

The Knowledge Advantage (K-Adv) For Unleashing Creativity & Innovation in Construction Industry

2001-004-A Industry Booklet

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Background—Knowledge and Competitive Advantage

An accelerating interest has emerged, particularly during the closing decade of the 20th Century, in the meaning of the knowledge economy. This has major implications requiring a radical re-evaluation of the role of knowledge in generating and maintaining innovation, and thus business sustainability.

For over twenty years now, business has been aware that the key to commercial success, and its sustainability, is in **nurturing its core competencies**—those things that it can do better than its competitors. Furthermore, strategic management and best practice have focussed in more recent times on generating value to new customer bases, developing new products or services or re-defining past success in new ways to meet new demands. All this requires knowledge about the past, contexts in which success and competencies were developed and defined, and knowledge of how to apply competencies to deliver future sustainable success.

In the last decade the concept of knowledge management was formulated and evolved as a strategy for *managing an environment that supports and harnesses knowledge to deliver innovation* to gain **a 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'. Central to this concept is the notion that organisations (and indeed individuals) possess a set of learned and practiced core competencies that are in their best interest to concentrate upon and develop. These competencies provide a **knowledge advantage**. The main problem that each organisation grapples with is to know what it knows and know how to successfully transfer knowledge about its competencies within its boundaries. Managing knowledge is a highly complex and difficult thing to do because the most valuable knowledge an organisation has access to either resides mainly in people's heads or is embedded with organisational procedures.

The first point that must be understood is that there are **no simple solutions**. In the 1980's a lot of people believed that machines could replicate experts making complex judgements—the expert systems (ES) fad came and went with many useful ES tools developed but these have been successfully applied in only a limited number of cases, and mainly as assistants to experts engaged in diagnostics. Similarly, information and communication technologies (ICT) tools used for storing and retrieving useful knowledge have only provided a small step in the knowledge advantage vision of organisations in **nurturing its core competencies**.

Barriers to transfer 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 a competitive advantage relies upon an organisation's competencies in being difficult to copy or replicate. Hence 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.

The Knowledge Advantage (K-Adv) Concept in Brief

The K-Adv concept recognises the need to manage the duality of both tacit and explicit knowledge. Its strength lies in its recognition of the primacy of **focussed intelligent leadership** that envisions how knowledge assets can be identified, nurtured and harnessed as well as its advocacy of providing the **essential human infrastructure** that is supported by an **enabling ICT infrastructure**. An organisation requires a coordinated approach to gain and maintain *The Knowledge Advantage* that:

1. Nourishes the *Leadership capabilities* to establish and deploy a vision to develop a capacity for sustained *Knowledge Advantage*;
2. Supports the *People management* necessary to effectively use their knowledge in business activities; it comprises systems that are supported by organisational processes which facilitate the mobilisation of knowledge resources; and
3. Provides the necessary enabling *Information and Communication Technologies (ICT) Infrastructure* that encompasses hardware, software and network delivery facilities, together with a support system.

To obtain such a coordinated outcome a number of primary structural attributes of each of the aspects must be manifest in the organisation. Addressing, implementing or reviewing such attributes establishes *The Knowledge Advantage* model.

Figure 1 illustrates the three basic infrastructures discussed above. The **leadership infrastructure** encompasses the creation, communication and deployment of a suitable knowledge vision that realises and generates and sustains organisational innovation. The critical leadership role enables the core competencies to be developed and transferred within an organisation that both uses and builds human capital through the way that people interact to generate and share knowledge. It delivers the necessary project management skills to realise the knowledge vision. It is dependent upon a process of determining and enacting appropriate strategies. The organisation also provides the **people infrastructure** to develop policies, procedures and processes that enable people to create and share knowledge for solving problems and delivering value that underpins an organisation's competitive position. People cannot always be conveniently collocated when working together. Some degree of separation is unavoidable. This raises the knowledge management problem of communication and coordination of effort. Fortunately, **ICT infrastructure** provides valuable and critical enabling tools that helps people to create, share and use knowledge. These tools allow people to be virtually collocated and for their activities to be coordinated. The whole purpose of knowledge management ICT tools is to assist people to access, use and coordinate knowledge for problem solving. ICT can also be helpful by performing some tasks more quickly than humans—searching information banks, rapidly undertaking simulations and calculations that assist humans to better evaluate cause and effect loops when problem solving. The ICT infrastructure needs to be supported to enable people to use it effectively.

The creation and maintenance by organisations of the fundamental *Infrastructure*, as described above, is dependent upon a process of determining and enacting key

strategies that nurture them. Figure 1 also illustrates the key strategies that support the infrastructures discussed above.

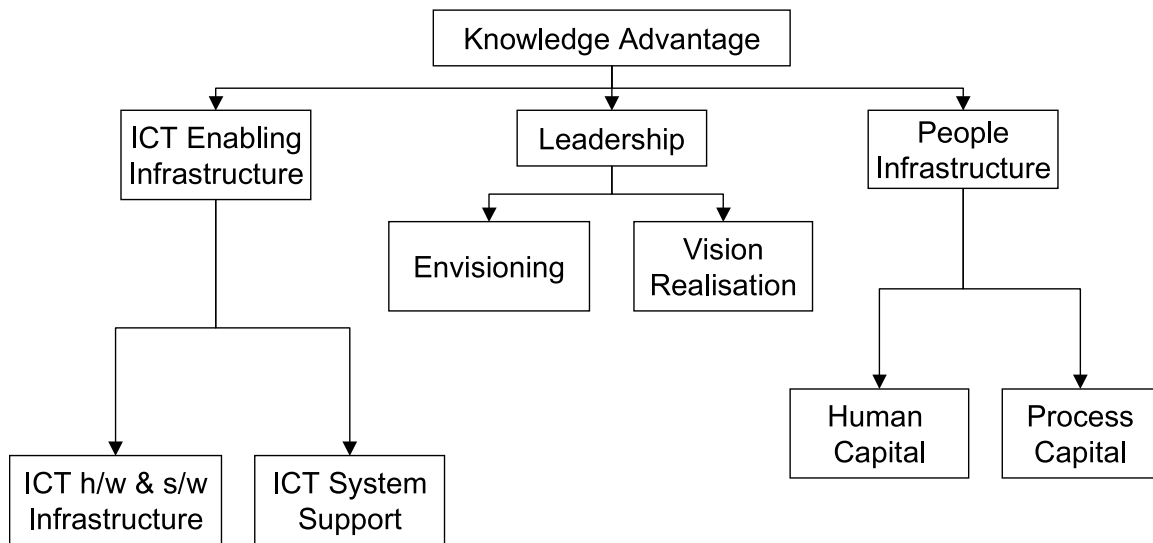


Figure 1 - Illustration of the K-Adv Concept

The *Leadership Infrastructure* should be supported by two inter-related strategies: *Envisioning* and *Vision Realisation*. *Envisioning* involves organisations in identifying, developing, prioritising and articulating a vision derived from the stakeholders of the undertaking. *Vision Realisation* involves the organisation in maintaining the vision by deploying and coordinating it, and mobilising required resources to support it.

The creation and maintenance of supporting *People Infrastructure* entails a process of creating a *Social Capital* which is adequately supported by *Process Capital*. *Social Capital* can be described 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. *Social Capital* is derived from employee, customer and supply chain networks, and provides organisations with critical competitive advantage and, accordingly, is a valuable asset. *Social Capital* is a crucial intangible asset that drives competitive advantage. The *People Infrastructure* also requires an organisational response and a supportive environment. This can be provided through organisational processes, routines and procedures that form the necessary organisational *Process Capital*. It is encapsulated in the 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.

