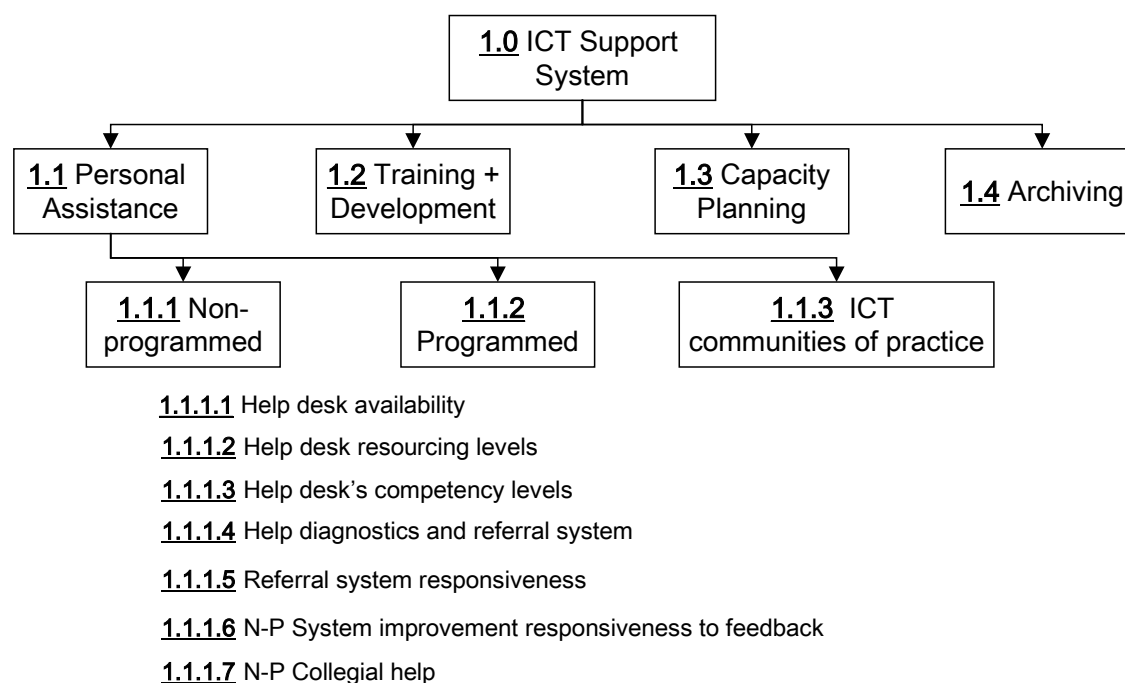
Keywords:

[ . Non-programmed help; Workplace Culture; Stakeholder knowledge . ]

Issue Description	Solution Strategy	Contextual Notes
Transfer of road system data into Microstation – Civil Section	Became a team activity, another person in the office knew the software intimately and helped the staff member. On-the-job training  Later the person went on a 2-day introductory training course for the software application.	New person to this type of application product had not yet been to training sessions provided by the vendor.  This person would be using this software intermittently but as a necessary part of the task while in this role.

**Figure 34 - Issue Logging Form**

After gathering the data over an appropriate time and for an appropriate number of people a workshop would be arranged with the frontline workers being observed. The objective of this workshop would be to help to classify these into a series of categories that would form an issue breakdown structure that mirrors and would improve the tables described in earlier chapters in this book describing the K-Adv (see Figure 35).



**Figure 35 - Issues Category Reflecting the K-Adv**

Issues can then be assessed by workshop participants in terms of the frequency of their occurrence (scaled 1 = infrequently to 5 = almost all the time), the impact that this issue has on the participant's knowledge work (1 = very low to 5 = very high) and solutions mapped to where they would occur in the K-Adv framework. These could then be also recorded in a database together with notes on the context and nature of the impact, frequency and pertinent brief notes on the solutions strategies and discussion surrounding this issue. Figure 36 provides the format that this input form could take.

