Organizational culture as a knowledge repository for increased innovative capacity

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ABSTRACT

Just as "innovate or die" is one of the mantras of today's economy, knowledge is increasingly recognized as the key underpinning resource. Effective innovation that improves the ability of an organization to remain competitive within an uncertain environment requires the creation, capture, harvest, sharing and application of knowledge and expertise. The ability of an organization to 'learn' means that knowledge must be utilized on problems and opportunities as they emerge and is generated through an ongoing evaluation of how those responses have impacted on the organization and its operating environment. Much has been written about process of innovation from idea generation through down streaming and operationalization to commercialization. Organizational culture has been recognized as a primary determinant within innovation and the need to better understand this relationship or process is a necessary prerequisite to nurturing it in a more structured and systematic manner. Innovation is holistic in nature and is inseparable from the culture that facilitates or constrains the ability to 'add value'.

This paper explores and presents organizational culture as a "bundle" of knowledge repositories with storing and information processing capabilities. Drawing upon the knowledge management and innovation literature the location, attributes and characteristics of these repositories are provisionally identified and mapped. Primary data drawn from an R&D environment within telecommunications is then used to develop a tool for auditing, intervening, changing and maintaining knowledge repositories. This is a three-stage process comprising of an *audit tool* that identifies various cultural archetypes and their respective audited knowledge layers; an *intervention tool* that suggests various interventions and strategies for targeted change to the audited knowledge layers and an *innovation maintenance tool* that proposes strategies for "maintenance" of the desired organizational culture archetype. It will be argued that organizational learning plays an important part in ensuring that knowledge repositories are continually replenished and updated to enable efficient responses to changes it its competitive environment.

The key role of innovation in managing the uncertainty facing organizations and creating added value is becoming recognized as increasingly important as are the dynamic knowledge capabilities underpinning it (Tidd et.al., 2001). Innovations are, in part, the result of a group's knowledge of new markets and or new technical possibilities leading to improved product development. Efficient operations emerge from ensuring that both tacit and explicit knowledge is shared and contribute to a collective understanding about how things work and how they could work. This is close to the definition of culture as the 'way we do things around here'. It is also what inspired Hewlett-Packard's Lew Platt to say: "*If only HP knew what HP knows, we could be three times more productive!*" This is especially true in a globalized world of constantly changing and challenging competitive markets. To remain competitive, organizations must therefore, efficiently and effectively create, capture, harvest, share, and apply their knowledge and expertise. They must also have the dynamic capability not only to bring that knowledge to bear on problems and opportunities as they emerge but also to develop a dynamic capability to continually replenish it.

Rapid change means quicker knowledge obsolescence and entails constant internal adaptation including new strategies, structures, processes and tools and most importantly a need for people and organizations to learn quickly (Prusak, 1997). Because knowledge is not simply data or information, but is rooted in human experience and social context, its management demands that close attention is paid to the people and culture as well as to organizational structure, and information technology (Havens & Knapp, 1999). Earl (1994) suggests that knowledge management requires a combination of technological and social action while Davenport, De Long & Beers' (1998) stress the need to successfully navigate the political, organizational, and technical challenges, as well as appreciating the depth of the cultural change required. Organizations must develop ways of ensuring that the culture is conducive to knowledge sharing (Wharton, 1998). Wah (1999) puts forward the idea that the key issue is to '*instill a corporate-wide culture that encourages knowledge sharing*', while Martiny (1998) stresses the human side of managing knowledge as the most difficult. All this points towards the importance of the softer, social aspects of organizational culture and knowledge sharing.

Individuals acquire the information to facilitate problem solving and decision making and individual cognition is a central element in how and what data is acquired, how it is organized (information) and subsequently assimilated and used (knowledge) within an organizational context. What constitutes a problem and potential solution inevitably varies with individuals. In other words behavior is tied to the world as it is perceived (Green and Lemon, 1996). The latter point is important in a cultural sense because the 'world view' that underpins organizational behavior may not coincide with that of the individuals or groups carrying out that behavior. It is only through the process of sharing and assimilating information, often determined in large part by high levels of reciprocal trust, that organizations can move from collections of individuals to a more collective culture that may, for example, retain knowledge of the past even when key organizational members leave (Weick & Gilfillian, 1971).

The information used for decision-making is stored in various physical locations (Simon, 1976); is collected, stored and accessed through a range of standard procedures (Cyret and March, 1963) and can be influenced by protocols in dress and social interaction and

the physical environment within which that interaction takes place e.g. office layout, status attached to office space and fittings (Smith and Steadman, 1981).

This paper presents a conceptual model of organizational culture as a multi-layered knowledge repository. Drawing upon a range of literatures (e.g. knowledge management, organizational learning and innovation) culture is conceptualized as a "bundle" of knowledge repositories with knowledge storing and information processing capabilities. The location, attributes and the characteristics of these repositories are then identified and mapped onto a knowledge matrix. Primary data, collected from interviews with R&D personnel in the telecommunications industry, is then used alongside this model to develop a tool for auditing, intervening, changing and maintaining knowledge repositories. This is a three-stage process comprising of an *audit tool* that identifies various cultural archetypes and their respective knowledge layers; an *intervention tool* that proposes a range of interventions and strategies for targeted change in the knowledge layers and an *innovation maintenance tool* that suggests strategies for "maintaining" the desired archetype.

TOWARDS A CONCEPTUAL MODEL OF ORGANIZATIONAL CULTURE.

The following section uses existing organizational literature to identify a set of layered knowledge repositories, each containing distinctive forms of knowledge, which collectively contribute to a conceptual model of organizational culture.

The environment

In systems terms the environment is that which resides outside of a system of interest (Fortune and Peters, 1990) and, perhaps more relevant to this paper, that which can influence but is not influenced by that system. In other words much of the uncertainty that an organization encounters is grounded in its environment. Global economics, lifestyle changes, the educational competence of potential employees etc. will all affect how an organization operates but as a rule that organization will only have a limited influence on the processes themselves. It is, however, a key feature of a learning culture to scan that environment, formally and or informally, to access information and insight about it and to introduce adaptive capability into the organization to respond to it. The term redundancy is often perceived as pejorative, as are slack and fat, whereas they can also indicate the ability to respond to the unforeseen in ways that are not covered by existing procedures and mind-sets however effective they are in meeting clearly defined objectives with limited short-term uncertainty attached to them.

Mission, vision and values

An organization's values can be communicated partly through the abstract 'cultural stamp' of a mission statement. These are often dismissed as meaningless or disreputable (Eden and Ackerman, 1998) because they appear ambiguous and fail to translate into a framework for action. They appear like proverbs for general consumption, the motherhood and apple pie of management. A greater degree of freedom in the setting and implementation of strategy exits at higher levels in an organization but some of the principles for which a strategic response is set are equally apposite at the level of individual and collective operations. The subsequent interpretation of these principles impacts future decision making at all levels and is reflected in the individual and collective schema of the organizational members.