The creation and maintenance of an enabling *ICT Infrastructure* entails creating an *ICT Hardware and Software Infrastructure* and an *ICT Support System*. A suitable *ICT Hardware and Software Infrastructure* allows people to seamlessly share communication without loss through translation, and without a need to transcribe explicit information for later re-use and reference. Groupware application technologies are also required to create the virtual linkages that facilitate problem solving and the coordination of

knowledge-related activities. To achieve this, both hardware and software need to be supportive. It must be user-friendly and secure, with firewalls providing appropriate protection against unauthorised entry to confidential information and knowledge. *ICT Support System* should be a fundamental feature of any ICT enabling infrastructure. A support system enables users to effectively exploit the advantages of an ICT infrastructure. It should encompass help facilities, training and staff development for ICT systems use. It should also provide for a capacity planning process for service levels, and develop system benchmarks, monitoring and controls. A provision for archiving of data, information and knowledge also enhances the organisation's *Support System*.

More details of this model are discussed and explained in this booklet, however, a fuller treatment of the techniques for implementation and diagnostics of the model was presented as a work-in-progress to the CRC-CI as a part of a commercialisation strategy for the research project that generated this publication. Details of the K-Adv consultancy model and its application can be obtainable from Prof. Derek Walker on derek.walker@rmit.edu.au

The K-Adv model provides a framework for understanding how knowledge can be used as a core strategic asset by managing the duality of tacit and explicit knowledge. It can be adopted and used as a strategic tool to help organisations develop a better understanding of how they can develop their core competencies, by *managing an environment that supports and harnesses knowledge to deliver innovation*, which in turn **delivers competitive advantage**. The model has also been developed for use as a benchmarking tool that identifies where organisations or their business units lie in terms of maturity in the application of K-Adv. It allows them to map their 'now' against a 'preferred future' with respect to effectively using their knowledge assets to deliver a sustainable competitive advantage. Thus, it can be used by organisations in myriads of ways to steer them towards their mission and vision.

Table 1 illustrates how the key Knowledge Advantage (K-Adv) infrastructures will manifest themselves at various levels of maturity of an organisation. 'Inactive awareness' is when the attributes of the infrastructures '*Leadership*', '*People*' and '*ICT Enabling*' are manifestly insupportive of Knowledge Advantage (K-Adv) in the organisation. 'Pre-active initiation' is when the attributes are just taking root. 'Active adoption' is when a conscious effort is made to embed the attributes. 'Pro-active acceptance and adoption' is when there is a visible momentum towards adopting the attributes. Finally, when the 'embedded routinisation and infusion' stage is reached the attributes are harmonised in the culture of the organisation.

Table 1: Maturity levels of Knowledge Advantage (K-Adv) Infrastructures

| Maturity | Leadership | People | ICT Enabling |
|-----------------------|----------------|---------------------|---------------|
| How can the Knowledge | Developing and | Developing a Social | Developing an |

| | | | |
|--------------------------|--|--|--|
| Advantage be gained by → | deploying a core vision. | Capital and deploying it through a Process Capital. | appropriate s/w and h/w infrastructure; Providing a proactive support for the 'people' and the 'systems' aspects. |
| Inactive AWARENESS | Generally management by crisis; A culture of manipulation; Top down imposition of targets and schedules; Political gamesmanship rife at all levels; Considering only the paying customers; Knowledge perceived as way of improving project's \$ bottom line; Poor resources allocated to talent development. | No organisational vision is espoused or shared; Minimal, local exchange of knowledge & learning; Minimal reflection & innovation. Top down functional focus; Hierarchic controls; Culture of blame; Rules rule; Adhoc rewards no focus on individuals or teams; Aversion to risk and innovation. | Very low availability, and reliability of h/w (20%<); Incompatible s/w packages used; Use of discs for data transfer; Phone and paper used with supply chain; Poorly resourced help facility; Small number of tutorials or manuals; Sporadic and crisis-based T&D; Systematic storage or security not planned. |
| Pre-active INITIATION | Preliminary consideration of environmental, social and knowledge issues; Planning based on a focus on critical issues; Relationships based on benefits. Beginnings of dialogue with stakeholders on own priorities; Traditional ways of resource and talent acquisition. Reactive approach to vision. | Organisational mission espoused but not shared; Knowledge sharing passive or formal; Dominance of rules; Token support to innovation; Basic knowledge initiatives; Elaborate, but ineffective reward system; Middle management involvement in policies; Risk tolerated; Limited scope for R&D. | Low availability, and reliability of h/w (40% <); Compatibility for one site only; Only standard applications; Low bandwidth connections; Centralised help facility (eg. call centre); Wary approach to CoPs; Rigid T&D (eg on-line tutorials); Inconsistent support to BUs; Global access to archives. |
| Active ADOPTION | Aware of social, customers and K-Adv vision issues; Planning done but, not on a proactive basis- but generally in response to BU's financial & 'powerful' stakeholders' terms; A range of options guides vision, but not sure of realising it; Extensive feedback obtained not analysed. | Attempts at balancing competition with collaboration; Knowledge networks at BU level; Formal support for innovation and exploration; Management guided cross-discipline groups; Reward system balanced; R&D and T&D co-ordinated, but not strategic; Basic knowledge initiatives. | Medium Availability, And Reliability (60%<); Task Specific s/w (Eg. Estimating); Cross Projects Interoperability; Servers with Emails; Moderate Bandwidth; Graded access; Web and on-line help; Passive encouragement to CoPs; T&D driven by the BU needs; Planned, retrieval & access to archives; |
| Pro-active ACCEPTANCE | Stakeholders, K-Adv & 3BL issues are identified, articulated & | Value system espoused and shared; Knowledge shared & | High availability and reliability of h/w (90%<); Web based |

| | | | |
|-----------------------------------|---|--|---|
| ADAPTATION + | analysed though financial element more emphasised; Extensive planning and exploration done to deploy the the core aspects of the vision; Negotiations mostly done on a win-win basis. | internalised well at BU level; Visible support for innovation and reflection. Focus on process simplification; Team-based systemic approach; R&D and T&D activities span supply chain. | s/w for policy and knowledge; B2B links with supply chain; High security systems; On-line and staff-based help; Chat rooms to integrate CoPs; Needs based archival systems. |
| Embedded ROUTINISATION + INFUSION | Knowledge needs of various players implemented; Awareness stakeholders benefits and values 3BL environments; Planning and exploration done & communicated to deploy all aspects of the vision; Negotiations for resources and talents are always done on a win-win basis. | Proactive alignment of culture to stakeholders; Competition and collaboration nurtured; Knowledge shared & internalised at organisational level; Strategic alliance with outside eg. education. Problem prevention through experimentation; Reward systems energise teams and individuals. | 24/7 availability, and 100% reliability of h/w; ERP systems; Video conferencing; Full tracking of security; 24/7 expert help systems; Industry-based CoPs; Proactive T&D plans with links to education; System synchronised with supply chain; seamless access to archival systems. |

Focussing on Leadership Attributes

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. 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.

Therefore the first requirement of leadership is to empower people and to develop an enthusiasm for being innovative. The second is the development and sustenance of a workplace culture that drives and supports this energy forward rather than inhibiting or crushing it. One theme that recurs in the body of knowledge on leadership literature is the critical role of effective communication. Communication of a knowledge vision and its transforming impact upon those it touches upon, results in the knowledge advantage that generates and sustains innovation.

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. While leadership helps create the vision, it needs sound project management skills and a

hands-on style and practical application to deliver and deploy the conceptual big-picture vision.

Leadership can be seen to comprise two vision inter-related activities that develop a knowledge advantage, *envisioning* and *vision realisation*. Figures 2 and 3 outline the component breakdown for the *leadership infrastructure* for K-Adv to be followed in the model, and places it in context with the *ICT Enabling Infrastructure* and the *People Infrastructure* to be elaborated later in the booklet.

