A SURVEY OF EPISTEMOLOGY AND ITS IMPLICATIONS ON AN ORGANISATIONAL INFORMATION AND KNOWLEDGE MANAGEMENT MODEL

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Abstract

This is a theoretical paper which aims to integrate various epistemologies from the philosophical, knowledge management, cognitive science, and educational perspectives. From a survey of knowledge-related literature, we have collated diverse views of knowledge. This is followed by categorising as well as ascribing attributes to the different types of knowledge. We have developed a novel Organisational Information and Knowledge Management Model which seeks to clarify the distinctions between information and knowledge by introducing a novel information and knowledge conversions; followed by providing mechanisms for individual knowledge creation and information sharing within an organisation.

Keywords: Seminal, Epistemology, Knowledge Management System, Conversions, Knowledge Creation, Information Sharing, Learning, Rationalist, Empirical, Pragmatic, Cognitive, Pluralistic, Community of Practice

1. Introduction

Epistemology is the study of knowledge which includes what it is and how it is acquired. Nonaka and Takeuchi (1995) emphasise the need to understand what knowledge is, know how to manage it, and exploit it to increase an organisation's competitive advantage. They view every member in an organisation as knowledge workers where new knowledge always begins with an individual which can then be transformed into organisational 'knowledge'. In this paper, we would like to address a few issues. Firstly, there is a need to revisit seminal epistemology and unify them with contemporary epistemology so as to uncover the elusive meaning of knowledge. Secondly, there is general lack of consensus over tacit and explicit knowledge as well as information and knowledge, which will affect knowledge management in organisations. To address these two issues, we have developed an *Organisational Information and Knowledge Management Model* to tease out the differences between information and knowledge for an organisation's benefits, and have provided mechanisms for individual knowledge creation and information sharing among individuals within the organisation.

2. Epistemology

2.1 Seminal Epistemology

2.1.1 Rationalist Approach

According to Plato's rationalist approach to epistemology, knowledge is justified true belief or unshakeable conviction (Descartes in Newman, 2005) which is attained through reason alone. Such

type of *a priori* knowledge which is independent of sense experience, could be innate knowledge or acquired through intuition and deduction. Popper (in Thornton, 2006) claimed that scientists begin with problems rather than observations and he attributed the growth of human knowledge to the search of solutions (involving the formulation of theories) which correspond to these problems. However, creative imagination which transcends the existing knowledge is required when current theories are inadequate to account for anomalies.

2.1.2 Empiricist Approach

Empiricists argue that humans have no innate knowledge, the human mind is a blank slate (*tabula rasa*) and claim that experience is a source of *a posteriori* knowledge (e.g. Aristotle (in Hett, 1936) and John Locke(1689)). Empiricists like Locke (1689) argue that human experience comes in the form of sensation and reflection where the former subsumes external senses (e.g. vision, smell, hearing, taste, and touch) and inner sensations (e.g. pain, joy, anxiety, etc…) which informs one about the things and processes in one's external world. On the other hand, reflection informs one about the operations of one's mind. Locke also argued that the outcome of our mental processes is ideas which are considered as the materials of knowledge. According to him, simple ideas cannot be created but can only be obtained from experience. However, when the mind has a repository of simple ideas which when reflected on (or applied reasoning to), will result in a variety of complex ideas that transcend beyond our experience. Empirical (or scientific) methods are employed to collect data through the observation of these physical phenomena, analyse them followed by the derivation of laws or theories.

2.1.3 Pragmatic Approach

Peirce (in Atkin, 2006) viewed pragmatism as a principle of inquiry and account of meaning where meaningful propositions or ideas must have practical bearings. Theoretical claims (or hypotheses) are coupled with verification practices to test the truth of existing knowledge. However, to pragmatists, ultimate truth is not attainable so existing truth is always changeable. The inquiry methods suggested by them resemble the typical scientific methods which constitute the following cycle of actions: formulation of hypotheses, testing of hypotheses, draw conclusions from the tests or provide explanations for the observed effects followed by reformulation of hypotheses and so on and forth (as shown in Figure 1).

