Learning through Viable Knowledge Creation

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Abstract

The idea that learners can have styles of learning derives from the work of Kolb, which stems from an inadequate theory of learning behaviour. Learning might better be placed within the context such as the knowledge creation cycle of Nonaka and Takeuchi. However this too has its epistemological problems. An alternative knowledge creation cycle is proposed that results in an alternative conceptualisation of knowledge style, and it derives from viable systems theory.

Keywords

Learning styles, knowledge creation cycle, viable systems theory

1. The Kolb Learning Cycle

The Kolb learning cycle has been used for a number of years to assess the learning style of learners. However, it has a number of problems associated with it. An alternative theory of learning style is proposed that derives from viable learning theory (Yolles, 2000a), itself deriving from viable systems theory (Yolles, 1999). This work will be developed to enable it to relate to Kolb-like indexes.

Kolb (1974) proposed that learning behaviour occurred as a continuous learning cycle (figure 2). It implicitly defines a behavioural schedule that is buried within the set of phases, and indicates a set of behavioural steps that a learner will pass through (e.g. read this, do that,…). The behavioural schedule defines how a learner tackles and deals with learning material. For traditional open and distance learning materials that operate as a schedule of programmed learning, a number of steps may be defined and the learner will make an ordered selection of them. Thus, suppose that we have a traditional form of open and/or distance learning material that is composed of units. It is through learning behaviour that a learner will pass through each unit, from the introductory unit to the final one, in some order and according to some stepped organisation of learning. At a more detailed level of behaviour, each unit may be composed of objectives, summaries, examples or case studies, a glossary, and a form of learning evaluation that may be either for the personal use of a learner of the formal use of an institution.

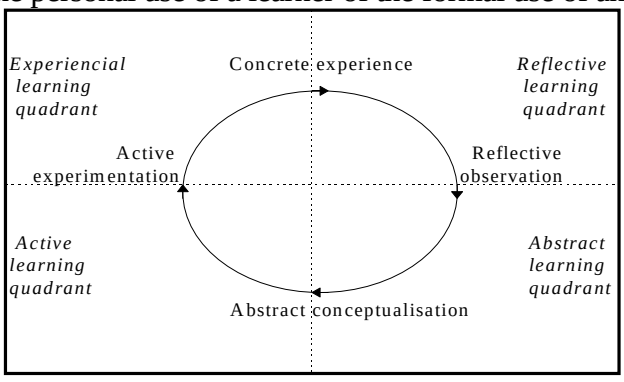

Figure 2: The Kolb Learning Cycle

Learning behaviour, if constrained to a set of predefined activity steps, occurs as a schedule of those activities. The schedule will be defined according to a strategy that a learner adopts. In

many traditional paper based open learning texts, a programme of work would be structured into units, and from the earlier theory, each might begin with the objectives of the learning materials, have summaries, embed examples and a glossary. If a tutor adheres to a rigid learning strategy, then he or she will devise a set of very tight constraints on learning strategy that will define a unique behavioural schedule permitting only one possible way for a learner to pass through this material. Thus for example, a sequential ordering of objectives, summaries, and so on may occur that define only one learning path for a learner. This may not be consistent with the personal strategy of a given learner who may wish, for instance, to sample parts of the learning material or consult the glossary before embarking on the learning material. This is what Crampes (Yolles and Pirani, 1991; 1994) would refer to as a phase of *discovery* that is personal to the learner. Perhaps a more flexible approach is for a tutor to offer a menu that enables the learner to define his or her own strategy of learning within less tightly tutor defined constraints, for example presenting materials on a website. So the degree of flexibility on learning strategy offered to a learner is tutor determined through the constraints imposed on the learning material.

Returning now to Kolb's learning cycle, Kolb associated each phase with a learning "style" that brought out the idea that learners can be classified as having a particular style of learning. Learning cycle approaches may be a satisfactory simplification of the learning behaviour/styles and process, but according to Cunningham (1987), Kolb's work was deficient in a number of ways:

- as a reaction against theory based learning, there can be an over-value of experience based learning;
- learning can be perceived to be based entirely on what others hand down and by self-reasoning;
- research evidence does not support learning cycle theory: e.g., the cycle does not indicate how learners gain ability in learning.

There are two other issues. Firstly, Kolb's work does not consider the existence of learning strategy. This centres on the notion that the acquisition of knowledge in learning environments is very much related to the strategy through which a learner learns. Learning strategy is to do with controls and constraints. Examples of control features are a content index and a content map. Laurillard (1990) argues that constraint minimisation provides better results in learning than its maximisation. Constraints are apparent when learning goals are predefined for a learner, rather than allowing them to be learner-defined.

Secondly, the Kolb cycle does not consider evolutionary learning, that is learning that enables a learner to change the way that learning occurs either incrementally, or dramatically. This process may be considered to involve metalearning, a term that is sometimes thought of as learning about learning. It enables learners to:

- have knowledge to reason about its own operation;
- have a structure which simplifies the reasoning process;
- infer conclusions from a chain of inference rules;
- determine accuracy, consistency, and plausibility of its conclusions;
- explain reasoning behaviour.

Metalearning induces learners to assess the *patterns* by which they learn (Cunningham, 1990). Patterns describe process, event schedules, or inter-relationships. Through metalearning, a behavioural schedule will establish personal criteria that enables a strategic trigger to be defined, and that will enable a behavioural schedule to be changed. It may redefine what constitutes the elements of a learning domain by creating new conceptualisations, thus explicitly influencing the nature of a learning strategy. This will then affect the behavioural schedule or sequencing of learning material in the learning domain. It can enable new maps of learning material to be created, based on the new conceptualisations. It can result in new logical strategic processes that sequence learning material, and can result in the definition of new rules to provide a way of overcoming highly constrained learning domains.

There is also a more fundamental problem with Kolb's model. Its epistemology is positivist, that arose during the rise of western industrialisation, and links closely with what systemists call mechanistic thinking. It came with Auguste Comte after the turn of the 19th century, as a reaction to theological and metaphysical philosophy.