Technology

There has been, and to some extent remains, a tendency to see technology as the process whereby knowledge is created and shared. However, this view is becoming increasingly discredited as cultures of learning and innovation recognize that the appropriate role for technology is as a set of tools for storing data, facilitating data management and communicating explicit knowledge. It is only through using these tools in appropriate contexts that knowledge (tacit and explicit) can be generated.

Knowledge structures

An organization, is at its root a cognitive enterprise that learns and develops knowledge (Argyris and Schon 1978). There is a common shared perspective of environmental events and organizational abilities, which is believed to have an impact on the strategic behavior and performance of the firm. This shared perspective is described as a general knowledge structure that incorporates a dominant management logic (Prahalad and Bettis 1986). The basis for knowledge structures is experiences through contact with the environment. As the organization gains more experience and learns from it, it becomes more of an expert in its field and the knowledge structure becomes more complex. Organizational knowledge structures, both core and peripheral, are different from the normally accepted definition of organizational culture in two ways (Lyles and Schwenk 1992). Whereas culture and climate refer more to affective or emotional elements the concept of knowledge structures deals with a narrower focus of goals, cause-and-effect beliefs and other cognitive elements. They are also closely linked to an organization's strategy for survival and more subject to change than an organization's climate or culture, neither of which changes readily or provides specific strategies for action. The core knowledge structure refers to the firm's purposes and goals, while the peripheral set contains knowledge about the steps that are necessary to achieve those goals. A tight coupling of the core and peripheral sets indicates a broad consensus between organizational members about the basic mission of the firm and how to achieve it in response to environmental signals. This can indicate an inflexible culture and a desire to maintain the status quo.

The management style, organizational structure.

Nelson and Winter's (1982) evolutionary theory of the firm assumes that organizations provide a special context in which the explicit and tacit modes of knowledge are selected through the interaction with external economic reality and its reflection in organizational routines. Teece (1996, 1998a) identifies flexible boundaries, high powered incentives, non bureaucratic decision making, shallow hierarchies and an innovative and entrepreneurial culture as required attributes for highly flexible and responsive knowledge intensive organization.

An organization's ability to innovate and learn will be affected by the different management styles that are adopted. Incremental and methodical approaches will inform about changes to the current way of working (single loop learning) whereas 'fliers' and risk takers or those capable and willing to operate outside of accepted norms will potentially provide insights that are qualitatively different from it (double-loop learning).

Individuals

There has been extensive research on the cognitive structures and processes that impact upon organizational behavior (see Ford and Hegarty (1984) on cognitive maps, Argyris and Schon (1978), Levitt and March, (1988), Hedberg, (1981) on organizational learning, Daft and Weick (1984) on interpretative systems, Mason and Mitroff, (1981) on assumptions, Dunbar *et al.* (1982) and Hambrick, 1981 on frames of reference). Individuals have their own recollections of what has transpired within and between organizations and their personnel. This information can be retained in their own memory stores (Cowan, 1988), in their own belief structures (Walsh, 1988: Walsh, Henderson, & Deighton, 1988), through the making and perpetuation of assumptions (Brief & Downey, 1983), personal cause maps (Weick, 1979a), values (Beyer, 1981) and articulated beliefs (Sproutt, 1981). Individuals in an organization retain information based on their own direct experiences and observations (Argyris and Schon, 1978; Nystrom and Starbuck 1984).

The collective.

The complicated nature of most projects requires the pulling together of a range of skills. Even when individual expertise necessitates working in isolation or through small groups that expertise has to 'fit' the project and the other members of the project have to see how different contributions fitted together. In consequence, team working is fundamental and the skills balance of a project / group team important in determining innovative capacity. This balance within teams, or the emphasis given to different skills, should vary according to the technological or social emphasis of the work.

While the disciplinary balance of the team does not, of itself, indicate innovative capability the ability to appreciate how different competences complement each other may well do so. This suggests a number of factors for consideration. For example is there a need for 'mavericks' who can think 'outside of the box' and if so when should this be utilized? Similarly, the ability to link skills sets in such a way that something new emerges is itself a skill and is key to the creative capability of a team. Such integrative skills need to be both recognised within the organization, its teams and individuals and underpinned by experience of other disciplines and industrial contexts. The willingness to share expertise combined with a preparedness and ability to ask and receive (trust issues) is an important feature of innovative capacity as is the communication necessary to identify, locate and learn from that expertise.

Organizational memory

Earlier theorists have postulated that organizational memory is embodied in standard operating procedures (March and Simon, 1958). March and Olsen (1976: 62-63) believed that "*past events, promises, goals, assumptions, behaviors*" are stored in memory, whereas Argyris and Schon (1978:19) asserted that "*learning agents', discoveries, inventions, and evaluations must be embedded in organizational memory*". Hall (1984) described an organization's memory as comprised of cause maps, architecture, strategic orientations and standard operating procedures. Organizational memory has also been viewed in terms of structural artifacts that over time lose their effectiveness and become obstacles to change (Starbuck & Hedberg, 1977), while others have attempted to list its contents (Argyris & Schon, 1978; Daft & Weick, 1984: March & Olsen, 1976).

Argyris and Schon (1978:11) have also argued that organizational memory is only a metaphor and so by extension "*organizations do not literally remember*" whereas Sandelands and Stablin (1987:136) have raised the possibility that "*organizations are mental entities capable of thought*". Walsh and Ungson (1991) define organizational memory in its most basic sense "*as stored information from an organizations' history that can be brought to bear on present decisions*". This information is stored through the individual recollections and shared interpretations that emerge as a consequence of implementing specific decisions.

For the purposes of this approach organizational culture can be conceptualized as a multi-layered knowledge repository each layer of which has behavioral qualities and the ability to process and store information (Figure 1). By viewing culture in this way interesting questions are posed about the form*, type* and *nature* of knowledge that is contained at each layer.

Figure 1: A conceptual model of organizational culture
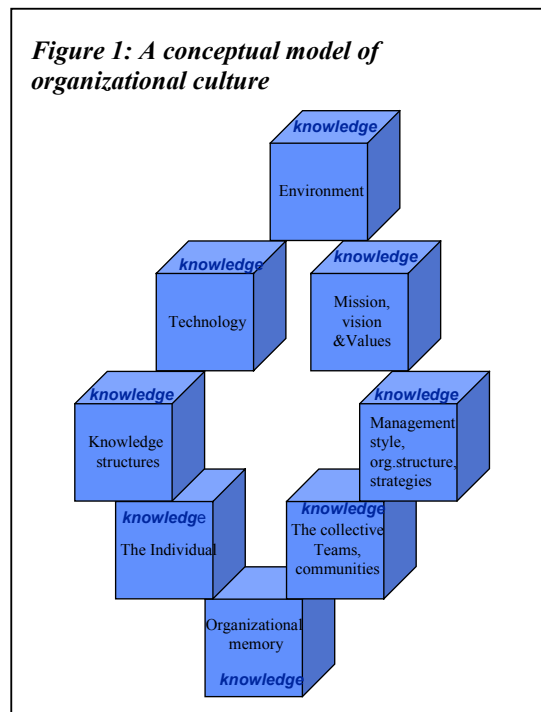
THE FORMS (CATEGORIES) OF KNOWLEDGE.