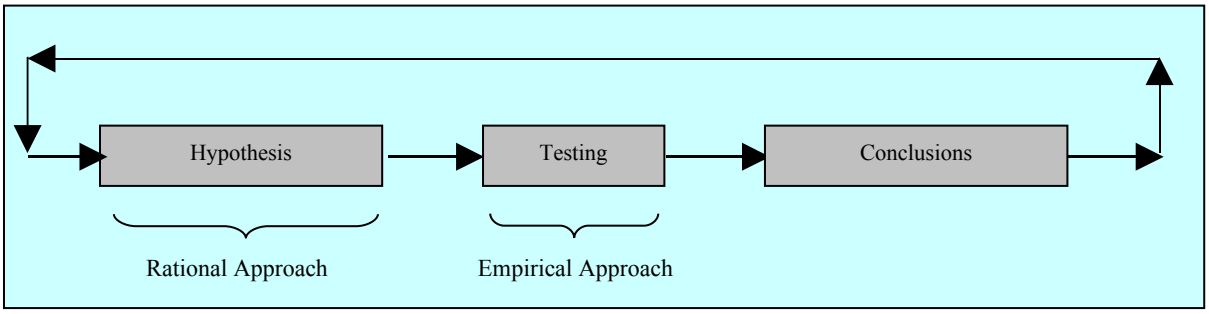

Figure 1: Scientific Method of Inquiry

According to Peirce (in Burch, 2006), the three types of reasoning involved in scientific methods are: abductive, deductive and inductive reasoning. Abduction entails the inference of some form of plausible explanation which is considered the best explanation for the current state of knowledge for an unexpected or anomalous observed effect. Such explanation is considered a conjecture or hypothesis whose truth is not ensured. On the other hand, for deduction, the conclusions are necessitated by previously known theories where inferences are being made from general principles to particular cases. To Peirce, deduction is a means of drawing conclusions about the expected observable effects given the hypothesis is true or drawing conclusions based on a set of facts or

supposed facts known as suppositions. Shanahan (1989) defines the roles of abduction and deduction in Cognitive Robotics: the former, for explanation which is a backward projection from effects to causes while the latter is employed for prediction, a form of forward projection from causes to effects. As for induction, it involves the testing (confirmation or refutation) of hypotheses and the drawing of inferences to generate hypotheses or generalisations. However, inductive inferences can be used to classifying observations of specific observations into categories, thus resulting in the acquisition of the knowledge of concepts as well as categories. A pragmatic approach could be viewed as a bridge of the rational and empirical approaches which are mutually exclusive but are complementary to each other.

Peirce viewed pragmatism as a theory of clarifying concepts (things, events, and qualities) and he introduced a maxim or a principle which allows us to better understand concepts that we use. The three pre-requisites for fully understanding a concept are: firstly, the particular concept ought to be familiar and saturates our daily experience, secondly, the ability to abstract and provide a definition for that concept facilitated by language, and finally, the ability to predict the effects when a concept is held to be true. However, Dewey (1960) maintained that 'understanding' is demonstrated when various parts of a concept/s are 'grasped in their relations to one another are grasped in their relations to one another through reflection.

Kant argued that the human mind is an active originator of phenomenal experience by systematically structuring its representations rather than a passive recipient of perception (in Ross, 2000-2002). He (in McCormick, 2006) claims that knowledge about the world is not attributed to sense perceptions alone but due to the operations on perceptual inputs by the mind based on innate rules, principles, or categories that facilitate understanding. James (1890) in his book *The Principles of Psychology*, named analysis and synthesis as examples of such mental operations where the former is a process of breaking down of objects which appear as wholes in the first instance, into their parts while the latter, bringing together objects which appear separately, and combine them as new compound wholes. He also applied the Law of Contiguity to support his claim that that objects that are experienced together have the tendency of being associated in the mind. James also added that not everything presented to our senses will be converted to experience due to selective attention. Some attention can be *immediate* (where a new percept is novel) or *derived* (or *apperceptive* where a new percept is related to a known percept). Kant postulated that knowledge has form or structure due to the structure of the mind that facilitates the unification or integration of concepts into judgements and content which is provided by the interaction of the mind with the world (Ross, 2000-2002). Both Kant and James (in Goodman, 2006) viewed the mind as possessing *a priori* templates for judgements (or values) and categories but not *a priori* judgements. According to James, knowledge could grow or change through rational processes, empirical discoveries or introspection (e.g. reflection put forth by Dewey, 1960) which is an inward process. These processes can be illustrated by a modified Kolb's experiential learning cycle (Kolb and Fry, 1975) which is shown in Figure 2 (note: learning is synonymous with knowledge acquisition in this paper).