Positivism represented an expression of man's perception that he understands the scientific laws that control the world. It has two main tenets. Firstly, universal and permanent laws or principles represent causal relationships. Secondly, there is the belief that there is one fundamental scientific method that subsumes all approaches to scientific enquiry. That method holds that everything is seen to be deterministic. Deductive reasoning can be used to postulate theories that can be tested. These theories relate to one reality within which we survive, and by which we are influenced. Within it, observers exist as individuals who are insulated from the real world because they are not intentionally participating. Indeed, there is only one real world, and all observers must relate to it. Rather, they need to be considered in terms of a cultural and social environment. In the 19th century, anti-positivists suggested that learners do not live in isolation. In the early 20th century, the logical positivism of Bertrend Russel became vogue, and the stand of anti-positivism became less significant. Today, however, as the ideas of complexity become embedded in most paradigms, epistomologies like those of post-positivism and the critical theory of Habermas (1987) have become important (Guba and Lincoln, 1994). They centre on the idea that new knowledges derive from distinct paradigms and local epistomologies. There are a plurality of methods, and that the validity of each is locally determined by the situation, and by the type of knowledge sought (Jackson, 1992; Flood and Jackson, 1991; Vidich and Lymann, 1994; Harvey and Mayers, 1995).

Kolb's learning cycle may be seen to be fundamentally positivist because of its notion of reflective observation, implying that the learner is an observer of something about which he then reflects in a rational way. The cycle would also seem to be structurally positivist in that **t**here is nothing to indicate that it is not continuous sequential in its passage through its phases, uninterrupted, and non-adaptable. Its sequence of phase activation is predetermined by the prior phase, and there appears to be no facility by which one phase can be spontaneously enabled out of sequence. This is consistent with a positivist epistemology. In this paper another approach to learning styles that develops from viable learning theory and its exploration of the viable knowledge creation cycle (Yolles, 2000). It is epistemologically based in critical theory, and has connected to it concepts of learning styles as well as other attributes that we shall explore in due course.

2. Viable Systems Theory

In a recent paper by Yolles (1999a), an exploration was made of viable learning systems. Viable learning theory derives from viable systems theory as developed by Yolles (1999). The concepts of complexity and evolutionary development are implicit to viable systems theory. It includes for example, the notion that viable systems may be dissipative (Nicolis and Prigogine, 1989) and thus implicitly unstable. Variety is a concept that encapsulates this because it is a measure of complexity. Having said this, however, probably few (if any) attempts have been made to formulate quantitatively measures of complexity because fundamentally, viable systems theory is qualitative.

It is possible to model any organisation as a viable system that is seen to be active, purposeful, and adaptive. A viable system is an organisation that survives. In doing so it can respond to changes (whether or not they have been foreseen) that can generate sufficient variety through self-organisation to deal with that variety impacting on it from its environment (called requisite variety).

A viable organisation is able to support adaptability and change while maintaining stability in its behaviour. In particular an organisation is viable if it can maintain stable states of behaviour as it adapts to perturbations from its environment. Now, the environment can be differentiated into a suprasystem of interacting organisations that exists in *its* environment. Such organisations are normally considered to be autonomous, in that they are taken to be analytically and empirically independent from one another. What constitutes independendence is a matter of practical requirement that enables, for instance, measurements to be taken from a given organisation without conceptually complicating them with data from other organisations. The question of whether an organisation in a suprasystem of them is indeed autonomous, is one of estimating its degree of interactivity with the other organisations. It is perspective driven, and is ultimately axiomatic.

A system can be seen as a non-separable entity that is composed of a set of *objects of attention* that are defined in mutual relation to each other, and which is not reducible into a sum of its objects. If each object is thought of as a component of the system, then commonly the system is a set of components that interrelate. A system is bounded through a frame of reference that is defined for and within the context of a situation. The boundary will change according to the learning purpose and worldview of a viewer. A system boundary may also be defined in terms of the degree of interaction between the parts that define it. Thus, a viewer may see the parts to be *richly* or *poorly* interactive. In modelling a situation systemically, a viewer will make a judgement about what constitutes a rich set of interactions, and distinguish this group by forming a *boundary* around it. This boundary distinguishes the set of parts within its perimeter from the poorly interactive ones that lie outside it in the environment. Viewers often have to justify this boundary to their peer group through language and logic that is common to the group.

Viable systems exist by virtue of the worldviews that create them. Worldviews are generators of knowledge. They can be defined in terms of their “culture” that has the attributes of cognitive organisation (the set of beliefs, values and attitudes), and language. Normative standards also exist, that guide our behaviours and ways of thinking. Worldviews also have a cognitive space, populated by concepts and meaning, from which knowledge comes. Exemplars, where they exist, also form part of worldviews, and represent the illustrative examples through which

knowledge is validated. Worldviews are action related, and through communications define a prerequisite for organised behaviour.

Two types of worldview can be identified: weltanschauung and paradigm. Within the systems context the term weltanschauung was originally used by Churchman (1979) and by Checkland (1981), and discussed by Checkland and Davis (1986). Yolles (1999) uses it as part of a basis for his viable systems theory. Weltanschauung may be seen as a worldview of an individual or a shared worldview of a group that is more or less visible to its viewholders, but not to others who are not viewholders. It is seen by some to be something that is personal (to the individual or group) indescribable, and informal. With peer group support weltanschauung can become formalised through language, enabling a set of explicit statements (propositions and their corollaries) to be made about their beliefs and knowledge. In this form it can become a *paradigm* when supported by a peer group. Paradigms enable a set of explicit statements about their beliefs and other attributes that enable everything that might be expressed about the worldview, to be expressed. They are thus more or less transparent to others who are not viewholders. The formalisation process uses language that (more or less) enables everything that must be expressed, to be expressed, in a self-consistent way.