Five forms or categories of knowledge can be identified from the organizational literature. The terms embrained, embodied, encultured, embedded and encoded (see Blackler, 1995) are an adaptation of a categorization suggested by Colilns (1993) to explain the psychological and behavioral aspects of knowledge and is based on its explicit – tacit and individual - collective dimensions.

Embrained knowledge (individual-explicit) is dependent upon conceptual skills and cognitive abilities. It is a form of abstract or theoretical knowledge that in western culture has enjoyed a privileged status. Fiol and Lyles (1985) reflect this view of the distinctive status of abstract knowledge when they discuss "routine" behavioral adjustments which they term as "higher level" abilities as complex rules and understand complex causations. Argyris and Schon (1978) in their theory of "double loop" learning feature embrained knowledge and encourage an explicit recognition and reworking of unquestioned

objectives. Senge(1990) also synthesizes personal insights, models, systems thinking and shared visions in a general account of organizational learning. Scientific knowledge, which focuses on the rational "understanding and knowing" of universal principles or laws of nature, belongs to this category.

Embodied knowledge *(individual-tacit)* is action oriented and is likely to be only partly explicit (Ryles (1949) called it " knowledge how", and James (1950), "knowledge of acquaintance"). It is this practical, individual type of knowledge on which Polani (1962,1966) focused. In contrast to embrained knowledge, which depends on abstract theoretical reasoning (knowing), embodied knowledge builds upon "bodily" or practical experience – doing - (Lam, 2000). It has a strong automatic and voluntaristic component and its generation and application does not need to be fitted into or processed through a conscious decision making schema (Spender 1996b). Describing embodied knowledge, Zuboff (1988) argued that it depended on people's physical presence, on sentiment and sensory information, physical cues and face-to-face discussions. He continued that it is acquired by doing, and is rooted in specific contexts. Other accounts include Scibner's (1986) description of "practical thinking", i.e. problem-solving techniques which depend on an intimate knowledge of a situation rather than abstract rules and Hirschhorn's (1984) analysis of mechanization and with the conclusions that operator's tacit understandings of machine systems are more important than their general knowledge. Embodied knowledge is also context specific; it is *"particular knowledge which becomes relevant only "in light of the problem in hand". Its generation cannot be separated from its application"* (Barley, 1996).

Encultured knowledge *(collective - tacit)* refers to the process of achieving shared understandings. According to Blackler (1995), cultural meaning systems are intimately related to the process of socialization and acculturation and such understandings are likely to be dependent on language, socially constructed and open to negotiation. Srivastva and Barrett (1988) in their work on organizational learning have demonstrated how imagery in the language of a group can change over time. As people grasp for new insights, they experiment with new metaphors that others may take up and develop. Orr's (1990) account of stories shared by maintenance technicians about complex mechanical problems and Nonaka's (1991; 1994) work on knowledge creating organizations are examples of this concept.

Embedded knowledge *(collective - tacit)* is knowledge that resides in systemic (organizational) routines and shared norms. The concept of social embeddedness refers to how institutions are affected by networks of social relations Granovetter (1985). Following Badaracco (1991), the notion of embedded knowledge explores the significance of relationships and material resources. Embedded knowledge is analyzable in systems terms through the relationships between technologies, roles, formal procedures and emergent routines. Nelson and Winter (1982) while analyzing an organizations capabilities noted that an individual's skills are composed of sub elements which become co-ordinated in a smooth execution of the overall performance, impressive in its speed and accuracy with conscious deliberation being confined to matters of overall importance. This they maintained was a way of analyzing an organization's skills. In addition to the physical and mental factors that comprise individual skills, organizational skills are also made up of a complex mix of interpersonal, technological and socio-

structural factors. Such knowledge is dynamic, contextual and dispersed; it is also capable of supporting complex patterns of interaction in the absence of written rules.

Encoded knowledge *(collective-explicit)* is information conveyed by signs and symbols. Electronically encoded and transmitted information has been added to the traditional forms of encoded knowledge, such as books, manuals and codes of practice (Blackler, 1995). It tends to generate a unified and predictable pattern of behavior and output in organizations. Zuboff's (1988) analysis of the "informating" power of information technologies explores the significance of this point for organizations.

If we link the knowledge layers within organizational culture to the types of knowledge discussed above it is possible to construct a provisional matrix (Figure 2). This will form the basic structure for representing the potential transitions between a set of cultural archetypes that have been derived from primary research within the R&D process of a large telecommunications organization.

	Embrained Formal, abstract or theoretical knowledge "universal laws" Individual explicit	Embodied Action oriented -Context specific Individual tacit	Encoded Signs and signals Information Collective explicit	Embedded Knowledge in systemic routines Collective tacit	Encultured Shared understanding Collective tacit
Environment				X *Tacit*	
Mission, vision &Values			X *Explicit.*	X *Tacit*	
Technology			X *Explicit*	X *Tacit*	
Knowledge structures	X Explicit	X *Tacit.*	X *Explicit*	X Tacit	X *Tacit*
Management style org.structure.	X Explicit	X *Tacit.*	X *Explicit.*	X *Tacit*	X *Tacit*
The Individual	X *Explicit*	X Tacit	X *Explicit.*	X *Tacit.*	
The collective	X *Explicit*	X *Tacit.*		X *Tacit.*	X *Tacit*
Organizational memory			X *Explicit.*	X *Tacit.*	

Figure 2: the cultural knowledge matrix

RESEARCH – THE INNOVATION MODEL.

The case study organization was concerned that it failed to appropriate the full benefits of its research. It was aware of the need to improve the fit between the aims of those employees who commissioned the research to meet corporate and revenue objectives and the researchers who carried out the work. Concern was expressed about how the research process as a whole was fed back into the organization. There was a perceived failure on the part of the organization to learn from the 'process' of R&D particularly when projects were deemed to fail in terms of their subsequent development and added financial value. Several scoping exercises were carried out to provide a clear strategic direction for the research which was subsequently carried out in two phases. Phase one led to the development of an innovation audit tool and identified various cultural archetypes with their resultant knowledge matrices. Phase two developed the innovation "intervention"

and "maintenance" tools. The intervention tool focuses on those interventions that are required for a desired transition between cultural archetypes and the maintenance tool provides strategies for their maintenance through the continual renewal of knowledge resources.

The innovation audit tool.

The initial phase of semi-structured interviews with R&D managers focused on identifying the drivers, barriers and down-streaming routes for innovation. Discussion also focused on what constituted a successful innovation in terms of the measurement criteria applied. Interviews were carried out with individual respondents drawn from six research groups discussed as domains A-F below. All the interviews were conducted on site, recorded on tape and later transcribed verbatim. Additional data was also obtained from company documentation and its Intranet. Four feedback workshops with managers and researchers were then organized to discuss these results and to provide direction for the second phase of the research with members of R&D teams in different domains.

Domain "A" Management

Interviews were conducted with two senior managers. One of these was located on site and worked in the corporate office that had responsibility for the financing of, and setting the strategic direction for, the research agenda. The first manager had extensive experience of working as a project manager in a research unit and was familiar with the drivers and barriers to innovation and creativity. The second manager was based more than one hundred and fifty miles from the research site and was responsible for "Innovation Creativity and Leadership". He saw his role as an integrative one making connections between people, ideas and networks – communities of practice both inside and outside of the company.