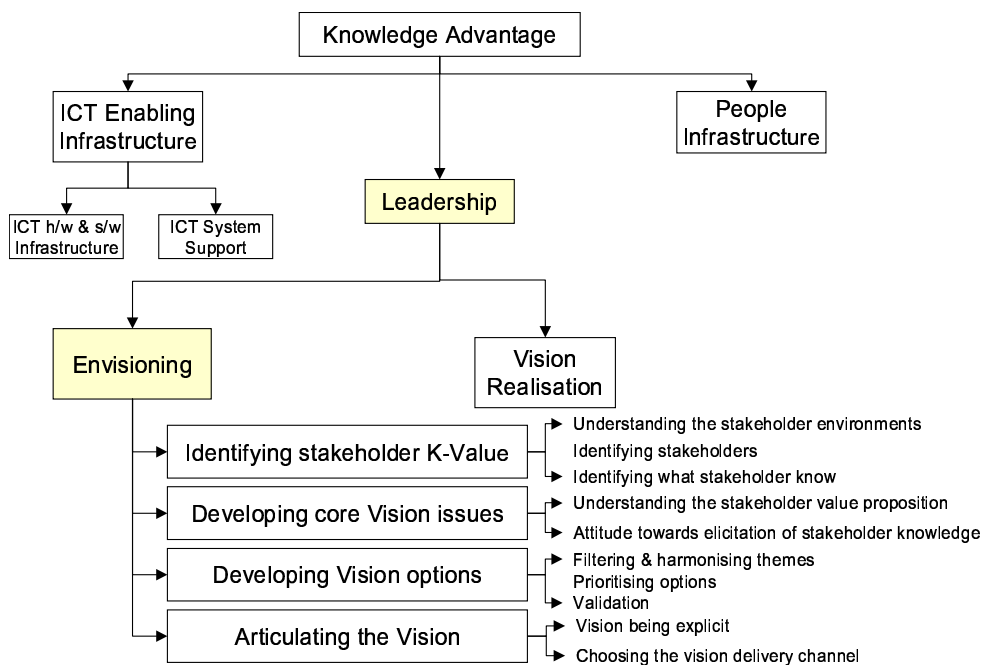


Figure 2 - Leadership Envisioning Infrastructure System Support Sub-Elements

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. Understanding the stakeholder environment and identifying their needs can be a valuable resource used to develop a K-Adv.
- What are the knowledge advantage issues that lie at the core of the identified stakeholders' needs? This involves 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. Developing core vision issues involves understanding the stakeholders' value proposition—the things that matter to them as well as eliciting knowledge from stakeholders to be able to understand what is it that they value.
- 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. 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.

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. The required steps for articulating the vision are then making the vision explicit and choosing the vision delivery channel carefully so that the message and channel are coherent and effective.

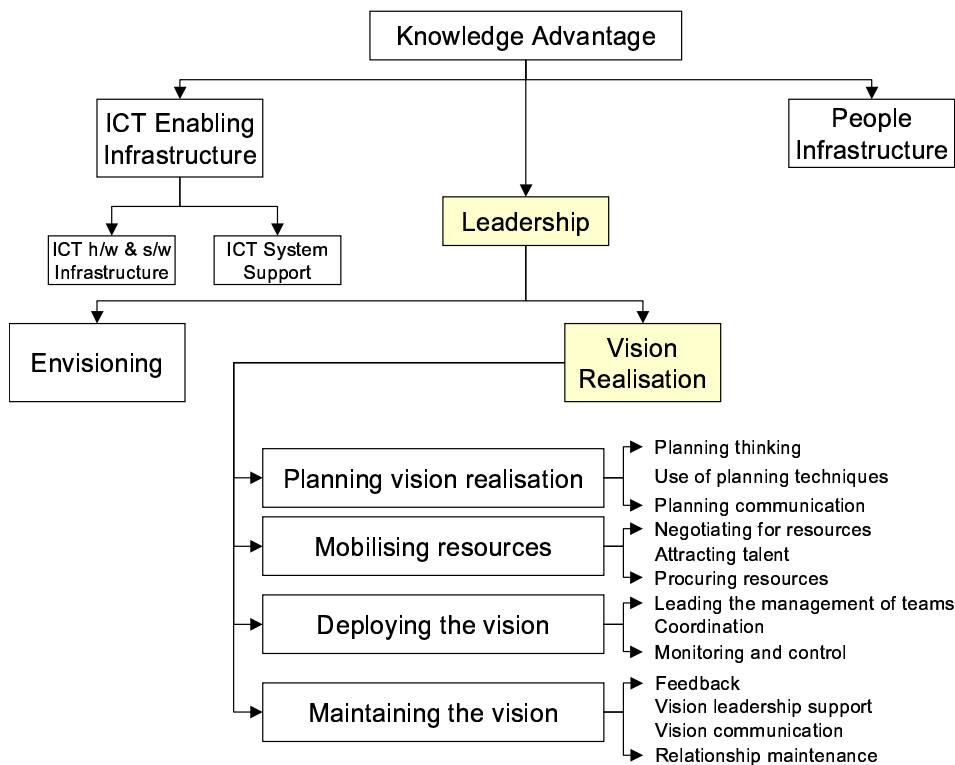


Figure 3 - Leadership Infrastructure Vision Realisation System Support Sub-Elements

With an effective envisioning, K-Adv is realised by planning and deploying vision. 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 aspect will strike deep chords of resonance. Similarly for corporate strategic planners and change management specialists also this aspect should be familiar.

Once an envisioning strategy has been developed it needs to be effectively deployed. The elements involved in this process of *Vision Realisation* is illustrated in Figure 3. 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. Planning the vision realisation 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.
- How do we mobilise resources? Having budgeted for resource commitment in the planning stage, this involves coordinating the resources to be available when and where required to mobilise the vision. This is a key activity requiring a negotiation for resources, attracting the necessary talent to deploy the vision and the use of an appropriate procurement approach that fits the circumstances.
- 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 happen. 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.
- 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 any alliance in that it is about managing relationships with those concerned. 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.

One of the most strategic leadership features is envisioning a preferred future and charting a way to get to that future. 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 the members need to seek and create to realise it.

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 organise stakeholders to create, share and transfer knowledge that support positive competitive advantage in product, process or service delivery outcomes?”

Table 2 illustrates how the key leadership attributes will manifest themselves at various levels of maturity of an organisation. ‘Inactive awareness’ is when the attributes of ‘*envisioning*’ and ‘*vision realisation*’ are manifestly absent in the organisation. ‘Pre-active initiation’ is when the attributes are just taking root. ‘Active adoption’ is when a conscious effort is made to embed the attributes. ‘Pro-active acceptance and adoption’ is when there is a visible momentum towards adopting the attributes. Finally, when the ‘embedded routinisation and infusion’ stage is reached the attributes are harmonised in the culture of the organisation.

Table 2: Maturity levels of Leadership Infrastructure

| Maturity | Envisioning | Vision Realisation |
|--|---|---|
| How can the K-leadership be improved, by → | Developing and articulating a core vision. | Planning, deploying and maintaining the core vision. |
| Inactive AWARENESS | Considering only the paying customers. Perceive knowledge as way of improving project’s \$ bottom line. Political gamesmanship rife at all levels. | Top down imposition of targets and schedules. Poor resources and talent development; generally management by crisis. A culture of manipulation. |
| Pre-active INITIATION | Preliminary consideration of environmental, social and knowledge issues. Beginnings of dialogue with stakeholders on own agenda & priorities. | Planning based on a focus on critical issues. Traditional ways of resource and talent acquisition. Reactive approach to vision. Relationships based on benefits. |
| Active ADOPTION | Aware of social, customers and K-Adv vision issues. But general response tend to be in BU’s financial & ‘powerful’ stakeholders terms. | Planning done but, not on a proactive basis. A range of options guides vision, but not sure of realising it. Extensive feedback obtained not analysed. |
| Pro-active ACCEPTANCE+ ADAPTATION | Stakeholders, K-Adv & 3BL issues are identified, articulated & analysed. These values are negotiated though the financial element is more emphasised. | Extensive planning and exploration done & communicated to deploy the the core aspects of the vision. Negotiations for resources and talents are mostly done on a win-win basis. |

| | | |
|---|---|--|
| Embedded ROUTINISATION + INFUSION | Knowledge needs of various players identified, classified and implemented. Awareness of significant stakeholders benefits and values in 3BL environments. | Comprehensive planning and exploration done & communicated to deploy all aspects of the vision. Negotiations for resources and talents are always done on a win-win basis. |
|---|---|--|

Focussing on People Infrastructure attributes

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. This is based on a view in which the employee, customer and supply chain network is seen as critical competitive advantage capital and a valuable asset 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. People infrastructure 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. Figures 4 and 5 outline the component breakdown for the *people infrastructure* for K-Adv to be followed in the model, and places it in context with the *Leadership Infrastructure* elaborated in the previous section and the *ICT Enabling Infrastructure* to be discussed later in the booklet.