A paradigm is more than shared weltanschauung. It is shared weltanschauung together with the explicitly defined propositions that contribute to understanding. When weltanschauungen are formalised they become paradigms, and are more or less transparent to others who are not viewholders. A formalisation is a language that enables a set of explicit statements (propositions and their corollaries) to be made about the beliefs and other attributes that enable (more or less) everything that must be expressed to be expressed in a self-consistent way. This does not of course mean that the paradigm is able to express ideas for which it has no concepts. Formal propositions define a logic that establishes a framework of thought and conceptualisation that enables organised action to occur, and problem situations to be addressed. Formal logic provides a standard of validity and a means of assessing validity (Kyberg Jr., 1968). While groups may offer behaviour in ways that are consistent with their shared weltanschauung, paradigms emerge when the groups become coherent through formalisation.

3. Behavioural and Cognitive Domains of Viable Systems

The relationship between weltanschauungen paradigms and the perceived real (or behavioural) world has been proposed by Yolles (1999) to have a form like that of figure 1. Let us explain this diagram.

Shared weltanschauung acts as a cognitive basis for the paradigm. Within it we develop cognitive models, that involve beliefs, values, attitudes, norms, ideology, meanings, and concepts. We perceive “reality” through our cognitive models as we interact with it through them. It is through the process of cognitive formalisation that weltanschauung becomes manifested as a paradigm that itself changes through a process of cognitive challenge. This may involve: a process of conflict that should be resolved; reflection to enhance our understanding of what we perceive; and conciliation enabling word view boundaries to change. The relationship between the perceived real world and weltanschauung is partly through interpretation. By this we mean that the “real” or behavioural world is an interpretation that involves our perceptions, and these are generally influenced by our beliefs. It also involves empirical challenge, which is connected to observation. The behavioural world is represented in the paradigm in a way that conforms with its belief system. Action is manifested in the behavioural world through an organising

process that is in effect a transformation that is subject to surprises. This means that the cognitive basis of the paradigm is applied to the behavioural world. This occurs according to some formalised regime within the transforming organising process, which effectively defines logical relationships. These relationships become manifested as structures with associated behaviour in the behavioural world.

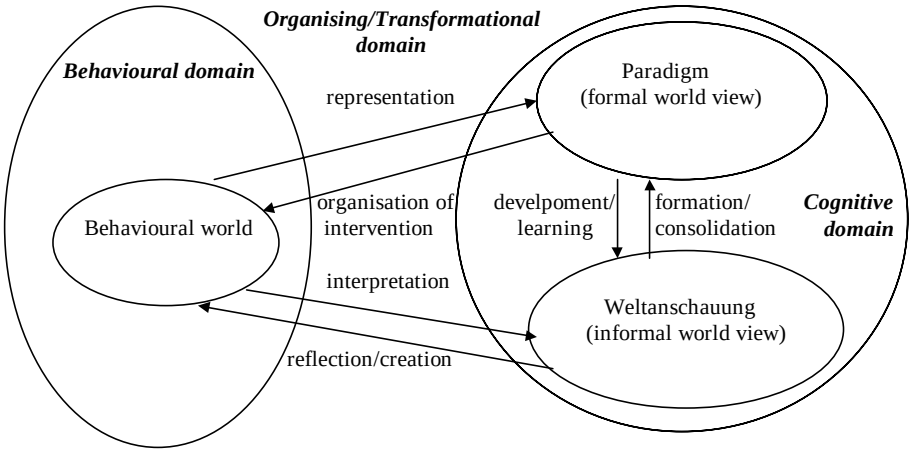

Figure 1: The Paradigm Cycle

The very idea of there being an organising process is a consequence of the notion of purposefulness, and results in purposeful behaviour. Purposeful behaviour is said to occur because of cognitive purposes that direct the actions of individuals and groups in a given situation. It is worldview determined, and can be expressed in terms of a behavioural mission. Cognitive purposes are interpreted within a domain of action through a knowledge of data processes and structural models, modelling processes that contain data, and procedures or rules of operation and other models relating to the current situation, and a mechanism for structured inquiry.

The cognitive domain is populated by worldviews that can be seen as a system of "truths" that rest upon worldview conceptualisations, and are able to generate knowledge as a result of manifest behaviour. This defines a potential for behaviour, but it is constrained within the organising domain. Transforming knowledge to behaviour occurs through organising. It produces a sometimes surprising knowledge morphology. It is the surprises, often ruled by chaos, which contribute to the creation of organisational variation and variety. The organising domain is strategic in nature. It is also a logical domain so that all transformational relationships exist there. Consequently, it is also a cybernetic domain so that it is where control processes are defined. This domain is, however, a construct that derives from the worldview itself. This means that the nature of the organising that occurs within this context is determined ultimately by worldview concepts and propositions.

The same basic tridomain model can be used to represent the relationship between worldviews and shared worldviews as illustrated in the paradigm cycle. Let us take the shared worldview under consideration to be informal: that is a weltanschauung rather than a paradigm. A shared worldview derives from the association of a group of people who through their association together have developed a common cognitive model. Relative to the individual's worldview, the shared worldview can be seen as a system of semi-formalised "truths" that involves a production of knowledge that is common and visible to those viewholders involved. These "truths" will be local to the group that defines the shared worldview, and will change as the

composition of the group changes in social space. It will also vary with time, since individual perspectives are dynamic experiential phenomena.

The process of learning is to enable knew truths, new knowledge, to be created within a learner. Each domain of the tridomain model can be expressed in terms of learning properties, perhaps most simply as expressed in terms of table 1 Yolles (2000a). This derives from Yolles (1999), and the notion that is associated with each of the three domains is a cognitive property that guides our organisations in the way that they function and survive. Yolles (1999a), in his exploration of the nature of cognitive influence, associates it with the process of knowledge migration, that is the movement of knowledge between worldviews that is subject to redefinition every time it migrates. It is not only knowledge that can be associated with the cognitive domain. Data is associated with the behavioural domain, and information with the organising domain. All three may also be identified as analytically independent commodities that enable the properties to become manifested.