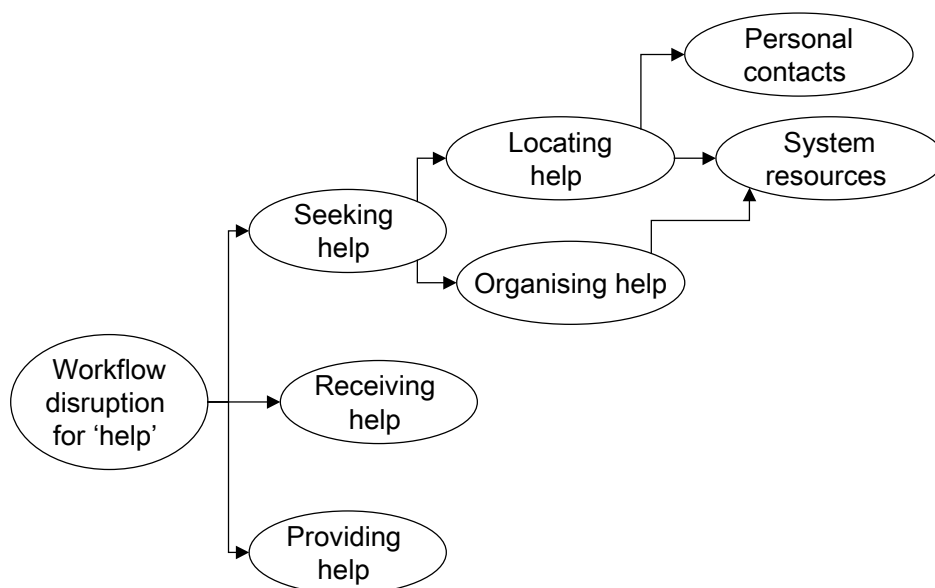
Issue Category	Frequency (f) 1-5	Impact (i) 1-5	Effect = $\sqrt{\{(f \cdot i)/25\}}$
1.1.1.7 N-P collegial help	4	4	$0.64^2 = 0.80$ = high
Impact Comment	Disruptive to the workflow of the helper and person helped but it provides good cultural 'glue' and builds trust bank.		
Solution Comment	<ul style="list-style-type: none"> <li>On-the-job training limitations to specific task problem rather than generic problem solving (single-loop)</li> <li>Builds social capital</li> <li>Need link of skills search facility in HR system for users to rapidly find personal 1-2-1 help</li> </ul>		
Context Comment	New person (< 1 month) to this task, role and organisation helper is very supportive and enjoys this part of the job.		

**Figure 36 - Workshop 1 Impact Index & Feedback Form**

The issue category would link to the K-Adv framework and be refined as more experience of shadowing consultation is gained. The frequency-impact

rating product divided by maximum value (25) provides the square of the effect index. In this case the index is  $\sqrt{\{(4 \times 4)/25\}} = \sqrt{0.64} = 0.8$  which is high. This provides useful feedback as it highlights an urgent need to address this issue. Moreover, the workshop consensus of the impact of this issue on those concerned, together with feedback on the efficacy of the chosen solution and the context comment provides valuable knowledge about the way that the workplace operates and can be used to not only better and more objectively produce a K-Adv audit but also can feed back into the general process of developing a K-Adv.

The outcome from this workshop process, which is only concerned with gathering and categorising K-Adv issues, is to provide the feedstock for a further workshop to investigate the cause and effect of these issues into broader K-Adv conversations. Figure 37 illustrates one of these exercises.