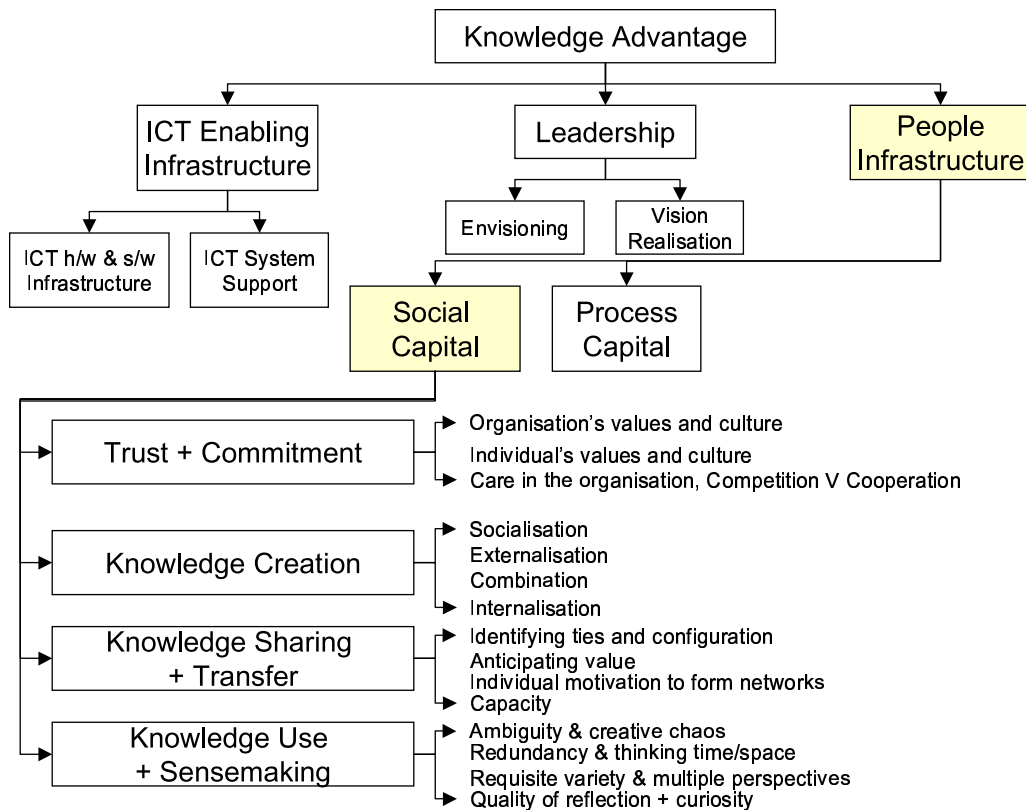


Figure 4 - People Infrastructure Social Capital

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. 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 rationalist 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.

Social capital includes doing work to create, share, transmit, transfer and use knowledge; knowledge networks such as community of practice (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.

Social capital comprises:

- *Trust and commitment* which forms the means to release latent energy. It is affected by the organisation's and the individuals' cultural values. The organisation's value system is well publicised and all employees and consultants are initiated to clearly understand what is expected. Individuals are facilitated to share knowledge through organised pro-active programs to build trust and commitment. 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. There is a proactive approach to match rewards based on cooperation but with a vigorous competition for ideas that are melded through collaboration.
- *Knowledge Creation* is a fundamental human activity that can be described as a cycle consisting of: Sharing individual tacit knowledge through socialisation; Articulating tacit knowledge either verbally or textually to create explicit knowledge; Combining created explicit knowledge with existing one such as operating procedures, manuals, and information bases; and Internalising knowledge through reflection and embodying the re-framed explicit knowledge to create refined tacit knowledge for individuals across the organisation. The contribution of *Knowledge Creation* to the creation of *Social Capital* can therefore be measured by the level of: Tacit knowledge sharing through socialisation; Tacit knowledge explication through externalisation; Explicit knowledge combination derived from socialisation with existing explicit knowledge; and Explicit knowledge internalisation derived from the combination process embedded as newly created tacit knowledge.
 - *Knowledge Sharing and Transfer* is undertaken through people networks that need to be configured to encourage participation. Knowledge network participation is derived from the perception of value from involvement. Participants in knowledge networks must have the desire and capacity to share knowledge. Networks can be developed for *Knowledge Sharing and Transfer* by undertaking the following activities: Configuring network ties through the development of people connections and communities-of-practice; Providing sufficient information about the benefits of knowledge sharing; Fostering the desire to participate and share; and Providing the capacity for people to share knowledge.

Knowledge use and sensemaking are inextricably interlinked. *Knowledge use* is achieved through enablers or conditions that are closely connected to the concept of *Sensemaking*. *Sensemaking* sets the framework within which decisions are made, which helps to explain how knowledge is used in action. 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. *Sensemaking* can be described as a process encompassing evaluative and analytical insights within a discovery feedback loop facilitating salient, logical outcomes. To make sense of knowledge and use it for competitive advantage, organisations can undertake the following activities: Provide a demanding challenge in ambiguous terms that generates a creative chaos that people respond positively to; provide sufficient resources to deliver both the time and a suitable venue to be able to think and explore mental models and hypotheses; encourage a variety of views and channels of rich communication; and provide sufficient time and space for people to contemplate and reflect so that they can map consequences.

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 5. This is called a *Process Capital*.

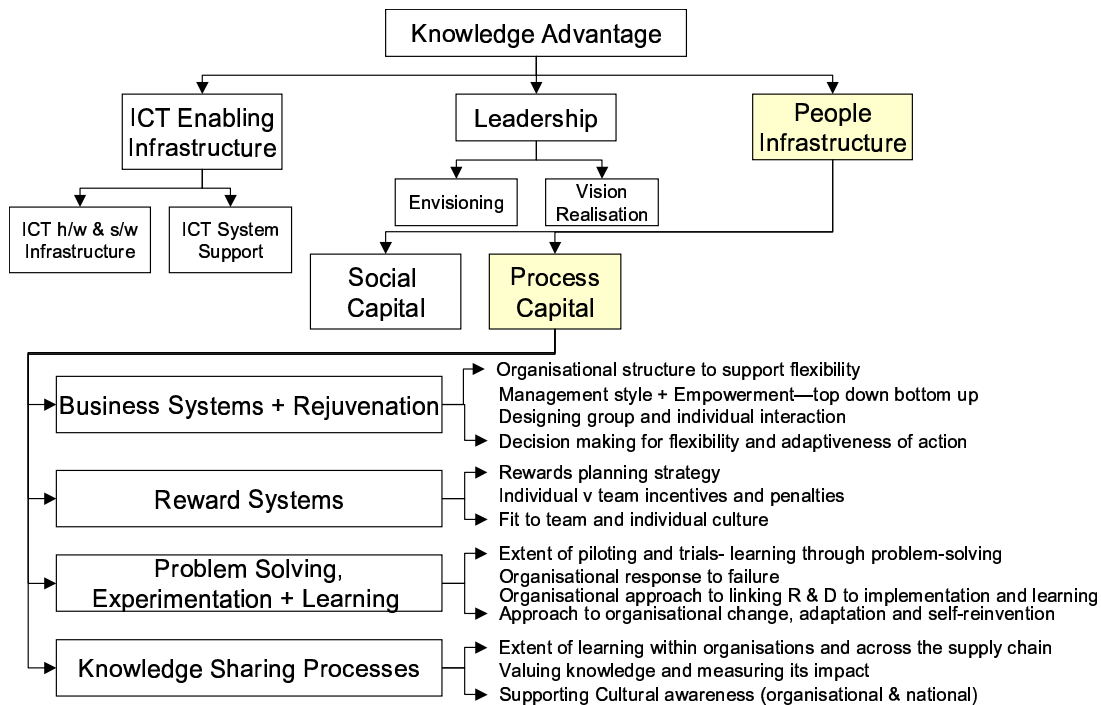


Figure 5 - Organisational Process Capital Supporting the K-Adv

Process Capital is defined 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.