Table 1: Relationship between human cognitive interests, purpose, and influences

COGNITIVE LEARNING INTERESTS OF THE BEHAVIOURAL DOMAIN		
Technical	**Practical**	**Critical Deconstraining**
Work. This enables people to achieve goals and generate material well-being. It involves technical ability to undertake action in the environment, and the ability to make prediction and establish control.	Interaction. This requires that people as individuals and groups in a social system learn to gain and develop the possibilities of an understanding of each others subjective views. It is consistent with a practical interest in mutual understanding that can address disagreements, which can be a threat to the social form of life	Emancipation. This enables people to (i) liberate themselves from the constraints imposed by power structures (ii) learn through precipitation in social and political processes to control their own destinies.
COGNITIVE PURPOSES OF LEARNING WITHIN THE ORGANISING DOMAIN		
Cybernetical	**Rational**	**Ideological**
Intention. This is through the creation and strategic pursuit of goals and aims that may change over time, enables people through learning control and communications processes to redirect their futures.	Logico-relational. Enables missions, goals, and aims to be defined, and approached through planning. It involves logical, relational, and rational abilities to organise thought and action and thus to define sets of possible systemic and learning behaviour possibilities.	Manner of thinking. An intellectual framework through which policy makers observe and interpret reality that has a politically correct ethical and moral orientation, provides an image of the future that enables action through politically correct strategic policy, and gives a politically correct view of stages of historical development in respect of interaction with the external environment and related learning processes.
COGNITIVE INFLUENCES ON LEARNING WITHIN THE COGNITIVE DOMAIN		
Social	**Cultural**	**Political**
Formation. Enables individuals/groups to be influenced by knowledges that relate to our social environment. This has a consequence for our learning about social structures and processes that define our social forms that are related to our intentions and behaviours.	Thinking. Influences occur from knowledges about learning that derive from the cognitive organisation (beliefs, attitudes, values) of other worldviews. It ultimately determines how we learn to interact and defines our logico-relational understandings.	Freedom. Influences occur from knowledges about learning that affect our polity determined in part by how we think about the constraints on group and individual freedoms to learn and in connextion with this to organise and behave. It ultimately has impact on our learning related ideology and our degree of emancipation.

6. A Viable Approach to Knowledge Creation

Both individual and organisational learning can be associated with the creation of knowledge locally to the individual or organisation. The area of knowledge creation, and its embracing subject area knowledge management, therefore has relevance to the idea of learning. The question of what constitutes knowledge management may be posed in different ways (Allee, 1997). A traditional meaning within the context of organisations relates to the question of knowledge ownership, control, and value, with an emphasis on planning. Another approach,

consistent with that adopted here, is that knowledge is organic, and has a flow, a self-organising process, and patterns. It explores how knowledge emerges, and how the patterns change.

In a paper by Yolles (2000), the notion of knowledge patterns are explored, and a new model of knowledge creation is created that is compered to the more well known model by Nonaka and Takeuchi (1995). Yolles' model derives from the viable system model of figure 1. In addressing this, we note that each of the three domains have associated with them its own knowledge process, one connected with cognition, one with organising, and one with behaviour. This notion is consistent with Marshall (1995), whose interest lies in knowledge schema within situations of individual learning. Schema have four catagories. They are the mental organisation of individual's knowledge and experience that allows him/her to recognise experiences that are similar. The access a generic framework that contains the essential elements of all these similar experiences. The use this framework to plan solutions. Finally, the ability to utilise skills and procedures to execute the solution. For this purpose, Marshall identifies three types of knowledge:

- Identification knowledge – the facts and concepts making up the knowledge domain
- Elaboration knowledge – the relationships between the individual knowledge components and the way they are organised
- Execution knowledge – the conceptual skills and procedures required to execute an activity

Marshall does not attempt to address knowledge creation, though we shall do so through our own model. We consider that in social situations, knowledge creation occurs through a process of knowledge migration from one worldview to another. It is an identification knowledge process. The basic knowledge management model is as given in figure 2. It links to table 1, and depicts the three fundamental phases of the knowledge process: migration, accommodation, and action. Migration is associated with the cognitive domain, accommodation with the organising domain, and action with the behavioural domain. Each process has an input and an output. A control process also is able to condition each process through actions on the inputs or the processes themselves. The way that migration occurs is conditioned by cognitive influence, accommodation though cognitive purpose, and action through cognitive intention. We shall elaborate on these shortly.

The way that (perhaps complex) control conditions *process* is represented through figure 3. Knowledge migration occurs through the development of interconnections between the worldviews of the actors in a given suprasystem, and is the result of semantic communication. As part of the process of knowledge migration, new knowledge is locally generated within the actor. While this may be seen as part of a socialisation process, it may also be seen as an actor local spontaneous thing when the process of knowledge migration operates as knowledge creation trigger. The transfer of new knowledge may be seen as a catalytic process for the creation of new local knowledge.

Newly migrated knowledge may be shared and re-shared within the suprasystem, because the new knowledge created by one actor will have a local definition that will be different for others. As a result, the originally migrated knowledge will have to be re-migrated in a feedback loop. This is fundamentally consistent with the notion of paradigm incommensurability, since every worldview will have its own distinct pattern of meaning that will be different from every other one. This does not stop the knowledge from being

"contagious" to relevant others within a given suprasystem through the continuous semantic communication process that they participate in, that involves recursive migration (that is re-migration and re-migration) of knowledge. Each recursive knowledge migration has the potential of new knowledge creation for each actor in the suprasystem. As knowledge is migrated, it is likely to pass through a morphogenic process, and sometimes a metamorphic one that makes it new to the group.