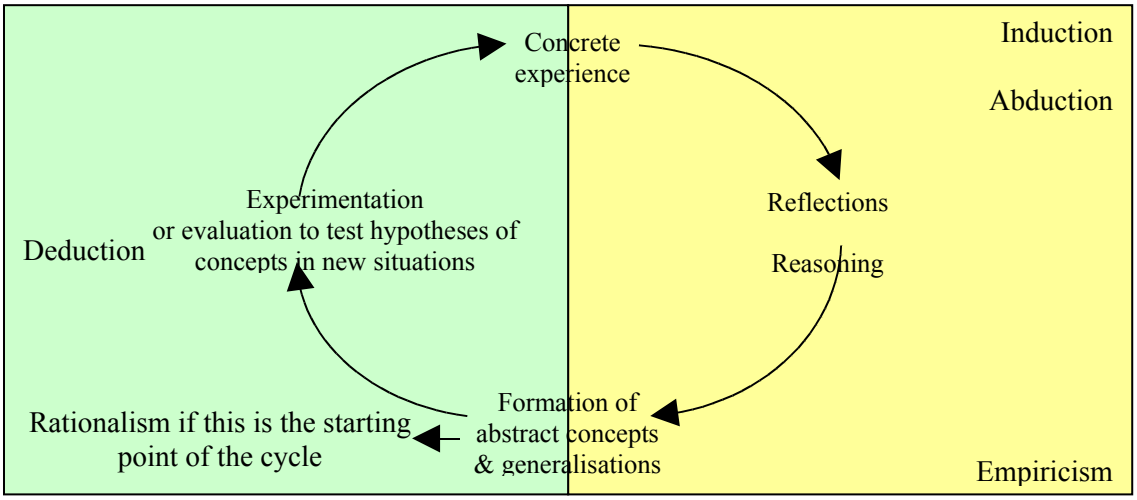

Figure 2: Knowledge growth or change cycle based on the *Pragmatic Approach*

2.1.4 Social Approach

A scientific community is viewed as a group of individuals that are committed to the sharing of their theoretical beliefs, values, instruments, and techniques. Kuhn (1962) highlighted the significant role of such scientific community in effecting a revolution of scientific theories which is not possible with the mere accrual of facts. He explained that the scientific community has an established coherent framework of scientific thought (called paradigm) which constitutes stable and consistent conjectures, theories, or practice. Normal science that occurs within such a framework is not dramatic and it develops by the addition of new truths to the stock of old truths, or the increasing approximation of theories to the truth, and the ratification of past errors. However, a paradigm is considered stretched when it is ridden with anomalies where numerous observed phenomena cannot be accounted for and then a crisis is said to occur. In such a situation, Kuhn continued, the community of scientists needs bold (or active) individuals who will explore alternatives which are considered rivals to the existing established framework of thought. This new potential but immature paradigm will initially seem to be accompanied by numerous anomalies due to its incompleteness and there will be no consensus on the emerging theories or methods which include verification rules. Consequently, it will be opposed by the majority of the scientific community. However, scientists who could recognise the would-be paradigm's potential will be the first to shift in favour of the challenging paradigm. When it is solidified as well as unified and widely accepted by the community, then it is ready to replace the old paradigm, and thus a paradigm shift is said to have occurred. The paradigm shift will entail a general consensus on radical new world views, the transformation of theories, changes in definitions of terms, verification rules and etc.

2.2 Contemporary Epistemology

In this section, we shall address two views of epistemology: one being from the cognitive approach (adapted from Kor, 2001) while the other, knowledge management which plays a pivotal role in fostering knowledge creation, codification, sharing, and diffusion.

2.2.1 Cognitive Approach

The essential elements in Piaget's stage-independent theory of cognitive development addressed in this paper are: schema, assimilation, accommodation, and equilibrium. Schemata, according to Piaget, are internal mental structures which depict the way a person represents the world through perception, understanding and thoughts (Hill, 1990). When a piece of information is similar but not identical to a learner's inherent knowledge structure, it will be assimilated by the existing cognitive structure. During this assimilation process, two changes will take place simultaneously. The first pertains to the stimulus itself while the second is the schema. The stimulus will be modified and, at the same time, the schema changes to accommodate the new input. The various ways of accommodating a new experience as outlined by Papert (1980) are abandoning the old or new knowledge, modify one or the other, or place both in separate compartments. When the conflict between the contradictory old and new knowledge has been resolved then equilibrium is said to have occurred. The schemata, in such a situation, are found to be in a stable state. Mendelson (1996) maintains that the notion of conflict is used as a tool to foster a conceptual change. However, if an incoming piece of information is either exactly the same or totally different from an existing mental structure then it will have no influence on the schema (Piaget in Mayer, 1992). The reason being the former is nothing new so will not be a stimulus of change while the latter can neither be understood nor encoded, thus failing to relate to the existing knowledge framework. Three views of conceptual change are as follows:

Schema change (Rumelhart & Norman, 1977). A cluster of related concepts is referred to a schema and is liken as a schema as a kind of tree structure in which subschemata correspond to subtrees. They classify three types of learning that can occur within a schema framework: accretion which occurs within existing schemata through the gradual addition of factual

information interpreted in terms of relevant pre-existing schemata; tuning which involves the slow modification and refinement of schemata through continual use and, presumably, it is instrumental for the development of expertise; and structuring involves the creation of new schemata to account for new information.