Process Capital requires the following:

- A *business system* that *rejuvenates* the organisational structure to support flexibility and creativity: in order to achieve it there is a focus on integration from a systems perspective. Business Process Re-engineering (BPR) is used to enhance process simplification. A management style and empowerment strategy stimulate people with challenges and support them in their finding solutions. Self-regulation and team-based approach is practised with a shifting role of the team leader to be a facilitator. Group and individual interactions are designed to promote a sharing of knowledge. There is a focus on workshop and collaboration to get people ‘singing from the same hymn sheet’ and a pressure for consensus and agreement. Decision making approaches support flexibility. Sophisticated modelling and testing are done to allow breakthrough thinking and prevent problems.

- A *reward system* that is strategic and clear in its goals: the organisation needs to consider the purpose and the imperative of the knowledge sharing. It should motivate the individuals to fit within a team culture so that there is a balance between the personal and team motivational drivers matched by appropriate rewards. In determining an effective *Rewards Systems*, the stage of the team's development and organisational culture should be considered. The rewards can be financial, recognitional or developmental.
- A *problem solving, experimentation and learning* philosophy that promotes experiential learning: that is, stimulating an understanding through testing, developing and adapting of ideas. Research and development supports and sustains learning through applied and action research. Organisational response to failure minimises the negative and accentuates the positive impact of learning from mistakes to build a social capital. Knowledge approaches and business focus contribute to an adaptation and re-invention of the organisation.

A *knowledge sharing process* that facilitates a cross-levelling of knowledge throughout the organisation: the role of communities-of-practice and knowledge networks in creating a *Social Capital* was described previously. The *Process Capital* aspect is the motivation, supporting and encouraging of cross-organisational knowledge transfer, including the supply chain. There is a support for cultural awareness by ensuring that the individual's cultural assumptions and values are understood and considered when designing knowledge transfer. This allows diverse perspectives to be accessed and capitalised upon. The value of knowledge is made explicit by facilitating the development of appropriate reward systems.

Table 3 illustrates how the key People Enabling Infrastructure attributes will manifest themselves at various levels of maturity of an organisation. 'Inactive awareness' is when the attributes of '*Social Capital*' and '*Process Capital*' are manifestly absent in the organisation. 'Pre-active initiation' is when the attributes are just taking root. 'Active adoption' is when a conscious effort is made to embed the attributes. 'Pro-active acceptance and adoption' is when there is a visible momentum towards adopting the attributes. Finally, when the 'embedded routinisation and infusion' stage is reached the attributes are harmonised in the culture of the organisation.

Table 3: Maturity levels of People Enabling Infrastructure

| Maturity | Social Capital | Process Capital |
|--|--|---|
| How can the People infrastructure support K-Adv by → | developing and nurturing social Capital. | Deploying and sustaining Process Capital. |
| Inactive AWARENESS | No organisational vision is espoused or shared; Minimal, local exchange of knowledge & | Top down functional focus; Hierarchic controls; Culture of blame; Rules rule; Adhoc rewards |

| | | |
|---|---|---|
| | learning; Lack of a sharing culture; Minimal reflection & innovation. | no focus on individuals or teams; Aversion to risk and innovation. |
| Pre-active INITIATION | Organisational mission espoused but not shared; Trust is reserved and knowledge sharing passive or formal; Dominance of rules; Token support to innovation & reflection. | Basic knowledge initiatives; Elaborate, but ineffective reward system; Middle management involvement in policies; Risk tolerated; Limited scope for R&D. |
| Active ADOPTION | Early attempts at balancing competition with collaboration; Knowledge networks passively supported at BU level; Formal support for innovation and exploration. | Management guided cross-discipline groups; Reward system balanced, but dominated by group culture; R&D and T&D co-ordinated, but not strategic; Knowledge initiatives elaborate, but not effective. |
| Pro-active ACCEPTANCE+ ADAPTATION | Value system espoused and shared; Knowledge shared & internalised well at BU level; K-networks supported; Visible support for innovation and reflection. | Focus on process simplification; Team-based systemic approach with testing and modelling; Rewards aimed at knowledge sharing; R&D & T&D activities span supply chain. |
| Embedded ROUTINISATION + INFUSION | Proactive alignment of culture to stakeholders; Competition and collaboration nurtured; Knowledge shared & internalised at organisational level; Strategic alliance with outside eg. education. | Problem prevention through experimentation; Reward systems energise teams and individuals; Customers and suppliers involved in developments and learning; A BSC approach to knowledge established. |

Focussing on ICT Infrastructure attributes

ICT enablers provide a means for experts from various places around the world to be brought together in a virtual environment to pool and exchange knowledge to creatively solve problems that could make a qualitative leap in performance. 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. Clearly, the value of ICT in supporting knowledge management and the K-Adv is well recognised as a vital communication tool. Knowledge transmission using ICT is widely reported to be undertaken using web-enabled technologies though voice and video conferencing. Figure 6 and 7 illustrate a component breakdown structure for each of the on *ICT Enabling Infrastructure* components: *ICT hardware and software infrastructure* and *ICT system support*. Each of these two components also comprise a further four components. It provides a framework for understanding how the 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 a gap analysis.

Figure 6 illustrates the *ICT hardware and software Infrastructure* and the component attributes. The infrastructure requires:

- *Functioning hardware* that is available - having access to when needed; current- the hardware's version matches closely to that which is currently available; functional- whether the hardware does what it was supposed to do to meet the knowledge work need; and reliable- characteristic of functioning against breakdown or malfunction rate. Availability for use means that there is either 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 second characteristic of *currency* means that, the hardware functions 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. *Functionality* is also a key issue of system responsiveness. 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? The issue is to what extent does the hardware perform relative to its capacity? The fourth characteristic of *reliability* implies that there may be sufficient supply of equipment but that is of little use unless the equipment can be used.
- *Functioning software* that comprises interoperable features with groupware application to enable digital information to be easily and rapidly transferred and shared. First, interoperability means that common software applications are used 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, groupware applications 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 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. 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.

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. First, users need to actually 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.