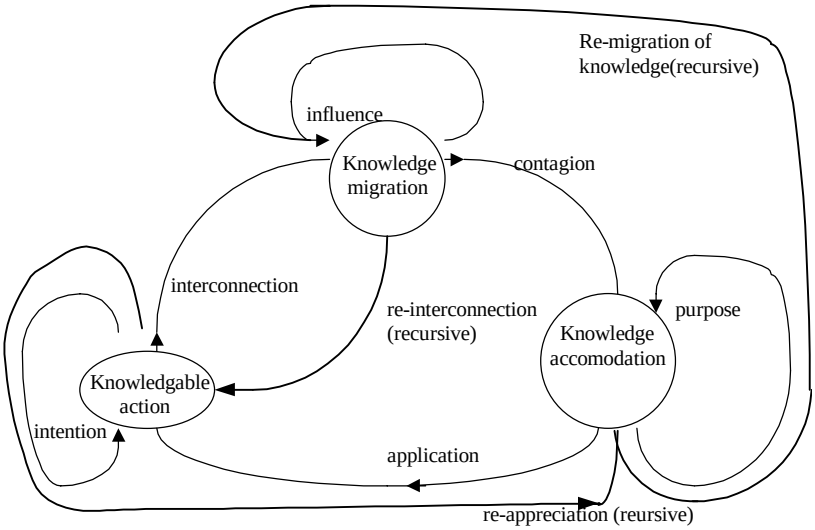

Figure 2: The Knowledge Cycle

Polity, a core aspect of politics, acts as a filter on knowledge migration. It is concerned with an organised condition of social (or civil) order. Polity is connected to politics through the latter's interest in the causal relationships relating to behaviour, that enables what may be referred to as social engineering. Within the context of knowledge about the creation of order, we can talk of polity knowledge. It would seem to be connected to what Marshall (1995) refers to as elaboration knowledge (relating to the relationships between the individual knowledge components and the way they are organised within a schema). Polity knowledge can be seen to relate to the relationships between individual knowledge components as perceived by an actor to be possessed by the other actors, and the relative way that they are organised. It would thus seem to be an active recogniser of identification knowledge (Ibid.) – i.e., the concepts and patterns of meaning that make up knowledge. When polity knowledge is applied to other actors, it enables us to decide about them. Sometimes, such decisions involve "false" assumptions that are not representative of the indentification knowledge of other actors. This can inhibit the process of knowledge migration, since recognition of knowledge differences is needed before knowledge migration can occur.

Measures can be attempted. Contagion can be evaluated by examining to whom knowledge has been passed, and whether it has been retained for use. Cultural and social influences can be evaluated by examining beliefs, values and attitudes (cognitive organisation). One way of doing this is to examining resistance to the adoption of new patterns of cognitive organisation. Social influences represent knowledges about the way in which social processes operate. This dimension can be measured in terms of not social meaning, but the reticence that actors have to the introduction of new social meaning.

The process of social accommodation can follow knowledge migration. The accommodation of migrated knowledge that can occur by a relevant other is essential if they are to be able to

harness it within a behavioural world. Knowledge appreciation by relevant others is dependent upon knowledge contagion to these others. However, this is filtered through knowledge that activates weltanschauung derived ideology and ethics. In addition, the evaluation reference criteria derive from knowledge about intention and logico-relational cognitive purposes. Interestingly, this connects with the Marshall (1995) idea of planning knowledge - the knowledge of which pathways to select in order to achieve a solution.

A consequence of the process of knowledge appreciation is its intelligent application. We say intelligent, because its obverse, rote application may not require knowledge appreciation, or even migration. Knowledge application can occur behaviourally within a superstructure and a substructure. Superstructure identifies the institutionalised political and cultural aspects of a situation, and is also issue relates. Substructure is task orientated, and relates to the mode and means of production (e.g., technology) and the social relations (e.g., roles and their relationships) that accompany them.

Measurements for this control process are qualitative, requiring an inquirer to search the local environment for ways in which knowledge has been applied (directly or indirectly) to varieties of situation.

The process of knowledgeable action is dependent upon the application of knowledge. Knowledgeable action is action that occurs with awareness of what is being done within a behavioural world. Knowledgeable action in a situation is dependent upon knowledge application to the tasks that are perceived to require to be addressed within the situation. This is filtered through knowledge that activates weltanschauung derived emancipative capabilities, that enable knowledgeable action to occur. The evaluation reference criteria derive from knowledge about actor interests through work and interaction. It relates to the Marshall (1995) idea of execution knowledge, that is seen as the computational skills and procedures required executing behaviour.

A consequence of the process of knowledgeable action that derives from knowledge migration is the creation of new definition of relationships between identifiable actors. It gives meaning to work related activities, and particularly with respect to those that involve interaction.

Measures within this control loop with respect to knowledgeable action can occur by examining the environment in which that action has occurred. Work and interaction knowledge that conditions knowledgeable action can be explored by examining how work and interaction processes change with the introduction of new knowledge. Knowledge about emancipation can be determined through in depth questioning of relevant others.

When the above control loops operate to make process changes, morphogenic change occur in the knowledge phases of our knowledge cycle. When the control processes are complex and control action fails, knowledge process metamorphosis can occur (Yolles, 1999). As an example of a metamorphic change, a new concept may be born during the process of knowledge migration.

7. Viable Learning Styles, and Knowledge Socialities

Based on the theory expounded so far on viable systems, it is possible to postulate an alternative pattern of possible “learning styles” to that of Kolb that come about through lengthy discussions between Yolles and Iles, and from which the typology given in figure 3 derives. To reach it we have had to adopt Marshall's classification of learner knowledge types. At the centre of this is the knowledge migration cycle. It must be noted however, that the ideas presented from now on are propositional, requiring experimental testing, evaluation, and validation according to some criteria.