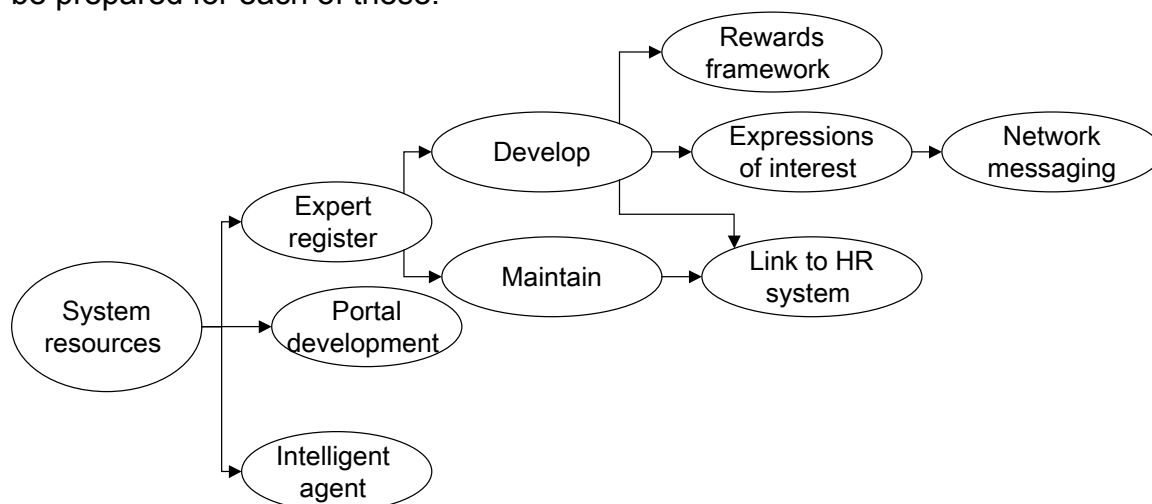


**Figure 37 - Cause and Effect Chain Diagram**

In this example a lack of personal contacts and system resources has been identified for the issue of workflow disruption experienced in getting help for using an ICT application. The way that it is constructed is to start with an apparent cause at the left-most part of the figure, then ask if it is really a cause or perhaps only an effect of a deeper cause. In this way the problem is broken down successively until there is agreement that the rightmost elements are the real 'causes' of the problem identified.

This exercise can be undertaken over time as resources allow, but highlight grass-roots problems. It can be appreciated that the chain illustrated in Figure 37 can be quite complex and inter-linked, for example system resources is linked to locating help as well as organising help, perhaps through a resource booking system that identifies people skills and allows them to be contacted for availability etc. This process can then further undertaken using a 'how-how' diagram which starts from the 'cause' and works to the right at each step defining 'how' to achieve the entity to its left. The diagram is complete once the means to achieve the desired outcome has been sufficiently defined for development of a business case for the application and for the experts developing it to be able to understand what is required and to develop the

solution. An example of this figure is illustrated in Figure 38. It should be noted that not all solutions will be implemented and a business case should be prepared for each of these.



**Figure 38 - How-How Diagram**

The outcome from workshops 1 and 2 are a deep understanding of issues and their potential solutions and a systematic set of issues that can be prioritised using the effect index that also can be used to help the consultant to establish which cell in the tables described in Chapter 4, Chapter 5, and Chapter 6 to rate the maturity level and hence to benchmark the organisation's K-Adv.

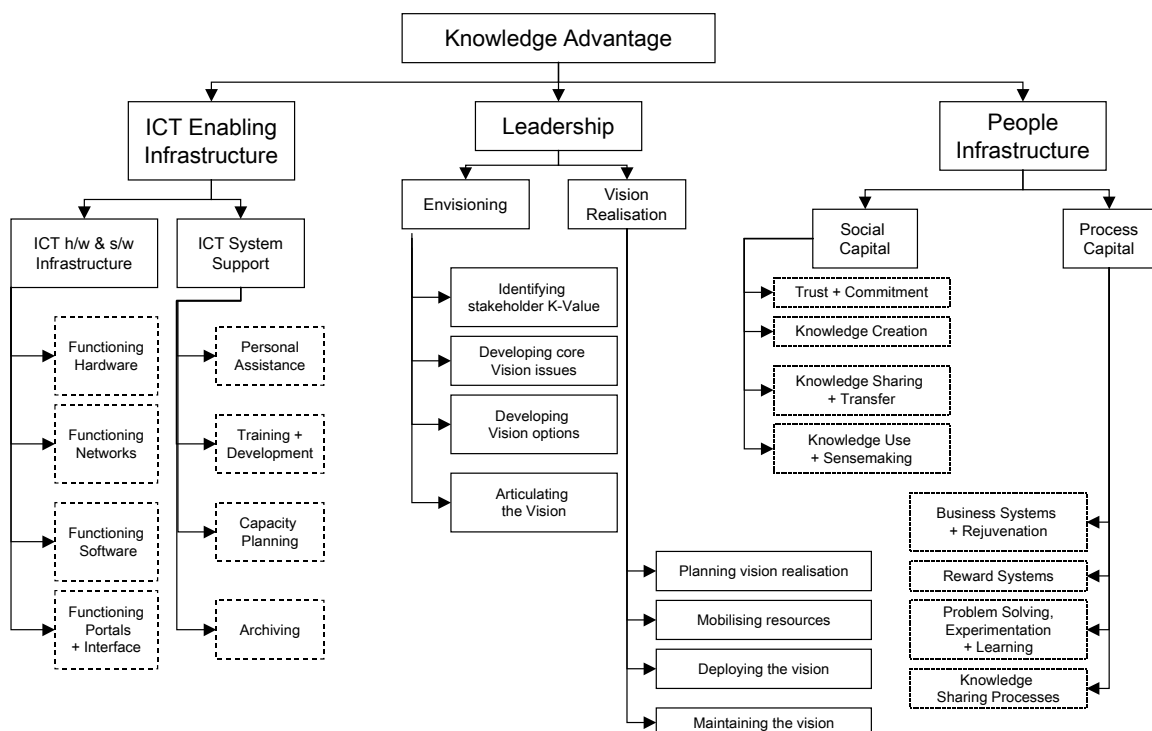
A further outcome of these workshops is the material required for workshop 3 with supervisor-level management who are responsible for these front-line knowledge workers. They may have different perceptions of both the frequency and impact of the identified issues. They would review the scores for impact and this could require debate and discussion between workshop 1 and 3 participants to form a consensus. When this is achieved this supervision level group will likely become champions for agreed improvements and this would further help the development of improved K-Adv infrastructure. The outcome of this workshop would be a framework for improvement as well as a tool for measurement and evaluation of the various K-Adv aspects. The documented issues, solutions and identified knowledge assets would be maintained in a database for future access, monitoring of issues addressed and as a knowledge asset. Numerous improvement initiatives would have been identified, documented, prioritised and submitted for senior management sign-off.