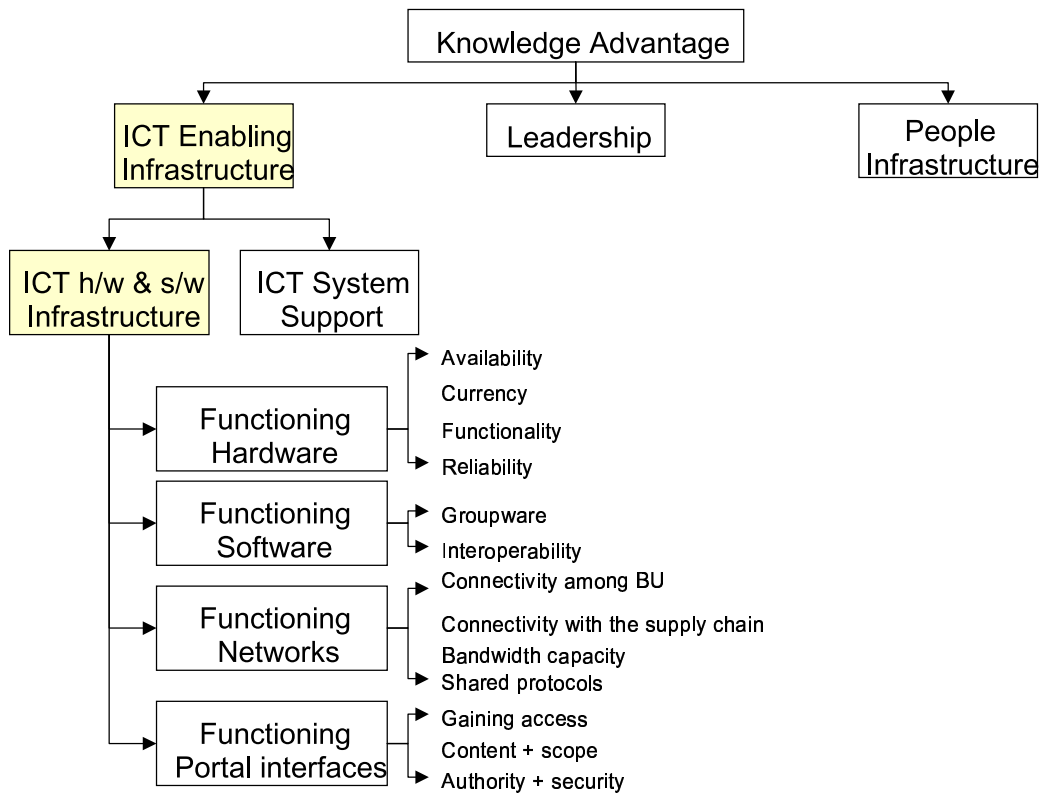


Figure 6 - ICT Hardware and Software Infrastructure Sub-Elements

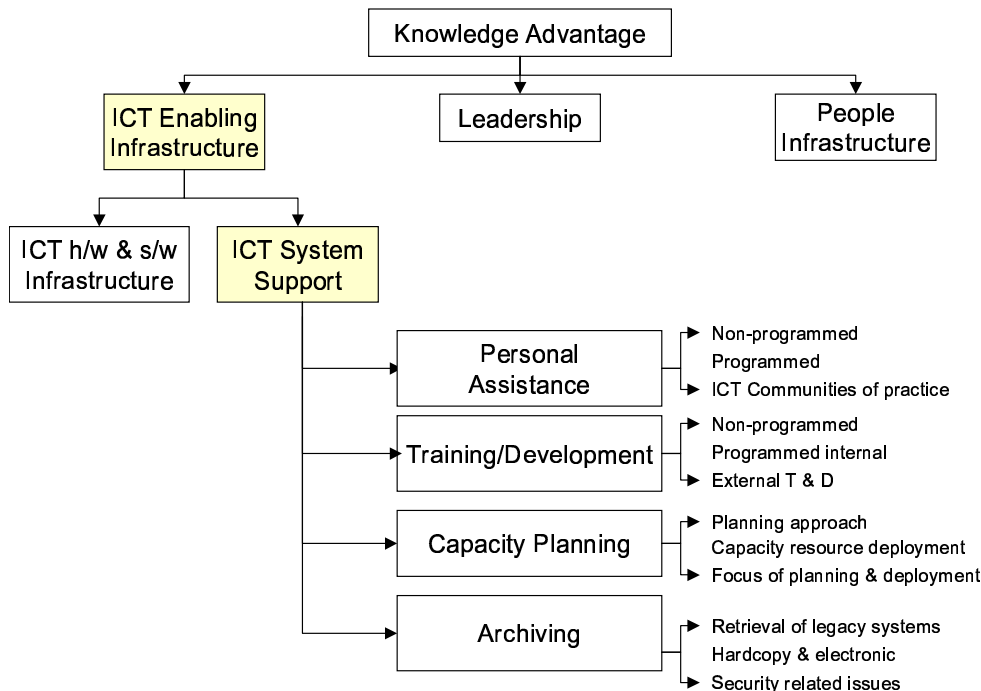


Figure 7 - ICT Infrastructure System Support Sub-Elements

In terms of *ICT system support*, organisations need to provide the means for people to be able to use ICT as identified in figure 6. This requires a ‘people’ and ‘system’ infrastructure as illustrated in figure 7 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. 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 and controlled by the support system. These are typically provided through frequently asked questions (FAQ) lists or web page search tools. They 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. 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.

- *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. 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. 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.
- *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. First there is the planning approach that follows the plan-do-check-act Deming Wheel. 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.
- *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. 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. 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 4 illustrates how the two key ICT Enabling Infrastructure strategies will manifest themselves at various levels of maturity in an organisation. 'Inactive awareness' is when when the attributes of '*ICT s/w & h/w infrastructure*' and '*ICT System support*' are

manifestly absent in the organisation. 'Pre-active initiation' is when the attributes are just taking root. 'Active adoption' is when a conscious effort is made to embed the attributes. 'Pro-active acceptance and adoption' is when there is a visible momentum towards adopting the attributes. Finally, when the 'embedded routinisation and infusion' stage is reached the attributes are harmonised in the culture and the resources of the organisation.

Table 4: Maturity levels of ICT Enabling Infrastructure

| Maturity | ICT s/w & h/w infrastructure | ICT System support |
|--|--|---|
| How can the ICT Enabling Infrastructure support K-Adv by → | Developing an appropriate software and hardware infrastructure | Providing a proactive support for the 'people' and the 'systems' aspects of ICT. |
| Inactive AWARENESS | Very low availability, functionality and reliability (20% <), very old version of h/w (5 yrs); No sharing of s/w. Incompatible packages used; Use of discs/CDs for data transfer; Phone and paper used with supply chain; No access records or controls. | Poorly resourced help facility; Small number of tutorials or manuals; Unaware of CoP; Mutual mentoring on problems; Sporadic and crisis-based T&D; Minimal external T&D; User needs not defined; No emergency procedures; Systematic storage or security not planned. |
| Pre-active INITIATION | Low availability, functionality and reliability (40% <); Old version of the h/w(3-5 yrs); s/w Compatibility & h/w connectivity for one site only; Only standard applications; Low bandwidth connections; Password access, but no tracking. | Centralised help facility (eg. call centre); Web enabled resources (eg. FAQs); Wary approach to CoPs; Rigid T&D (eg on-line tutorials); Focus on current needs; Inconsistent support to BUs; Local focus on h/w & s/w synchronisation; Global access to archives. |
| Active ADOPTION | Medium Availability, Functionality And Reliability (60%<); H/W Lags By (~3yrs); Task Specific S/W Eg. Estimating; Cross Projects Interoperability; Servers With Emails; Moderate Bandwidth; Web Applications; Graded access. | Almost adequate resources and feedback; Well-resourced web and on-line help; Passive encouragement to CoPs; Network support and Training reactively driven by the BU needs; Planned, not necessarily current retrieval system; Structured access to archives; |
| Pro-active ACCEPTANCE | High availability, functionality and reliability, (90%<); h/w lag (3yrs); Web based s/w for policy and knowledge; B2B | On-line and staff-based diagnostic support; Chat rooms to integrate CoPs; Mentoring & experiential learning supported; |

| | | |
|-----------------------------------|--|--|
| ADAPTATION + | links with supply chain; Hardwired groupware and utilities; High security systems. | Life-cycle planning & h/w-s/w harmonisation at organisational level ; Well-indexed and needs based archival systems. |
| Embedded ROUTINISATION + INFUSION | 24/7 availability, 100% functionality and reliability; h/w lag (1<yr); Network integrates supply chain; Active interaction; Wireless access; ERP systems; Video conferencing; Full tracking of security. | 24/7 expert help systems; Industry-based CoPs; Proactive T&D plans with links to education; 'Scenario planning' for future needs; Proactive approach to technology; System synchronised with supply chain; Flexible & seamless access to archival systems. |

Specific Tools for Developing and Measuring the Knowledge Advantage (K-Adv)

Both quantitative and qualitative approaches can be utilised to undertake a *Knowledge Advantage* analysis of an organisation. Some of the specific tools that can be utilised for developing and measuring *The Knowledge Advantage* include *Soft System Methodology*, *Case Studies* and *Shadowing*.