Domain "B" - strategic tools

This was a small department that was concerned with current issues and problems and was responsible for identifying and developing new techniques and approaches. The group's activities were divided between development and innovation. It carried out modelling work with new areas of technology in order to develop improved solutions for its customers, the majority of whom were located within the company.

Domain "C" – old unit providing new services

The main research focus of this group involved the integration of a variety of technologies in order to identify new potential applications. It was important for this group to produce a tangible output whether that be in the form of a product for market, a demonstrator or a prototype. The team then 'migrate' the product to explore how the organization might get added value from it. As demand changed they started to look not just at the technology but also at the business context in which it was likely to be used. The group sees itself sandwiched between research and development activities which were focused on multimedia and were clearly oriented to meeting the organization's short-term goals. This was an uncomfortable position because the group and individuals within it saw their role as acting in a 'maverick' capacity and challenging the existing order.

Domain "D" – exploitation

This group was set up in response to concerns that the organization was not achieving synergy between its parts with the result that a lot of innovation was never fully explored or its potential value unlocked. There was a perceived need to create an entrepreneurial culture that was not present within the organization's traditional R&D model. The group saw itself as an incubation unit for down streaming innovations and enhancing and facilitating value creation through joint ventures or spin offs.

Domain"E"- new services

This unit carried out advanced research activities in e- commerce and saw itself as "coupling" and bridging the gap between on the one hand the researchers in this area and on the other business development. It felt that it had achieved more synergy with the business end of the organization than most of the other research units. The focus for the group was on the exploitation of current capabilities within this specific context focus.

Domain "F"- new services.

The domain focus of this group was on the exploration of future scenarios in next generation Internet research. Research was concentrated on twelve specified technologies for the future with the aim of being a leader rather than a follower in the market.

Data derived from the interviews carried out within these groups suggested a variety of factors that both directly and indirectly affected innovative activity. These will not be explored in detail here but a number of key indicators can be identified; these include team make-up, cognitive and leadership style, time scale and creativity, scanning and broadening the innovative base of a group, home / remote working, office layout, level of social interaction, and measures of success. Six cultural dimensions were derived from different configurations of these indicators. These were:

degrees of freedom - risk taking and the sense of ownership (autonomy) over the work task;

group interaction - the level of formal and informal interaction within a research team;

communications - the degree to which communications were (un)hindered and levels of feedback from management;

balance- the sense of security within the workplace (job security, career development opportunities and financial rewards);

working relations: management style and the type of interpersonal relationships that developed as a result (e.g. trust, empowerment);

time- from short to long term perceptions of research and development. A short - term focus can refer to the innovation being product and value creation oriented while long-term perceptions refer to where innovation addresses a wider and less defined specification in terms of research and customer requirements.

CULTURAL ARCHETYPES FOR INNOVATION

There is some similarity between these dimensions and the principles that underpin aspects of cultural theory; namely the relationship between the amount of autonomy allowed to a worker and the extent to which collaboration takes place within teams (Douglas, 1994). While these are predominantly social dimensions it must be

remembered that they are in large part determined by the structural and environmental characteristics of the workplace. For example office layout, distance working and policies relating to them will affect social interaction, and accountancy cycles will have a marked impact upon how time is related to specific research and development activities.

By mapping these six dimensions against the research teams it was possible to derive four provisional cultural archetypes - controlled, fuzzy, inspiring and cultivated. These archetypes and the related knowledge matrices provide a template for auditing the innovation culture of an organization / sub organization at any moment in time.

Cultural archetype A "controlled": *(short time focus, closed communications; rigid working relations; individualistic; position vulnerable; extreme time pressures – cost cutting; rule based; creativity discouraged).*

Taylorism both advanced and froze management thinking with its 'scientific approach' that was task focused and subjected the worker and organization to a mechanistic interpretation. The principles of this approach attempt to codify worker experience and skills into objective scientific knowledge. This style of management can result in creative abilities being directed towards the disruption of innovation. The requirement to 'drive out fear' is a critical step toward bringing innovation to the workplace, however the formal innovation in this cultural style is largely product-oriented, contained and inward
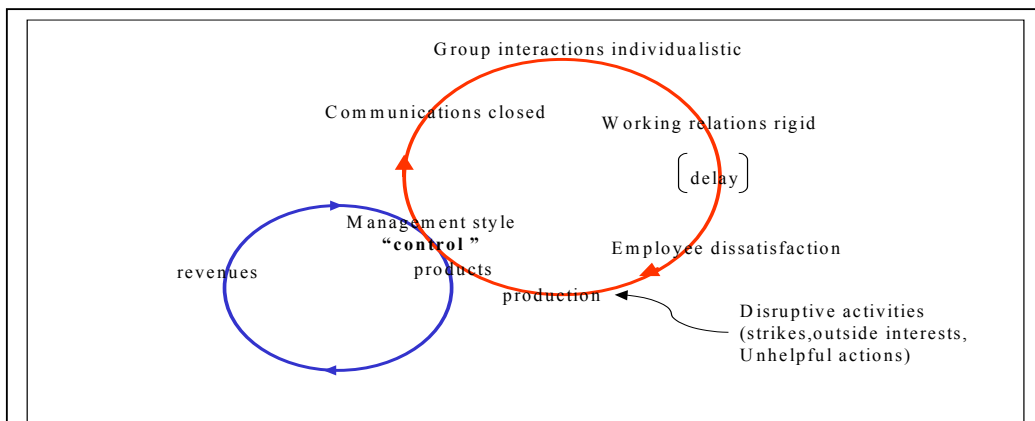

Figure 3: Archetype A – controlled and associated knowledge matrix

	Embrained Formal, abstract or theoretical knowledge "universal laws" Individual explicit	Embodied Action oriented -Context specific Individual tacit	Encoded Signs and signals Information Collective explicit	Embedded Knowledge in systemic routines Collective tacit	Encultured Shared understanding Collective tacit
Environment				X *Tacit*	
Mission, vision & Values			X *Explicit.*	X *Tacit*	
Technology			X *Explicit.*	X *Tacit*	
Knowledge structures	X Explicit	X *Tacit.*	X *Explicit*	X Tacit	X *Tacit*
Management style org.structure.	X Explicit	X *Tacit.*	X *Explicit.*	X *Tacit*	X *Tacit*
The Individual	X *Explicit*	X Tacit	X *Explicit.*	X *Tacit.*	
The collective	X *Explicit*	X *Tacit.*		X *Tacit.*	X *Tacit*
Organizational memory			X *Explicit.*	X *Tacit.*	

focused. Mintzberg (1979) refers to this as "sealing off the operating core from disruptive environmental influences". Innovation in this context may well ease individual and collective work tasks with a potential benefit for the company however at best these benefits are unlikely to be recognized as a product of innovative practice and at worst the innovative behaviour may be penalized for stepping outside of accepted practice. An alternative scenario within this archetype might be the focusing of innovative capability towards behaviours that circumvent accepted practice for the benefit of the individual and or group rather than the organization as a whole.