The final stage indicated in Figure 33 is the consultant's report collaboratively developed with the organisation's staff at the levels described. Thus the indexes developed, the indicated maturity levels in the tables describing the K-Adv elements and improvement strategies are all transparently arrived at and documented. This itself helps to further develop an organisation's K-Adv. The integrated linking of K-Adv consultant and the organisations strategy development and business improvement unit further enhances the systematic approach to developing a K-Adv.

## Using the K-Adv Model for Competitive Advantage

In this section I present a few ideas on how the K-Adv framework can be used in practice. To this end I illustrate a) how it can be used for benchmarking; b) how it can be used for analysis of strategic deployment of human, structural and customer capital assets; c) investigation of knowledge transfer within an organisation; and d) how specific task or process knowledge may be mapped and used to improve knowledge transfer as well as provide a knowledge development process.

In Chapter 4, Chapter 5 and Chapter 6 I presented a K-adv model that integrated the ICT Enabling infrastructure, leadership infrastructure and people infrastructure elements together with their sub-elements. In Chapter 6 I identified a social capital and process capital sub-element and for 'Process capital' I identified Reward Systems as a component. In Table 25 I presented three sub-components for this particular component and then developed questions relating to them that help define five levels of maturity. The lowest level relates to a nascent inactive condition or awareness where some or a small degree of maturity towards achieving the question response is evident. The next level relates to a pre-active condition where initiation of action is being actively considered. That level is followed by one of active adoption of a response to the question response. Following this level, pro-active acceptance of adoption translates into acceptance of the action and adapting it to meet the specific context of the issue. The highest maturity level is represented by embeddedness where the response to the question is part of the organisation's routine infused into normal operations including processes of review, refinement and change when required.



**Figure 39 - Summary of Components of the K-Adv**

Figure 39 illustrates the K-Adv model with three component infrastructure elements each with eight sub-components that were then further described in terms of characteristics of these sub-components. In this way the framework is established to allow users of this model to prepare a knowledge asset audit or to benchmark a business unit, organisation or process or to use it for strategic analysis in measuring gaps between a current position and a position identified as necessary at some future time. When this is done, a gap analysis can be undertaken.

Figure 40 illustrates a hypothetical benchmark result for Table 25. For 'rewards strategy' the closest response to the question "*How can social capital be improved by ensuring that the organisation's reward strategy is clear, well understood and effectively implemented*" is rated currently as minor because the observed situation closest matches the descriptor "*Rewards are designed as a 'one size fits all' and implemented in an ad hoc manner*". The desired position at the future time 'T' that would meet the strategic objective under consideration would be closest to the substantial level descriptor "*Rewards are designed to motivate teams and individuals to share knowledge and ideas*". Using the results from the gap analysis, a strategy can then be developed to enable the organisation to move from the minor level to the substantial level over the time 'T'. This tool not only provides a means to measure gaps but provides indicators of the shape of the desired future characteristic and thus provides a vision of how that characteristic might be viewed.