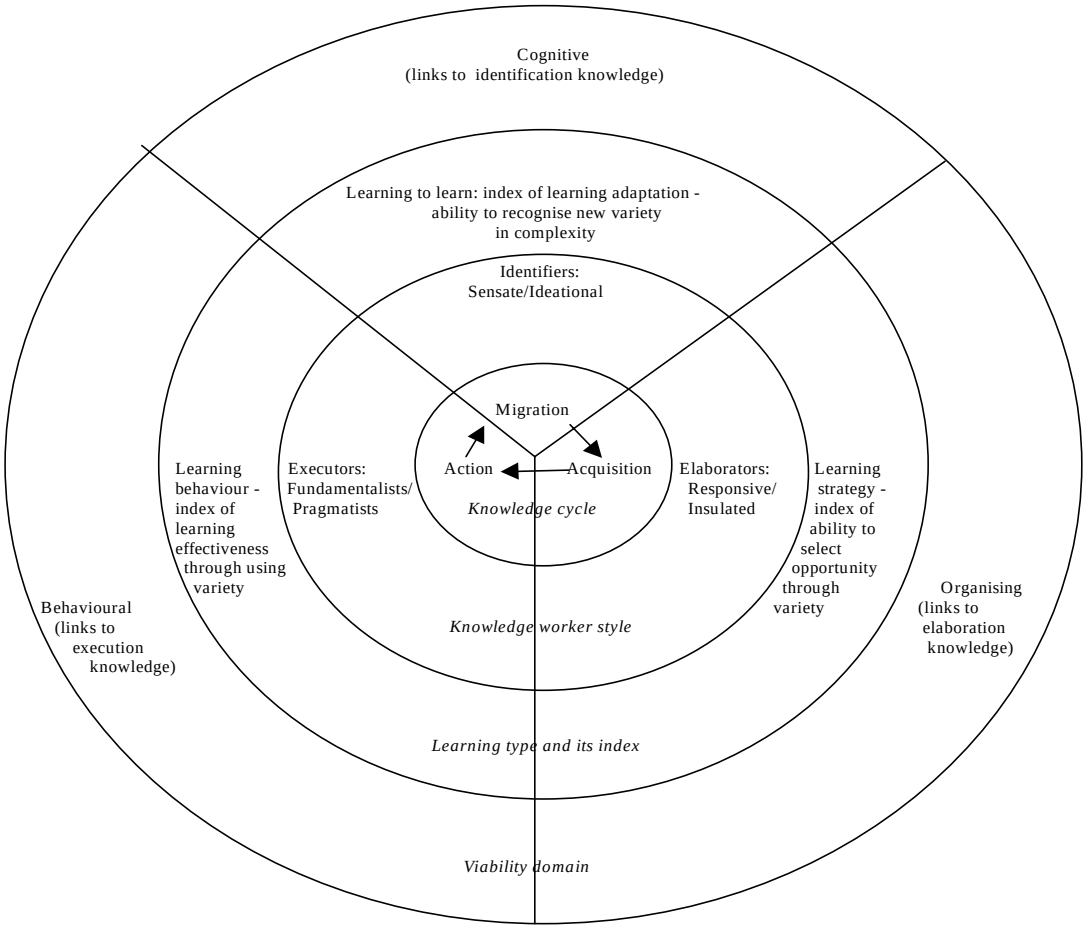

Figure 3: Indices for the development of learning attributes

A number of learning indexes are possible, that relate to knowledge creation. The most interesting for our purposes is that of *knowledge personality type*. Within the Kolb context, we might also refer to this as knowledge creation *style*, because since learning is the acquisition of knowledge it implies learning style. Associated with each phase of knowledge creation are types of knowledge workers. Those who are particularly good at migrating knowledge are seen as knowledge identifiers. Following the notions of Sorokin (Yolles, 1999), we can classify two cultural classes of identifiers, sensate and ideational. Sensate culture is to do with the senses, and can be seen to be utilitarian and materialistic. Ideational culture relates to ideas, and an example might be the adherence to say spirituality or some perhaps unachievable goal. The acquisition phase of knowledge creation has associated with it those who might be called elaborators. It is possible to classify two polar types of elaborators, those who are responsive to new knowledge, and those who are not. Finally, closely associated with the phase of knowledgeable action are executors. Two types of

executors exist. Fundamentalists obey to the letter a set of laws or fundamental principles that serve as the foundation of a given worldview, and to which they adhere strictly. Pragmatists operate (according to the Webster College Dictionary 1990 edition), not through theories, but through practical approaches. The dictionary further adds that pragmatists can be utilitarian, unidealistic, materialistic and unsentimental. However, we would contend that these really require testing since the categories encroach on our other knowledge personality types. Pragmatists, in the end, provide for some degree of leeway in the way that they adhere to notions. It should be pointed out at this juncture, that the way that in considering the typology of knowledge personalities, it is not necessary to be fundamentalist. That is for example, an identifier may not be only a sensate or an ideational personality. They may have a personality that enables them to mix sensate and ideational persepectives, in a condition that Sorokin refers to as idealistic. The same idea can apply to executors and identifiers.

The indices are measure of knowledge workers. The most interesting for our purposes, is that of knowledge creation style, since it implies learning style. Associated with each phase of knowledge creation are types of knowledge workers. Those who are particularly good at migrating knowledge are seen as knowledge identifiers. Following the notions of Sorokin (Yolles, 1999), we can classify two cultural classes of identifiers, sensate and ideational. Sensate culture is to do with the senses, and can be seen to be utilitarian and materialistic. Ideational culture relates to ideas, and an example might be the adherence to say spirituality or some perhaps unachievable goal. The acquisition phase of knowledge creation has associated with it those who might be called elaborators. It is possible to classify two polar types of elaborators, those who are responsive to new knowledge, and those who are not. Finally, closely associated with the phase of knowledgeable action are executors. Two types of executors exist: the fundamentalists who adhere to notions very strictly, and the pragmatists who provide for some degree of leeway in the way that adhere to notions. It should be pointed out at this juncture, that in considering the typology of knowledge personalities it is not necessary to take on an extremal personality condition. Thus, an identifier may not be only a sensate or an ideational personality. They may have a personality that enables them to mix sensate and ideational perspectives in a condition that Sorokin refers to as idealistic. The same idea can apply to executors and identifiers.