The knowledge within this archetype is "encoded" and not held by individuals thereby reducing the dependence of the organization on those individuals. Knowledge is held by the organizational structures that are responsible for forming the rules and processes. There is a separation of the knowledge that is required for carrying out the operations of the organization from its generation and renewal. Knowledge is therefore scattered and fragmented at an operational level and is only consolidated at management level. The abstraction of individual's experience and knowledge into encoded knowledge also facilitates centralization and control in organizations (Lam 2000). Organizational structure and the management information systems become the knowledge itself (Bonara and Revang 1993.). The encoded knowledge is inevitably simplified and selective and fails to capture and preserve the tacit skills and judgement of individuals. This inflexible archetype has difficulties with spontaneous change and is not effective in the creation of new knowledge. This is in large part due to the limited use of tacit knowledge.

Cultural archetype "B" – fuzzy: *(Long term focus on the big issues; closed communication; individualistic; protected; rigid working relations; rule based; creativity discouraged).*

When a 'fuzzy' approach is adopted towards innovation the basic culture allows creativity but provides limited assistance for, or direction to, the task. This can have a significant effect on the innovation process with the existence of unofficial projects where people are allowed to work on their 'pet' ideas. The "skunk-works" model popularized by Peters and Waterman (1982) is an example of a fuzzy archetype that allows individuals to work on projects in their own time or outside the main research activity of the group or organization. Skunk-works, and indeed most innovation within this archetype seem to work largely through intrinsic motivation.

As Kohn (1995) has shown, promised reward is neither a motivator nor a guarantee of innovative success. The improvised style of the typical skunk-works seems to be an important ingredient for creativity. For such private projects to work, the domain of innovation needs to be aligned to the skills and interests of the people working on them. Although the "fuzzy" archetype allows a higher degree of autonomy to individuals, its structures are still bureaucratic. Controls remain in place and co-ordination is achieved "by design and by standards that predetermine what is to be done" (Mintzberg 1979).

The nature of the 'fuzzy' archetype makes it unlikely however that the organization will learn from the process even if it does succeed in developing the products of such innovation. Embrained knowledge provides the competence that forms the basis of internal work rules, job descriptions and status. The knowledge structure is individualistic, functionally segmented and hierarchical and individual experts have a higher degree of autonomy and discretion in the application and acquisition of knowledge

within their own specialist areas. The sharing and dissemination of knowledge across boundaries is however limited (Lam 2000) with the uncertainty in problem solving

remaining contained within specialist boundaries. Mintzberg (1979) refers to this process as "pigeonholing" whereby the organization assigns specialist tasks to individuals and groups and loses the capability to work outside of those specialist areas.
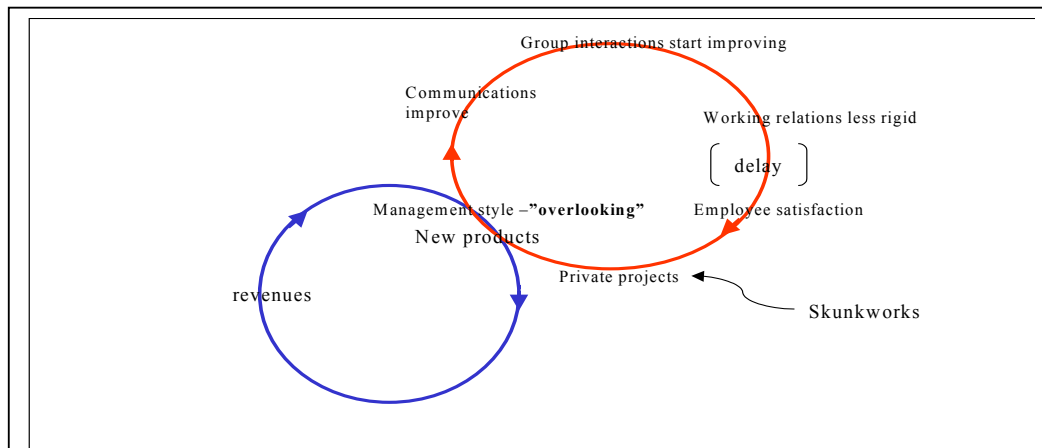

Figure 4: Archetype B – Fuzzy and associated knowledge matrix

	Embrained Formal, abstract or theoretical knowledge "universal laws" Individual explicit	Embodied Action oriented -Context specific Individual tacit	Encoded Signs and signals Information Collective explicit	Embedded Knowledge in systemic routines Collective tacit	Encultured Shared understanding Collective tacit
Environment				X *Tacit*	
Mission, vision &Values			X *Explicit.*	X *Tacit*	
Technology			X *Explicit*	X *Tacit*	
Knowledge structures	X Explicit	X *Tacit.*	X *Explicit*	X Tacit	X *Tacit*
Management style org.structure.	X Explicit	X *Tacit.*	X *Explicit.*	X *Tacit*	X *Tacit*
The Individual	X *Explicit*	X Tacit	X *Explicit.*	X *Tacit.*	
The collective	X *Explicit*	X *Tacit.*		X *Tacit.*	X *Tacit*
Organizational memory			X *Explicit.*	X *Tacit.*	

The key knowledge agents are the trained experts who apply an existing body of abstract knowledge in a consistent and 'logical' manner. This restricts the use of tacit knowledge and judgement skills for dealing with uncertainty in problem solving (Lam, 2000). While formal expert knowledge entails "perceptual filters" (Starbuck 1992) there is a lack of shared perspective and this inhibits both the transfer of non-routine tacit knowledge in

day-to-day work and the interaction and sharing of knowledge with "non" experts (Lam 2000). This lack of co-ordination creates problems for the innovation process with organizational learning being limited by the existing levels of formally acquired specialist knowledge and the restricted use of tacit knowledge.

Cultural archetype "C" - inspiring: *(Short time horizons; individual responsibility and autonomy; open communications and group interaction; informal relations with management; protected positions).*

Within an 'inspiring' R and D culture the skills that support creativity are actively sought as the innovation worldview has expanded from a product focus towards multiple work processes. There is less standardization than in the controlled model of innovation and the organization is more responsive to new ideas and open to alternative ways of working. Individuals have greater autonomy and more discretion in how they undertake their work and there is a more enthusiastic approach to experimentation and interactive problem solving. The concept of Total Quality Management triggered many such efforts to move from a 'controlled' to an 'inspiring' style of innovation. This often followed an analytic approach with quality being measured, root causes identified and innovative solutions found in response to the underlying problem. The primary tool underpinning this model has been brainstorming which can be less efficient than individual critical thinking because it encourages an organization to focus on the less difficult of their problems rather than those that are more complex and long term and in need of a more creative approach.

This is a fundamental shift from away from a focus on re-engineering and could be perceived as a retrogressive step with intrinsic motivation being replaced by an extrinsic reward system for improvements made. The linking of compensation to savings can be expensive and result in a focus on immediate reward rather than longer-term and whole company benefits. This archetype draws on the formal knowledge of an organization's members alongside the embodied practical problem solving skills of external experts. Greater tacit knowledge is generated through experimentation and problem solving. This supports the concept of "know – how" companies, in which technical and managerial expertise is integrated, and points to the broad-based and varied nature of knowledge required by the organization (Sveiby and Lloyds 1987).