Table 26 – Reward Systems and the K-Adv

Maturity	Performance Characteristic		
	Rewards Strategy	Individual-Team Motivational Fit	Individual-Team Cultural Fit
How can process capital be improved, by ensuring that →	the organisation's reward strategy is clear, well understood and effectively implemented.	the individual's and team's rewards are in harmony with their motivation drivers.	the individual's cultural norms and values are in harmony with the teams and the rewards strategy.
Inactive AWARENESS	Rewards are provided in an ad hoc way	Reward systems pay little attention to what individuals or teams want or articulate	Reward systems pay no heed to the culture or values of <del>neither</del> individuals nor teams
Pre-active INITIATION	Rewards are designed as a 'one size fit all' and implemented in an ad hoc manner	Reward systems are focussed on either the team or the individual in an either/or manner.	The organisational culture dominates. Reward systems pay no heed to the culture or values of <del>either</del> individuals or teams.
Active ADOPTION	Rewards are designed as a 'one size fit all' and implemented in a rigorous manner	Rewards systems are balanced but do not consider the life cycle stage.	Group culture dominates. Reward systems focus on the culture and values of individuals and teams.
Pro-active ACCEPTANCE + ADAPTATION +	Rewards are designed to motivate teams and individuals to share knowledge and ideas.	Reward systems are balanced between team and individual and life cycle stage motivational drivers in mind	Reward systems are harmonised with individual and team values and culture so that they focus on what is of real value to those targeted for reward.
Embedded ROUTINISATION + INFUSION	Reward systems meet strategic goals as well as respond to individual/team goals and are reviewed and assessed appropriately. Extensive use of stretch goals.	Rewards systems are designed with team and individual development in mind to enhance their future value to the organisation in mind	Rewards systems harmonise and energise the culture of individuals, teams and the organisation and also complement aspirations of other less obvious contributing stakeholders

Figure 40 - Example of a Gap Analysis Exercise

The whole K-Adv model provides a balanced score card type of approach to tackle this task and as such is a powerful tool for auditing and benchmarking as well as strategic planning.

In Chapter 2 I discussed various types of capital, more specifically human, structural, customer and social. These can be used to apply a knowledge management strategic analysis we can first identify either where we are relative to an identified competitor or where we are relative to where we would like to be at time 'T'.

I illustrate one possible application of this using a matrix with the three types of knowledge along the Y-axis and the types of knowledge capital on the X-axis for the four types of knowledge identified by Scharmer [50, p73] as illustrated in Table 1 in Types of Knowledge in Chapter 3.

The following two tables provide an example that could be used for such an analysis for each of the four types of knowledge actions (performing, strategising, mental modelling and sculpting) in this case I highlight 'Sculpting' where the explicit knowledge relates to 'know-who', the tacit knowledge relates to 'Ethics/aesthetics' and the self-transcending knowledge relates to 'intuition in action'.

The strategic question to be addressed, in the case illustrated in Table 33, is—what kinds of knowledge do we need for sculpting knowledge? The content of the cells could be substantially populated using a brainstorming session with relevant organisational thinkers/idea-contributors. While I suggest the format illustrated in Table 33, I can envisage that a workshop or brainstorming exercise could unearth such information in a variety of forms, so this is only presented as a guide to what may be just one approach.

The contents of each cell could be later used to test a number of questions such as the (as-is with the would-prefer-to-be) strategic positioning question or (us-against-them) competitive analysis question.

**Table 33 - Strategic Analysis for Sculpting Knowledge Action**

	<b>Human capital</b>	<b>Structural capital</b>	<b>Customer capital</b>
Explicit knowledge (know-who)	<b>The people our organisation knows are:</b> <ul style="list-style-type: none"> <li>• Xxx</li> <li>• Yyyy</li> <li>• etc</li> </ul>	These people can be found at: <ul style="list-style-type: none"> <li>• location XX</li> <li>• contact information Y</li> </ul>	Upstream contacts are: X, Y, Z Downstream contacts area <ul style="list-style-type: none"> <li>• A, B, C</li> </ul>
Tacit knowledge (Ethics/aesthetics in use)			
Self-transcending knowledge (intuition in action)			

The Zack knowledge strategic analysis illustrated in Figure 8 can be used to COMPARE your organisation with a competitor or yourself where you use a as-is for 'us' compared with a where you would-prefer-to-be situation. Three assessments may be made based upon core, advanced or innovative knowledge within a matrix of on the X axis of, the intersection cell from Table 33 and on the Y axis a list of knowledge advantage drivers. These can be made for your organisation and a competitor of yours. Alternatively you could perform this analysis based upon your organisation's current and expected position at some time in the future 'T'. A gap analysis can then be undertaken and based upon that a strategy adopted. An example of this kind of analysis is presented in Table 34 for one of the 12 cells identified by Scharmer [50,

p70] in Table 1 for 'Intuition in action' knowledge—sculpting action and self-transcending. The three forms of capital knowledge assets identified by Stewart [8, p91].

The Stewart asset forms is proposed in Table 34 because customer capital is an important strategic differentiator for competitive advantage. The analysis indicated by Table 34 could be competed for Explicit, Tacit and Self-transcending knowledge. Thus knowledge management related concepts could be deployed to provide a tool for both strategic analysis for incremental improvement or breakthrough innovation/invention and competitive analysis.