Associated with each phase of knowledge creation are, it is proposed, different types of knowledge workers. Thus, those who are particularly good at migrating knowledge, are seen as knowledge identifiers. After Sorokin, we can classify two cultural classes of identifiers, sensate and ideational. Sensate culture is to do with the senses, and can be seen to be utilitarian and materialistic. Ideational culture relates to ideas, and an example might be the adherence to say spirituality or ideology. The acquisition phase of knowledge creation has associated with it those who might be called elaborators. It is possible to classify two polar types of elaborators, those who are responsive to new knowledge, and those who are not. Finally, closely associated with the phase of knowledgable action are executors. Two types of executors may exist. Fundamentalists adhere to notions very strictly, whilst pragmatists provide for some degree of leeway in the way that adhere to notions. It is not necessary to be either fundamentalist or pragmatist. There may be phases in between them, in the same way, for example, there may be between insulated and responsive elaborators, or sensate and ideational identifiers. Thus for instance, an identifier may be able to mix sensate and ideational perspectives, in a condition referred to as idealistic. Clearly, these ideas and propositions need testing through further empirical research. However, certain research questions can be formulated and propositions developed.

There is an obverse view that we can take to that suggested above that may be simultaneously true. It is that different cultures prioritise different attributes, and that individuals who become predominant in a given culture do so because they may have a particular orientation that fits well with that culture.

Before exploring this any further, we note that there is a tendency within the human sciences to move from exploration of the personal to exploring the social. This occurs in a way that is consistent with the current tendency of developing social theory from some well chosen psychoanalytic propositions (Frankl, 1989). It very much relates to the notion that a coherent social can be seen as an individual organisation, and it behaves in a way that is representative of a conscious individual. If we wish to explore the characteristics of the social we could refer to it as group personality just as if the group has an individual personal. However, since our interest lies in the social that may be different in nature from the personal in a number of its aspects, it would seem more appropriate to refer to the characteristics of the coherent social group as its sociality. Within this vein, we could also refer to the coherent social group itself as the social. If we are interested in examining the social knowledge characteristics within the context of knowledge management, then we can use the term knowledge or cultural sociality, noting that the connection between culture and knowledge has been well defined here. This is firstly because the term sociality has consistency with the notion of personality while it refers to the social rather than the personal. Secondly, the term sociality is already in current use in a way that is consistent with our interest; for instance Boudourides (1997) sees human sociality in terms of (inter)active social relationships that enable the formation of new forms of collective subjectivity (for him within the contect of virtual groups involved in communications). This has implications for knowledge management, and in Caporael's (1995) use of the term sociality the relationships are defined in terms of the connection between the social construction of knowledge and group situation.

From here on, the term personality and sociality should be seen as interchangeable, though the frame of the reference for one is the individual, and the other the coherent social group (or social).

As a result of these considerations, we can now identify three types of culture using the framework developed earlier. Each in particular supports a type of knowledge sociality types. Each type has its own polar extremal as indicated in Table 2.

Table 2: Nature of distinct Cultural/knowledge Types with Polar Values

Type of Culture	Supports	Nature	Extremals	
Cognitive	Identifiers	Supports the creation of ideas and is called cognitive; its members are appreciative of the nature of knowledge. There are two types of identifiers, sensate (to do with the senses) are those who are able to develop existing ideas materially, and those who are ideational and who create ideas but not know how to develop them materially.	Ideationalist	Sensatist
Organising/ Political	Elaborators/ Planners	Supports both elaborators (who know the relationships between cultural attributes) and planners (who through their understanding of cultural attributes and its patterns of knowledge are able to determine possible trajectories for action). Two polar types are those that are responsive to situations and those that insulate themselves from them.	Insulated	Responsive
Activistic/ Behavioural	Executors	Two types of executors are: those who are fundamentalist in that behaviour conforms to some fundamental prescription independent of circumstance; and	Fundamentalist	Pragmatist

		pragmatists, whose behaviour may reflect the demands of circumstance.		

We know that worldviews are generators of knowledge, and while patterns of knowledge create understanding for the individual, we also propose that they can formulate traits. One example of a trait as explored by Eysenck (1965) is extroversion/introversion indicated by the attributes of activity, sociability, risk-taking, impulsiveness, expressiveness, reflectiveness, and responsibility. Another is neuroticism/stability indicated for example by degrees of self-esteem, happiness, anxiety, obsessiveness, autonomy, hypochondriasis, and guilt. According to Underwood (2000) drawing on the work of Argyle, traits are the result of an *interaction* between a situation and the personality. This model does not deny that there may be generalisable aspects of a personality, but denies that they will be consistently evidenced across all situations.

To further the interests of exploring the nature of organisations as sociality types within the context of knowledge management, there is a further leap that we can make from what we have structured so far. It lies in the possibility of developing the notion of the knowledge personality into a fuller description of personality type. To pursue this line of thinking, however, requires that we understand a little better the nature of personality type. It can be defined in terms of the properties of individuals (the personal), "such as attitudes, needs, traits, and feeling, as well as processes like learning or perception" (Secord and Blackman, 1964, p.2). Within the context of the sociality, however, and in line with viable systems theory, it suites our purposes to provisionally define sociality type in terms of the following characteristics:

- worldview characteristics that includes a group or individual cognitive organisation (attitudes, values and beliefs),
- knowledge characteristics (that form traits)
- emotion
- ego characteristics

These must be seen as independent (and thus orthogonal) to each other. Most of these characteristics have been discussed in this article already in terms of their extremals. Emotion, however, requires further consideration. Since the start of the science fiction series Star Trek and one of its heros Spock, we have been faced with the notion that rationality is the opposite of emotionality. However according to our structures this is a false premise. Rather, rationality lies in the domain of the worldview, and is independent from emotion. Any extremal in any of the proposed dimensions can subdue aspects of the others, but this does not mean that a highly non-emotional person is rational. In order to progress the model further, it is necessary to identify two extremals for emotion. We suggest that these should be stoicism and emotiveness. Stoicism represents an impassiveness that can be considered as the opposite of emotiveness. Returning to the Star Trek scenario, emotiveness will overshadow rationality, but stoicism will not. The space between these two extremals, which we shall call reactiveness, can moderate the rational process, perhaps by accelerating it.