The capacity to react to changing situations is a key characteristic of this cultural archetype in which the knowledge structure is individualistic but collaborative. Lam (2000) refers to the importance of embodied skills and "know – how" competencies. The idea of "knowledge intensive firms" emphasizes the significance of "esoteric expertise" over commonplace, readily accessible, knowledge and illustrates the idiosyncratic nature of the knowledge base (Starbuck 1992). Learning occurs as experts of diverse fields jointly solve problems. This is similar to the process identified by Leonard-Barton (1995) where knowledge building takes place through individuals with diverse signature skills working together on the solution of a problem. Through experimentation and prototyping the organization is able to extend its existing capabilities and to build new ones for the future. As these competencies are embodied in an organization they also cease to be exclusive. Starbuck (1992) refers to the "porous boundaries" of knowledge intensive firms and suggests that they find it hard to retain unique expertise.
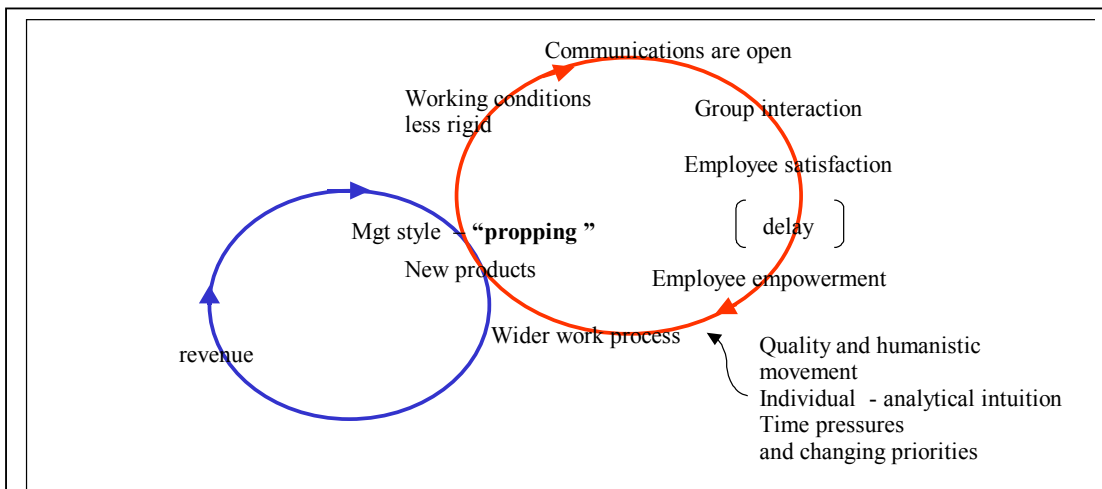
Communications are open

Working conditions
less rigid

Group interaction

Employee satisfaction

Mgt style   **"propping "**

[delay]

New products

Employee empowerment

revenue

Wider work process

Quality and humanistic
movement
Individual - analytical intuition
Time pressures
and changing priorities

Figure 5: Archetype C – Inspiring and associated knowledge matrix

	Embrained Formal, abstract or theoretical knowledge "universal laws" Individual explicit	Embodied Action oriented -Context specific Individual tacit	Encoded Signs and signals Information Collective explicit	Embedded Knowledge in systemic routines Collective tacit	Encultured Shared understanding Collective tacit
Environment				X *Tacit*	
Mission, vision & Values			X *Explicit.*	X *Tacit*	
Technology			X *Explicit*	X *Tacit*	
Knowledge structures	X Explicit	X *Tacit.*	X *Explicit*	X Tacit	X *Tacit*
Management style org.structure.	X Explicit	X *Tacit.*	X *Explicit.*	X *Tacit*	X *Tacit*
The Individual	X *Explicit*	X Tacit	X *Explicit.*	X *Tacit.*	
The collective	X *Explicit*	X *Tacit.*		X *Tacit.*	X *Tacit*
Organizational memory			X *Explicit.*	X *Tacit.*	

Cultural archetype "D" – cultivated: *(focus on the big issues over a long time frames; high levels of autonomy and low levels of risk aversion; empowering management style; secure working environment).*

The 'cultivated' cultural archetype incorporates innovation as a critical process in its own right with a focus on the long-term and the whole organization rather than the group responsible for carrying out the work. This over-rides the restrictive cost centered approach that might predominate in other models. In order to increase creative and innovative competences people are trained on a range of tools and techniques, either to stimulate general creative thinking or for specific use within creative problem solving. In many ways the transition from the inspiring to cultivated archetypes is not as difficult as previous transitions because it requires limited cultural change although increased creativity may require more open communication and trust than was previously the case.

It is important to note that this 'empowered' style of innovation is also capable of undertaking some directed and product oriented work because of the relationships and trust that are built into the team. The controlled archetype, by comparison, is likely to be

incapable of undertaking work that is creative, relatively unstructured and grounded in competence (skills) and relationship forms of reciprocal trust (Newell and Swan, 2000).
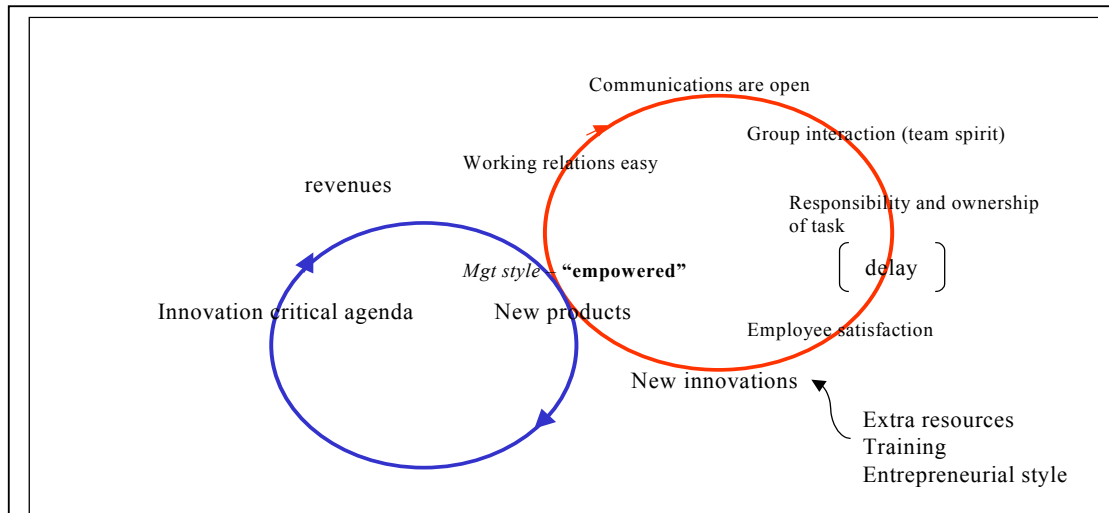