**Table 34 – Sculpting Action Explicit Knowledge—OUR Organisation**

Knowledge Advantage Enablers	Human Capital Explicit		Structural Capital Explicit		Customer Capital Explicit	
	Us	Them	Us	Them	Us	Them
ICT h/w-s/w infrastructure:						
• Functioning h/w	Inov.	Core				
• Functioning network	Adv.	Adv				
• Functioning s/w	Inov	Core				
• Functioning portals	Adv.	Core				
ICT System support						
• Ad hoc						
• Planned						
• Capacity planning						
• Interoperability						
etc						

The above map could provide details of the nature of the knowledge advantage support systems. For example the human capital functioning hardware for our organisation (us) might be using a state-of-the-art hardware configuration of linked workstations with scanning equipment, digital cameras for site photographs and other image processing etc using groupware package X on a well maintained reliable linked network with customised portals for rapidly accessing software applications to the ICT support infrastructure. This may be contrasted to our benchmarked competitor using only email and a rudimentary intranet with only a basic portal structure to access the organisation's range of software applications. Such a comparative system could be used to estimate the gap and to form the basis for strategy development and sculpting the future.

Another type of strategic analysis that can be undertaken for developing the K-Adv is to analyse the knowledge transfer approach used by the organisation or part of the organisation. I suggest that one way of doing this could be through mapping enabling and inhibiting drivers of adoption of knowledge transfer as illustrated in Table 35. The three main Ps of realising knowledge transfer (people, processes and policy) can be used to construct a table and map to identify potential enabling and inhibiting forces. This could help knowledge transfer become more effective.

**Table 35- Enabling and Inhibiting Dynamics of Knowledge Transfer**



Enabling (✓) Inhibiting (X)	People	Processes	Policies
Serial	X = Moving on before codifying knowledge ✓ = People keen to experiment with AAR	X = Lack of standards for developing reports	X = No requirement by client or within organisation
Near			
Far			
Strategic			
Expert			

Analysis of the drivers and barriers through using the above as a template can reveal strengths and weakness to help in the planning of effective knowledge transfer processes.

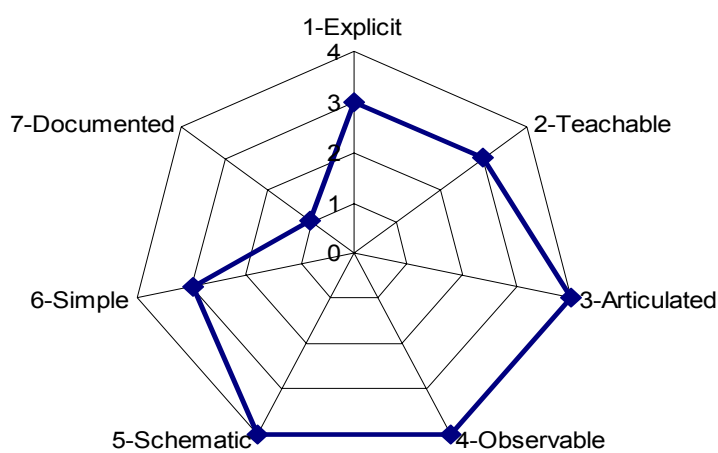
In Chapter 3 Dimensions of Knowledge seven dimensions of knowledge were presented in Table 2. These can be used at the micro level of knowledge advantage analysis to map knowledge required for any identified skill or knowledge base.

Take for example the skill required to back a car with a trailer down a narrow access road to deliver materials to a building site. The task may be to design a knowledge management approach for doing so. Dimensions of knowledge illustrated in left to right across the continuum of Table 2 could be described and scored from 1 to 5 (as indicated in brackets below) on the basis of ease of knowledge transfer. A diagram can also be drawn to represent this knowledge for each dimension. A description of the above task in terms of its knowledge characteristics follows:

1. It requires medium levels of tacit knowledge about experience with the 'feel' of the vehicle that can not be made **explicit** (3);
2. It has medium levels of being **teachable**, because of individual practice and experimentation it can be taught to some extent (3)
3. It can be reasonably **articulated** though in terms of 'if you turn the wheel left the trailer will' because of its position and direction turn (4)
4. The outcome of this knowledge is highly **observable** in use—we can see the effect of turning the steering wheel (left, right, a lot, a bit, etc) and we not see the driver's reactions and share the mental model to gain generalised knowledge of undertaking how such manoeuvres are undertaken (4);
5. The knowledge is **schematic**—it can be easily reduced to rules (4)
6. The knowledge is relatively **simple** though it draws upon special reasoning, local conditions knowledge and technical knowledge of the characteristics of both car and trailer as well as the topography of the driveway (3); and
7. I would suggest that there is available **documentation** on how to undertake this kind of task but like many manuals of instruction the tacit nature results in vital information being missing (1).