Socials, like persons, can have emotional responses if the culture permits the individuals within them to respond emotionally to situations and maintain that emotional response. Examples may best be found in the public domain where governments respond emotionally to situations, and are then reprimanded by process of law.

Let us now reconsider ego. We may refer to ego in terms of two extremals that we shall refer as attached and detached. By the former is meant that the ego is totally attached to the worldview belief system, and by the latter that it is separated from it. A person that has an attached extremal may also be said to have a large ego, while a partly attached ego may be referred to as small. It is clear from these ideas that there is a connection between ego and worldview in that both are in some way related to the belief system. We have already discussed the frames of reference of worldview, and we use these terms in table 8.

We can further the notions considered here by adopting landmark theory (Yolles, 1999). To understand this, take for example the three dimensions of knowledge sociality as a three dimensional cube (figure 4). We can suppose that each extremal of each dimension can take the value of either 0 or 1 (see table 3), though there may also be landmark values in-between, like 0.5 or 0.25 say. Thus, in the case of Identifiers, an ideationalist will take the value 1, while a sensatist will take the value 1. A balance between the two might take a value 0.5. We can extend this to if we are interested in personality/sociality profiles, as shown in table 8. It should be notes however, that it may well be the case that in measured situations, few socialities will demonstrate extremal values, but rather intermediate ones.

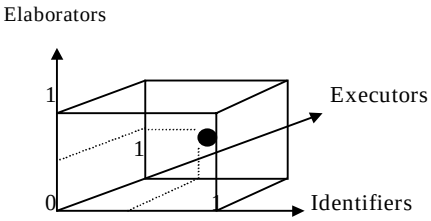

Figure 4: Learner personalities on a scale of (0,1), each extremal referring to the learner type

We can also calculate these values as aggregates by setting them up as a vector, and generating a mean value that is indicative of the sociality type, or in the case of the three dimensions alone, knowledge sociality. This has been done in table 4 by adopting the Euclidean norm (the normalised sum of the squares of the coordinate values). The aggregate values can be related to each other, on say some qualitative scale of values. As an indicator of the potential developments that are possible here, we have in this table extended the vector to incorporate ego, emotional, and worldview boundary condition. The values proposed are quite arbitrary, and the interpretations are only possibilities.

Table 3: Qualitative Landmark Values for Personalities/Socialities

		Possible Landmark Values and their Associated Terms				
Characteristics		0	0.25	0.50	0.75	1
	Ego	Detached		Small		Attached/Large
	Worldview	Self-actualising	Adaptable		Robust	Rigid
	Emotion	Stoic		Reactive		Emotive
Knowledge personality	Elaborators	Responsive				Insulated
	Executors	Pragmatist				Fundamentalist
	Identifiers	Ideational		Idealistic		Sensate

The result is the creation of a single value that intends to be indicative of sociality type. It should be realised that as usual in landmark theory, the proposed units are not intended to be

indicative of a precise measurement scale, but are manifested from a qualitative evaluation that translates to a fuzzy point somewhere between these values. Thus for instance, we may decided that we can assign the values of (0.5,0.5,1) to the coordinates (elaborator, executor, identifier) for a given individual knowledge personality. An elaborator may be responsive (i.e., 1) or insulated (i.e., 0), or be a mixture of both (say 0.5). Similarly, and executor may be a pragmatists (1) or a fundamentalists (0). Finally, an identifier may be ideational (1) or sensate (0), or an ideal mixture of both (say, 0.5).

The approach adopted here, if valid, may also be seen as being particularly useful for the exploration of groups of learners in a learning organisation that are involved in knowledge migration. The reason is that there may well be an inability for certain types of knowledge personalities to apprehend migrated knowledge from other types of personality.

Table 4: Use of Euclidean norm through use of landmark values to generate personality evaluations

Personality / Sociality Type	**Euclidean aggregate**	**Qualitative position of Type (ego, worldview, Emotion, elaborator, executor, identifier)**	**Possible Personality Interpretation**
9	0.92	(1,1,0.5,1,1,1)	He works in a project development office as a financial administrator. He thinks a lot of himself, and because of his large ego he is very confident about his own ideas. This is primarily because he does not recognise that others can have different valid beliefs. He reacts to situations with some degree of emotion, and this can moderate his rational responses. He is a good organiser and administrator, but quite unable to create a new idea of his own capable of being harnessed for the organisation. If he is approached by someone from another department, however, who needs him to introduce some adjustment in his administrative procedures, he insulates himself from their needs and is unable to respond favourably. More, he is quite restricted in what he does by the rules that guide him in his administrative activities. This is not a bad thing in that much of his work relates to the tax office, which requires strict adherence to the rules.
2	0.24	(0.75,0.25,0.5, 1,0.5,0.75)	He can listen to the views of others, but he is still quite confident about his own beliefs, which mainly predominate. He is adaptable to situations, since he is capable of dealing with and even adopting new beliefs if he is pushed. When finding himself faced with a situation that is new to him, however, he may react emotionally. He is not too good in social situations, being insulated from them and thus a strong introvert. He is generally a good driver, and while usually paying attention to the highway code and road signs, he also tends to be rather pragmatic in dealing with his needs. He has, for instance, been known to drive down a one-way street the wrong way to save a long detour. He would like to be an inventor since he is good at developing ideas, and while he comes up with the occasional idea he has difficulty sustaining an output of new ones.

0	0	(0,0.25,0.5, 0,0,0)	He is a Guru of Eastern spiritual teaching, quite selfless and believing that he is on the pathway to universal knowledge. He is responsive to others who approach him with questions relating to knowledge. While he is aware of the spiritual teaching of others, he is quite capable of responding to problems through the creation his own unique responses.

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