Figure 6: Archetype D – Cultivated and associated knowledge matrix

	Embrained Formal, abstract or theoretical knowledge "universal laws" Individual explicit	Embodied Action oriented -Context specific Individual tacit	Encoded Signs and signals Information Collective explicit	Embedded Knowledge in systemic routines Collective tacit	Encultured Shared understanding Collective tacit
Environment				X *Tacit*	
Mission, vision & Values			X *Explicit.*	X *Tacit*	
Technology			X *Explicit*	X *Tacit*	
Knowledge structures	X Explicit	X *Tacit.*	X *Explicit*	X Tacit	X *Tacit*
Management style org.structure.	X Explicit	X *Tacit.*	X *Explicit.*	X *Tacit*	X *Tacit*
The Individual	X *Explicit*	X Tacit	X *Explicit.*	X *Tacit.*	
The collective	X *Explicit*	X *Tacit.*		X *Tacit.*	X *Tacit*
Organizational memory			X *Explicit.*	X *Tacit.*	

Knowledge is embedded within the operating routines in the cultivated archetype. There is a shared culture and a strong interaction between different types of knowledge. This is similar to *knowledge conversion* (Nonaka and Takeuchi 1995) where the organization produces new knowledge and creative insight by moving between the personal, tacit knowledge of individuals and the shared explicit knowledge, which the organization needs to develop new products and innovations.

16

DISCUSSION: MANAGING THE TRANSITION BETWEEN ARCHETYPES

It is important to reiterate that there is not necessarily a qualitative improvement as one moves from a controlled culture for innovation towards a cultivated archetype. Rather, different archetypes are appropriate for different organizational contexts. The ability to move between archetypes is however determined by the current position. For example the cultivated archetype will incorporate the attributes of the other archetypes and it should be possible to draw upon these when a more structured approach is required. In contrast a controlled innovation culture will not include the attributes that are necessary for operating according to the cultivated archetype. The transition in this direction will require the acquisition of new attributes as opposed to the selection of, and reconfiguration from, those that are already evident (Figure 7). Let us term the movement from a cultivated archetype towards one exhibiting more control as 'reassigning' and the movement in the opposite direction as 'fostering'. It has been argued that the culture of innovation and the learning associated with it is dynamic. Consequently, it is important to consider strategies for actively maintaining an existing archetype when this is considered to be appropriate.

The paper will conclude with a brief discussion about how movement between archetypes and the dynamic maintenance of an existing one might be facilitated. This phase of the work is ongoing and the discussion will present a number of examples rather than a comprehensive set of intervention strategies and associated techniques.
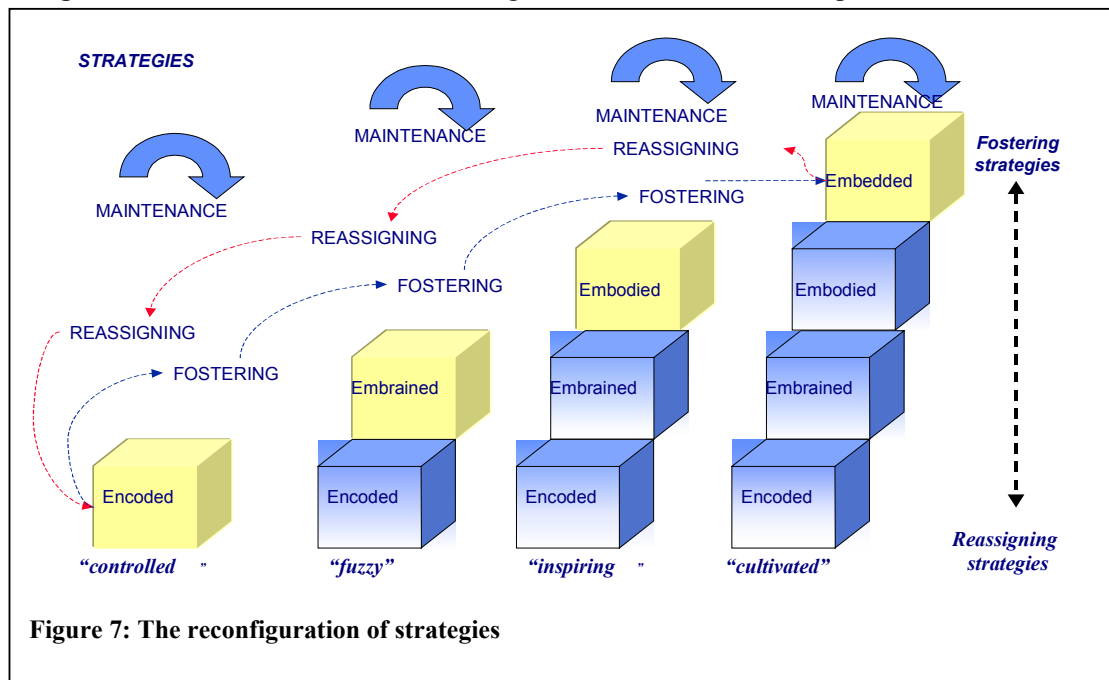

Figure 7: The reconfiguration of strategies

An example of a reassigning strategy – from cultivated to control

A reassigning strategy might be necessary in one of two situations. Firstly a change in which personnel and the related tacit knowledge is lost possibly as the result of downsizing, reengineering, or take-over. The recovery of knowledge and lost skills might be facilitated through moving to a more controlled archetype involving formal training, clearly defined roles and competences etc. Leaders take charge, and organizational

members' working lives are increasingly shaped by rules and contractual and competence as opposed to relationship trust. Secondly, a refocus away from creative activity and towards product development requires a more structured working environment and clearer direction from management.

The knowledge matrix for the controlled archetype suggests what strategic action might be required for this transition. The knowledge in the controlled archetype is explicit, collective and encoded. The mission statement provides a sense of direction as the management style exerts greater control by making the organizational structure bureaucratic. Fayol (1949) describes an "e*spirit de corps*" and a sense that "union is strength". It is the executive function to promote this widespread belief in a common purpose. Barnard (1938) suggests that organizations are co-operative systems that have a unifying purpose. He continues that it is the belief that is important, not necessarily the detailed understanding of common purpose. Cyert and March (1963) and Thompson (1967) develop the notion of a core set of beliefs and values that serve as motivating reasons for individuals to join together in an organization.

The knowledge structures are also closely linked to an organization's strategy for survival and more subject to change. Changes in knowledge structures occur as a result of the impact of environmental events, past organizational actions, the influence of key decision makers and the advocacy positions of coalitions within the firm (Lyles and Schwenk, 1992). During the process of development, organizations with simple structures attempt to find segments of the environment in which they can operate without being traumatized by too many jolts (Meyer, 1982), or they will ignore the jolts, remaining unaffected by them and maintaining the viability of the its structure. Lyles and Schwenk (1992) propose that firms that have a structure that is tightly coupled i.e. the core (mission – knowledge about the most basic of the firm's purposes and goals) and the peripheral (cause and effect belief structures – knowledge about sub goals and about their behavior or steps to achieve those goals) need to maintain stability and to avoid jolts. They view knowledge structures as a combination of the mission and the shared perspective of the management core, that are treated as separate issues. This suggests that the mission and values of an organization and the strategy to achieve those objectives should be clearly and explicit stated and expressed in a controlled archetype. Consequently the firm will seek to maintain the status quo and to avoid change. A firm with a tightly coupled structure will seek the similar market conditions so that it can use the same business models. The key decision makers in tightly coupled firms are interested in reducing disagreement because it could lead to "uncoupling" and trauma for the firm. This suggests a "protectionist" or "shielding" responsibility for management.