Each of the 7 knowledge dimensions are illustrated in Figure 41 with the value out of a maximum of 5 based upon 1 = Table 2 left hand descriptor to 5 = right hand descriptor. The value of such a representation is that it provides a better insight into the characteristics of this knowledge.

The resulting representation, Figure 41, helps to provide a richer understanding of the knowledge required for that task and may be used for example, to design an appropriate system for training and development. In this case it seems that on balance the skills can be routinely gained and it also indicates where programmed training is appropriate and where one-on-one coaching may be appropriate and where experimental or learning through doing can be best suited. This way of graphically illustrating how knowledge can be shared and transferred could be of great help in gaining a K-Adv. The interplay between existing knowledge and new knowledge, and between tacit and explicit knowledge provides the basis for a theory of knowledge creation. Knowledge is constantly being created from a process of combining existing knowledge with new insights to provide new knowledge.



**Figure 41 - Radar Chart of Dimensions of Knowledge**

This kind of representation can help in the design of an improved knowledge transfer system. For example if a knowledge task is seen to be high in explicit, teachable, schematic and documented knowledge then much of the learning may be accomplished by more formal means possible with a high input of ICT learning tools. If the observable level is high then it may be best transferred with added multi-media using video-audio communication channels and if the articulated dimension is high then an audio channel may be appropriate with the opportunity of dialogue through using an ICT interface or perhaps a person-2-person interface. Whatever the case may be, the type of analysis demonstrated above reveals opportunities for analysing the nature of a knowledge task and to design an appropriate learning approach that capitalises upon elements of the K-Adv such as ICT or the people infrastructure.

## **Chapter Summary**

One of the more important parts of this chapter related to some practical illustrations of how the K-Adv model may be used for K-Adv auditing, benchmarking and strategic planning. Several examples were presented.

Both quantitative and qualitative research approaches have been presented with discussion and illustrations of how they can be used to

develop a sound understanding of the nature of an organisation's K-Adv.  
These should provide guidance on how to practically use the K-Adv concept.

## Chapter 9. Conclusions

Derek H.T. Walker

The purpose of this publication was to provide a rigorous and soundly theoretically based guide to mapping an organisation or one of its elements or unit's K-Adv. The core of the book presents the three infrastructure components of the K-Adv: ICT enabling infrastructure; a leadership infrastructure and a people infrastructure. This framework was justified and explored and can be effectively used as a tool for innovation diffusion, knowledge management and developing business excellence.

In Chapter 1 I provided an introduction that defines the knowledge advantage and sets the agenda for the publication as well as providing an executive summary.

In Chapter 2, I discussed macro issues relating to the K-Adv in terms of: the knowledge economy; competitiveness and the notion of competitive advantage; and tangible and intangible outcomes in the value chain, sustainability and waste minimisation. This chapter set the scene and outlined some of the more relevant knowledge management and learning organisation issues relevant to the K-Adv.

In Chapter 3 I discuss micro more specific organisation- related issues pertaining to the K-Adv. These are the issues such as strategic implications, types and dimensions of knowledge, communities of practice, general implications of the K-Adv to the construction industry and a general theory of knowledge transfer.

In Chapter 4 I began to focus on the K-Adv elements. In this case the ICT enabling infrastructure and its components of functioning hardware, functioning networks, functioning software and functioning portal interfaces, personal assistance, training and development, capacity and archiving. In this and the following two chapters I provide a rigorous summary of theory relating to each component to justify my choice and the logic of identifying these as important issues to concentrate on. I then developed for each identified component a question that formed the best described the maturity level of addressing the question for each sub-element characteristic at each of the five maturity levels. These five levels of maturity ranged from small/some to all for each identified characteristic of the sub-element and this provides the basis for more specific measures that enable us to be able to substantiate the maturity level through a detailed auditing process.

The leadership infrastructure major component of the K-Adv model was developed and presented in Chapter 5 and for the people-enabling infrastructure in Chapter 6.