Soft Systems Methodology

Soft Systems Methodology is an iterative, interpretive approach that provides a framework to explore the complex situations that are associated with human activity. In particular, it is a method of analysis that seeks to identify different stakeholders so that their perceptions, beliefs and worldviews can be understood within the context of the problem or opportunity being investigated. The analyst who applies *Soft Systems Methodology* is primarily undertaking action research that provides a learning experience for both the investigator and the participants, with the major outcome being a better understanding of what needs to be done. As such, *Soft Systems Methodology* is suitable for analysis, but is not a design technique.

In general, *Soft Systems Study* comprises seven parts: Investigations leading to the formulation of the *Rich Picture(s)*; Development of *Root Definitions* that describe ideal systems from different stakeholder perspectives; Building *Conceptual Models* of the ideal systems; Comparison of these initial stages, leading to the identification of opportunities, lessons learnt, and the need for further analysis. This is the most common point for initiating further iterations of *Soft Systems Methodology*; This is followed by recommendations for change, and taking action. At the completion of these stages, either further iterations of *Soft Systems Methodology* occur, or some other appropriate approach is adopted to design and implement a solution.

As indicated above, the approach is highly iterative, with backtracking and repeated cycles of learning about the situation. Furthermore, *Soft Systems Methodology* encourages investigators to view organisations from a cultural perspective. Therefore the essential characteristics of organisations are determined by the component parts, which are human beings. These “people-components” can attribute meaning to their situation and define their own purpose for the organisation.

Case Studies

Case Study work relies upon a purposeful exercise in gathering data, information and knowledge about a focus for study – perhaps an organisation’s innovation diffusion or Knowledge Advantage approach. A Case Study tests what is observed against a

theoretical framework and makes sense out of the conversation between what is expected in theory and what is seen to exist. The Case Study then provides the basis for action to be undertaken, or it provides the foundation for further study that will result in action being taken. The Case Study approach may be developed further to better understand an organisation's Knowledge Advantage, through the gathering of data based on the maturity index measures and performance indicators for key Knowledge Advantage attributes.

Case Studies can be used to provide a coarse level of benchmarking of how change management may be applied in developing The Knowledge Advantage. The starting point is a sound and robust theoretical framework that can be used to compare groups or compare a group over different time frames.

Shadowing

Shadowing is a *Knowledge Advantage* investigative tool that can be used when no assumption of what is happening in a workplace governs analysis of observed action. The objective is to observe what typically is occurring so that issues and problems that emerge, and perhaps are solved, can be analysed and placed into a logical framework and improves understanding of the workplace deployment of *The Knowledge Advantage*, or one or more of its supporting infrastructures. Within the investigative process, the person/s *Shadowing* individuals or groups become a *fly-on-the-wall*, observing and logging important insights and actions, and perhaps minimally interjecting to discuss these with the subjects investigated.

The observer records details of various emerging incidents that relate to the three supporting infrastructures of *The Knowledge Advantage*. Typically these are problems that impede the effective work of the observed person. The observer logs the incident in a database that identifies the organisation, its unit of focus, key words for later searching, a brief description of the issue, the observed strategy for resolving it, and contextual notes, including the observer's assessment of potential impact and other pertinent data. The advantage of this approach is the formation of a source of knowledge, as a result of the contextual information, that can be mined for analysis and synthesis.

After gathering the data over an appropriate timeframe and utilising an appropriate number of people, a workshop is arranged with the observed frontline workers. The objective of this workshop is to determine a series of categories to form an issues breakdown structure that mirrors the structural framework of *The Knowledge Advantage*. These are recorded in a database together with comments on the context and nature of the impact and frequency, and brief pertinent notes on the solutions, strategies and discussion surrounding the issues.

The outcome from the initial workshop process, which is only concerned with gathering and categorising Knowledge Advantage issues, is to provide the feedstock for a further workshop to investigate the cause and effect of these issues into broader Knowledge Advantage conversations. Participants would review their impact and this could require

debate and discussion from between 1 to 3 workshops for the participants to form a consensus.

The management group will likely become champions for agreed improvements, further facilitating the development of an improved Knowledge Advantage infrastructure. The outcome of these workshops would be a framework for improvement as well as a tool for measurement and evaluation of the various Knowledge Advantage 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. The final stage of the Shadowing process is the consultant's report, collaboratively compiled by the organisational staff at the levels described. Numerous improvement initiatives would have been identified, documented, prioritised and submitted for senior management sign-off.

Overview of the Knowledge Advantage Model

Figure 8 provides an overview of the strategic infrastructure of *The Knowledge Advantage* model and its derivative elements. Each of the elements has been discussed in the sections above. Initially, an organisation should ideally undertake a benchmarking exercise to establish and review the performance characteristics of the derivative elements of each of the strategic infrastructure of *The Knowledge Advantage* model using the investigative tools described above. This provides the senior management with an indication of the maturity level of knowledge management and the resources required by the organisation to effectively adopt the fundamental attributes of the model. Such an investigative process will define the pattern of implementation of the model.

With the adoption of the K-Adv model, organisations can be better positioned to know what they know, and plan how to effectively transfer knowledge throughout their organisation. At the same time they can provide a more attractive and intellectually stimulating environment in which talented people, motivated by the opportunity to learn and share knowledge, can be appreciated and valued. This can help organisations to populate their business units with highly talented and motivated people, a key aim for any learning organisation with aspirations for performance excellence.

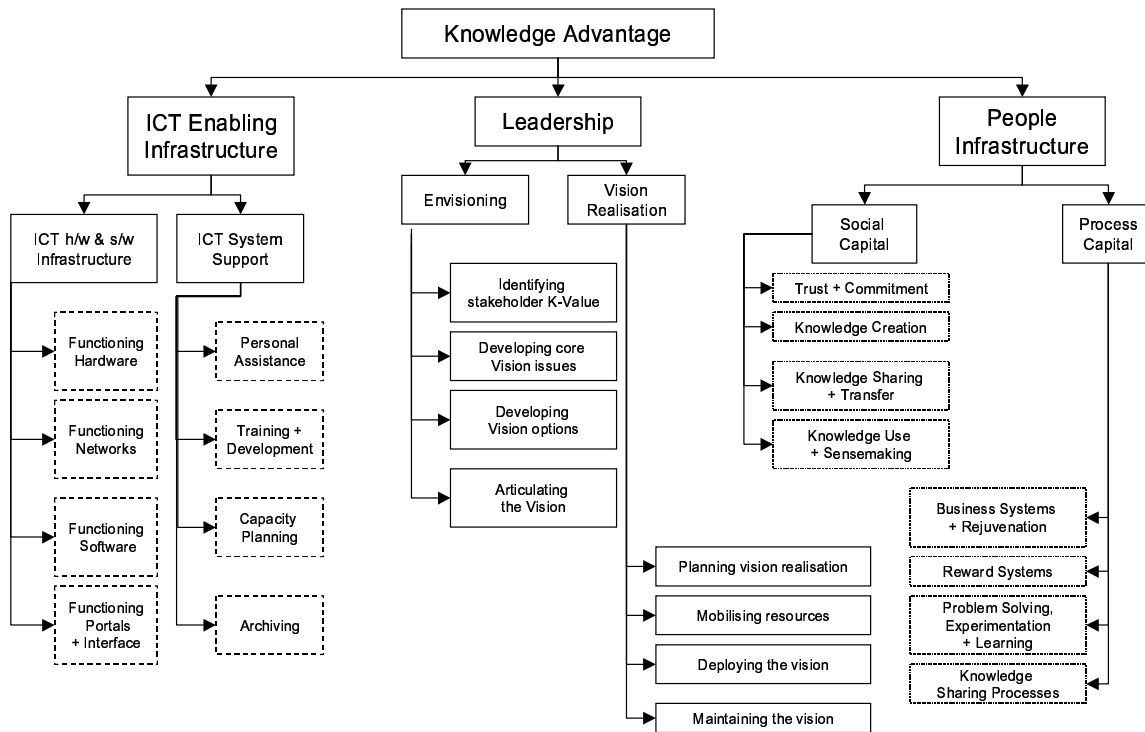


Figure 8 - Strategic Infrastructure of The Knowledge Advantage System and its Derivative Elements