It is important that when a strategy of greater control is implemented the work force is well informed. The reinforcing cycle of this controlled archetype leads to greater control measures and if the balancing process is not aligned to the benefit of the organization, increased worker dissatisfaction will result. This should be a continuous process and in a format that is accessible and comprehensible to personnel aligned to interventions designed to increase extrinsic motivation and retain self-esteem under conditions of uncertainty.

An example of a fostering strategy – From 'fuzzy' to 'inspiring'

An example of a fostering strategy is the movement from a "fuzzy" to "inspiring" archetype. This requires a shift from dominant embrained knowledge to that which is

embodied and is typical of an organization where there is decreasing standardization and a more responsive attitude to new ideas and ways of working. This might be exemplified by a shift from single to multiple work processes. The capacity to react to changing situations becomes a key characteristic and individuals have to be given greater autonomy and more discretion in how they undertake their work. This is aligned to a more enthusiastic attitude to experimentation and interactive problem solving. Skills that support creativity are actively sought as the innovation worldview expands. The formal knowledge of an organization's members, alongside the embodied practical problem solving skills of external experts, becomes increasingly necessary. Greater tacit knowledge is generated through experimentation and problem solving and learning should occur as experts of diverse fields collectively solve problems.

The dominant knowledge type within the inspiring archetype is the action oriented, context specific embodied knowledge that is individual and tacit. As in the "fuzzy" archetype, this is found in individuals and teams however there is increased collaboration leading to the generation of new knowledge. Issues such as trust, empowerment, open communications, and a greater degree of freedom become essential in encouraging innovative activity through collaboration and individual satisfaction. Motivation becomes intrinsic and the knowledge structure more complex. This influences the ability of the organization to respond to environmental change. Stored knowledge can become difficult to retrieve and what is retrieved depends on the frequency of use, how recently it was used, its usefulness and location alongside individual and group preferences, self-interest competence in retrieval (Douglas, 1986; Levitt and March, 1988; March and Olsen, 1975; March et al., 1991). More complex structures however allow for more diverse information to be recognized and processed. As the organization gains more experience and learns from it, it becomes more expert at what it is doing and as a result is able to encompass a greater number of new situations and problems (Lyles and Schwenk, 1992). The strategy here regarding the mission, value and the knowledge structures is that of a loose coupling. Firms with a loosely coupled structure incorporate and are more accepting of alternative interpretations about how to carry out the firm's mission. Changes can be made more easily and there will be more flexibility of action. According to Weick (1979), environmental jolts do not affect such firms as greatly as tightly coupled firms. The firm can adjust its strategies with changing environmental conditions and the ability to incorporate new knowledge is increased.

In order to develop a successful strategy the communication channels need to be improved and worker empowerment should accompany more trust and risk taking. The style of management should become more participative with major decisions being taken in an increasingly collaborative and consultative manner. The individual motivation within this archetype is more intrinsic and supported by a conducive working environment, knowledge sharing tools and improved down streaming methods. Scanning and networking activities, such as attendance at seminars and conferences, and membership of communities of practice and interest should also be encouraged.

An example of a maintenance Strategy – the Cultivated archetype

The cultivated cultural archetype is necessary when an organization is operating in a knowledge intensive sector with a highly volatile and competitive environment. These organizations are in the business of creating added value through the exploitation of current activities, products and the skills embedded in the firm. The need to experiment

and anticipate future trends is important. This links the exploitation of resources and the available knowledge base to compete in the short-term market place (exploitation program) and the development of knowledge that helps sustain this competition in the long run (experimentation program). In order to meet these challenges the organizations have to be entrepreneurial.

The dominant knowledge type of this archetype is embedded and encultured with an emphasis on collaboration, team working, and putting in place working practices that are conducive to creativity and innovation. Continuous double loop learning becomes the norm. Learning at the collective level also results from the interplay individual and group knowledge through social interaction, team-working and communities of practice. There is agreement that collective knowledge that comprises embrained, embodied, encoded, and encultured knowledge is the most powerful strategically. The organizational memory, which is defined by Walsh and Ungson (1991) in its most basic sense as "stored information from an organizations' history that can be brought to bear on present decisions", has to be continually updated through learning. Failure to do so would result in the organization slipping into the common attitudes of " the not invented here syndrome" and "this is the way things are done around here" and engrossed in self perpetuating routines.

Social networks, both formal and informal, therefore have to be encouraged and the skills of individuals and teams should be continually upgraded through additional resources. The personal development of the knowledge worker is important. Knowledge building (Leonard- Barton 1995), knowledge conversion (Nonaka and Takeuchi 1995) and knowledge linking activities (Badaracco, 1991: Wikstrom and Normann 1994) have to be made the routine. In *knowledge conversion* (Nonaka and Takeuchi 1995), the organization continuously creates new knowledge by converting between the personal, tacit knowledge of individuals who produce creative insight, and the shared explicit knowledge, which the organization needs to develop new products and innovations. Tacit knowledge is shared and externalized through dialogue that uses metaphors and analogies. New concepts are created, and the concepts are justified and evaluated according to their fit with organizational intent. Concepts are tested and elaborated by building archetypes or prototypes. Finally, concepts, which have been created, justified, and modeled, are moved to other levels of the organization to spark new cycles of knowledge creation. In *knowledge building* (Leonard-Barton 1995), the organization identifies and nurtures activities that build upon knowledge and strengthens the organization's distinctive core capabilities, enabling them to grow over time. These knowledge-building activities are shared problem solving, experimentation and prototyping, the implementation and integration of new processes and tools, and the importation of knowledge. Individuals with diverse signature skills work together on solving a problem and through experimentation and prototyping the organization can extend its existing capabilities and build new ones for the future. The successful implementation of new tools and related processes requires users and technology to mutually adapt and to complement each other and knowledge about the technology as well as the market is imported from outside the organization and absorbed.

In *knowledge linking* (Badaracco 1991), the organization forms intimate learning alliances with other organizations in order to transfer knowledge that is situated in specialized relationships, work cultures, and operating styles of the partner organization.

As the organization becomes more dynamic, and innovation widespread, internal competition may cause conflict through knowledge becoming specialized and only available to a few. Henderson and Clark (1990), distinguish between component knowledge (knowledge of specialist elements in an organization) and architectural knowledge (knowledge about how such elements interact). Architectural knowledge is submerged within routines yet is central to an understanding of an organization's strengths and weaknesses. The need to retain staff is a defining feature of the cultivated archetype because a great deal of specialist knowledge has been developed. This highlights the importance of identifying and addressing both the extrinsic and intrinsic motivational issues.

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