In Chapter 7 I discussed the implications of the K-Adv for the construction industry. This comprised a discussion of the theory and practice relating to power and influence because to adopt the K-Adv will inevitably lead to a change management project and understanding the nature of power and influence is required to enact any significant change. I then discussed fear and anxiety because that figures prominently as a change management issue that must be understood to effectively enact change. Similarly, drivers and barriers to change also need to be understood and so I included a section on

that important topic. I used recent cutting-edge research into ICT diffusion in the Australian construction industry to further explore the nature of innovation diffusion because it is a fundamental element in an organisation's K-Adv.

In Chapter 8 I presented examples of how the K-Adv could be used as a practical tool for auditing, benchmarking and strategy development. And in this chapter provided conclusions.

References used and cited in this book are presented in Chapter 10

This book has been designed as both a rigorously theoretical source of reference that helps to explain the academic underpinnings to the concept of the K-Adv as well as providing a practice guide of how to use the K-Adv concept. The executive summary at the introduction provides a very brief précis of the K-Adv model and I trust that readers will preserve to read beyond that summary. No guide such as this is a final model that can be used to solve complex problems. Rather, it is a work in progress. The performance characteristics chosen for each of the sub-element has been drawn from logic, theory and observation of practice. It is far from infallible. It will be tested on a number of organisations during 2003 and no doubt refined further. Anomalies will be identified and improvements made at the suggestion of those generously sparing their management energy to test the model and the guide. Like the quantity surveyor's standard method of measurement (SMM), this will no doubt evolve through much iteration over coming decades.

I trust that what will endure will be the basic framework of the model because the theoretical underpinning is strong and rigorous. Like the great Australian mythical 'bush hammer' it will survive through many changes, recognisable for the invaluable tool it represents even if the 'shaft' and 'head' have been changed or replaced many times during its useful life.

Derek H.T. Walker – Editor and principal author.

## Chapter 10. References, Bibliography and Glossary of Abbreviations

Derek H.T. Walker, Andrew Finegan and Tayyab Maqsood

The following will be discussed in this chapter:

- Purpose of the Chapter
- Useful References:
- References:

### ***Purpose of the Chapter***

The purpose of this chapter is to provide guidance on few of the books used in the literature review for developing the K-Adv concept. The reference section contains many references from books, journal papers, conference papers and other relevant sources. The usefull references section not only lists some of the books used but also explains how they are of value to the reader in understanding the K-Adv concept.

### ***Useful References:***

In terms of journal articles, the Harvard Business Review (HBR) is a prime source of business knowledge in general. It can be contacted through Harvard Business School Publication Corp.; 300 North Beacon Street; Watertown; MA; 02472; <http://www.hbr.org>. Two other journals that are also of great value is the California Management Review and Sloan Management Review. The California Management Review can be contacted at California Management Review; F 501 Haas School of Business; University of CA-Berkeley; Berkeley; CA; 94720-1900; <http://haas.berkeley.edu/News/cmr/index.html>. The Sloan Management Review at Sloan Management Review; 30 Memorial Drive; Cambridge; MA; 02139-4307; <http://mitsloan.mit.edu/smr/index.html>. These three journals provide a strong US based perspective although contributors are drawn from all over the world. Two journals that are produced from the UK that are also of particular value are The Learning Organisation and the Journal of Knowledge Management contactable through the Emerald Group Publishing Limited 60/62 Toller Lane Bradford England BD8 9 BY tel. +44 (0)1274 777700 fax. +44 (0)1274 785200 e-mail: [feedback@emeraldinsight.com](mailto:feedback@emeraldinsight.com).

The references supplies a specif set of useful pointers for further valuable information sources. While it is difficult to highlight a few of these without appearing to downgrade the value of others, there are several books that I would recommend buying to begin to develop an explicit bank of knowledge about knowledge and innovation diffusion. I appologise for having to be selective and for those readers who would prefer a more extensive list I refer them to the references section.

- Davenport, T. H. and Prusak, L. (2000). *Working Knowledge - How Organizations Manage What They Know*. Boston, Harvard Business School Press. This is a classic and highly readable text that gives a sound broad view of KM.

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- von Krogh, G., Ichijo, K. and Takeuchi, H. (2000). *Enabling Knowledge Creation*. Oxford, Oxford University Press. Like the previous text this is another with very deep insights. These authors bring a strong European perspective.
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- Weick, K. E. (2001). *Making Sense of the Organization*. Oxford, Blackwell Publishers. This text is a very useful compilation of Karl Weick's major journal and other published work. I found it dense and slow to read but the content is well worth the effort. His work has gained increasing acclaim as being a seminal source of our understanding how we make sense of knowledge.

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