Abbreviations

| | |
|--------|---|
| 24/7 | 24 hours, 7 days a week |
| 3BL | Triple Bottom Line |
| B2B | Business to Business direct connectivity without intermediaries |
| BPR | Business Process Reengineering |
| BSC | Balanced Score Card |
| BU | Business Unit |
| COP | Community of Practice |
| CRC-CI | Cooperative Research Centre for Construction Innovation |
| ERP | Enterprise Resource Planning |
| ES | Expert Systems |

| | |
|-------|-------------------------------------|
| FAQ | Frequently Asked Questions |
| h/w | Hardware |
| s/w | Software |
| K-Adv | Knowledge Advantage |
| ICT | Information and Computer Technology |
| P2P | Person to person / peer to peer |
| Q&A | Questions and Answers |
| R&D | Research and Development |
| T&D | Training and Development |

Definitions

Absorptive capacity—is the ability of a group of people or an individual to recognise the value of new external information, assimilate it and use it for commercial ends.

Benchmarking—is a process of developing performance measures to compare one individual/group/entity with another. A key feature of benchmarking is developing a performance measurement framework and conducting analysis to determine where there are gaps between the performances of the compared entities.

Community Of Practice (COP) – Etienne Wenger defines a community of practice (COP) as “groups of people informally bound together by shared expertise and passion for a joint enterprise” (Wenger and Snyder 2000, p139). However, Wenger and others have described how organisations can encourage and support a COP. A COP, shares knowledge and skills and sustains its members through obligation to exchange knowledge, providing access and accessibility to shared insights and knowledge about the practice of work (Wenger *et al.* 2002, p4).

Competitive Advantage—a firm has competitive advantage when it can produce the same good as its competitors at less cost or it can deliver a qualitatively differentiated product that is difficult or impossible to replicate.

Explicit knowledge—is knowledge that has been codified in documents or other tangible media or has been clearly explicated. While such things as manuals and procedures are often referred to as examples of explicit knowledge it can be argued that while this provides explicit forms of knowledge at one level, it still requires a measure of tacit knowledge to know how to use these explicit knowledge forms.

ICT—information and communication technologies, technologies that combine both the power of electronic data processing with communication media such as text, images, sound, video etc.

Innovation diffusion—the process that spreads or propagates an innovation within and between organisations.

Knowledge management (KM)—is the process of knowledge: creation; sharing and transferring; and practical use. KM accesses both explicit and tacit knowledge.

Organisation's maturity levels—are measures of an entity's progression along a continuum related to the targeted issue. For example a five-point scheme for innovation diffusion could range from awareness (as an inactive state merely contemplating doing something new), to initiation (being pre-active in the sense of planning to do something new), to adoption (be active in doing something new using an existing thing that is new to the target group), to acceptance and adaptation (being pro-active in making changes to suit the unique situation rather than merely following the existing model) and finally to routinisation and infusion (embedding the newly adapted model and continually questioning the innovation's relevance and re-calibrating actions to best use the innovation as a part of the new ways of doing things).

Rich pictures—are ways of representing complex situations through cartoon-like representations. Constructing rich pictures requires intense investigation of the situation being described and capturing the essence of it and communication of key concerns and solutions through these illustrations. They convey a deeper sense of the situation than mere text because relationships between elements of the system of the situation being described as well as the emotional undercurrents documented in the cartoon-like pictures.

Soft systems methodology (SSM)—Soft systems thinking seeks to explore messy problematic situations that arise in human activity. It strives to learn from the different perceptions that exist in the minds of the different people involved in the situation. It uses a 7-step approach to map the elements of a situation in order to be able to better describe the situation and present a model of it in terms of its root cause, SSM, in its idealized form, is described as a logical sequence of seven steps (Checkland 1999, 162-183) as described in the text.

Tacit knowledge—Tacit, according to the dictionary, means silent, not openly expressed but implied, understood or inferred—from the Latin *taceo* I am silent (Macquarie 1987, p1727). Tacit knowledge is more difficult than explicit knowledge to create, capture, codify, communicate and transfer because tacit knowledge is embedded in a person's mind (they know but cant explain what they know or how they know it) or physique (where they has a physical knack of doing something).

Reference:

Checkland, P. (1999). *Systems Thinking, Systems Practice*. Chichester, UK, John Wiley & Sons Ltd.

Wenger, E. C., McDermott, R. and Snyder, W. M. (2002). *Cultivating Communities of Practice*. Boston, Harvard Business School Press.

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Macquarie (1987). *The Macquarie Dictionary*. Sydney, NSW, Macquarie University.

Wenger, E. C. and Snyder, W. M. (2000). "Communities of Practice: The Organizational Frontier." *Harvard Business Review*. **78** (1): 139-145.

Bibliography:

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 9BY tel. +44 (0)1274 777700 fax. +44 (0)1274 785200 e-mail: feedback@emeraldinsight.com.

The references supplies a specific 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 we would recommend buying to begin to develop an explicit bank of knowledge about knowledge and innovation diffusion. We apologise for having to be selective and for those readers who would prefer a more extensive treatment we provide a list of references below:

- 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.
- Harvard Business Review (1990). *Harvard Business Review on Knowledge Management*. Boston, MA, Harvard Business School Press. This is a compilation of 8 classic HBR articles on KM.

- Nonaka, I. and Takeuchi, H. (1995). *The Knowledge-Creating Company*. Oxford, Oxford University Press. This is another classic and highly readable text but with excellent references and notes that leads the reader to further valuable sources of information. These authors bring a strong Japanese perspective.
- 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.
- Sveiby, K. E. (1997). *The New Organizational Wealth: Managing and Measuring Knowledge-based Assets*. San Francisco, Berrett-Koehler Publishers, Inc. This book provides a strong Scandinavian perspective. Karl-Erik Sveiby independently developed ideas of a balanced way of viewing organisational performance with a strong knowledge and social capital perspective at the same time that Kaplan and Norton were developing their ideas.
- Dixon, N. M. (2000). *Common Knowledge : How Companies Thrive by Sharing What They Know*. Boston, Harvard Business School Press. This highly readable book has a very useful way of categorising knowledge transfer.
- Rogers, E. M. (1995). *Diffusion of Innovation*. New York, The Free Press. This is the classic innovation diffusion text and draws upon the USA perspective from over the second half of the 20th century in particular.
- Leonard-Barton, D. (1995). *Wellsprings of Knowledge - Building and Sustaining the Sources of Innovation*. Boston, MA, Harvard Business School Press. This is another classic text that is easy to read and full of stimulating ideas.
- Wenger, E. C., McDermott, R. and Snyder, W. M. (2002). *Cultivating Communities of Practice*. Boston, Harvard Business School Press. This is one of the best texts for those interested in communities of practice.
- 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.

Skyrme, D. J. (1999). *Knowledge Networking - Creating the Collaborative Enterprise*. Oxford, Butterworth-Heinemann. This is a book I only recently read and it is well worth getting. It has a very readable with a good section on government and society KM initiatives.