Theory change (Carey, 1985; Vosniadou, 1995). A theory structure differs from schemata in that it provides a causal explanatory framework within which a phenomenon it describes can be understood (Vosniadou, 1995). In domain-specific theory change, Carey (1985) proposes a few possible changes: change in the individual concepts that make up the theory, change in the relationships between the concepts, and change in the scope of the phenomena that the theory explains. Vosniadou's (1995) notion of theory change appears to be an extension of Carey's work when she further describes the changes in terms of theory enrichment through addition or theory restructuring through deletion or modification.

Mental model change. A mental model is perceived as a form of knowledge structure (Gentner & Stevens, 1983) while some see it as a transient representation which is constructed on the spot to deal with a particular situation (Johnson-Laird, 1983; Vosniadou et al. 1999). According to Vosniadou et al. (1999), such a representation can be manipulated mentally to provide causal explanations for physical phenomena and make predictions about the causal effects of the physical world. Mental models change in different ways as a result of learning and the change in a mental model is either of the mental model itself or in the underlying structures that constrain it (Vosniadou, 1995).

2.2.2 Knowledge Management Approach: Pluralist Epistemology

The *pluralist epistemology* recognises the existence of more than one type of human knowledge which interacts with each other. The term is first used by Spender (1996) to capture the different types of knowledge that an organization uses (e.g. knowledge that is held individual or collectively). Based on existing Knowledge Management literature *pluralist epistemology* could be classified into the following categories:

Dichotomy Model of Knowledge: This model which is prevalent, has been the subject of extensive debate and our discussion here will only focus on the typical categories of knowledge being explicit knowledge and tacit (or sometimes known as implicit, a term used by Polanyi, 1967) where the former is formal, systematic, and can be quantified, captured, codified (or structured), stored, reused, and disseminated. Typical examples of explicit knowledge that have been given include product specifications, codified procedures, a scientific formula, principle, or a computer programme. On the contrary, tacit knowledge is not easily captured, expressible, codified, communicated, nor shared. It is often associated with deeply rooted actions or experiential knowledge that resides in the heads of the knower (Nonaka and Takeuchi, 1995; Spender, 1998; Davenport and Prusak, 1998). According to Nonaka and Takeuchi (1995), both explicit and tacit knowledge are dichotomous yet mutually complementary and interact with each other in the knowledge conversion process. There is no general consensus about the explicit and tacit knowledge. Although the Spiral Model of Knowledge (Nonaka and Takeuchi, 1995) is considered a piece of seminal work in Knowledge Management, its knowledge conversion process (from tacit to explicit and vice versa) is critiqued (Hildreth et al, 2002; Tsoukas, 2005) based on Polanyi's (1967) stance that tacit knowledge is *ineffable* which is ascribed to something that is known but can only be described very vaguely.

Multiple Model of Knowledge: Choo (1998) extends the explicit-tacit model by including cultural knowledge to explicate organisational knowledge. The three categories of knowledge are interdependent and cultural knowledge constitutes cognitive and affective structures utilised for perception and justification purposes. Also, it is said to include assumption, beliefs, and values about the organisation and its environment. Boisot (1995) classifies knowledge into four different categories. The first is **proprietary knowledge** developed by an individual or a group, which is

context specific, can be codified but not completely diffused because it becomes not meaningful when it is utilised in a different context. Next is idiosyncratic **personal knowledge** which is derived from personal experiences and thus cannot be codified nor diffused. On the contrary, **public knowledge** can both be codified and diffused in the form of textbooks or other printed resources. Lastly, **commonsense knowledge** which is social-contextual personal experiences that have been internalised, its ownership and meaning are shared by the community and thus, can be diffused but not codified. Spender (1996) also suggests four categories of knowledge: **conscious knowledge** which is explicit knowledge held by an individual; **objectified knowledge** which refers to explicit knowledge held by the organisation; **automatic knowledge** (pre-conscious individual knowledge) which experience is linked to intuition where experts linked experience to intuition where experts arrive at solutions without being able to explain how or the reasoning bit Davenport and Prusak (1998); **collective knowledge**, which is highly context specific (like Boisot's proprietary knowledge), is manifested through the practice of the organisation (as in Boisot's commonsense knowledge).

Continuum Model of Knowledge: Polanyi (1967) and Leonard et. al (1998) present knowledge in a continuum model where one extreme end of the spectrum is a completely explicit form of knowledge (conscious) while the other end is, completely tacit (unconscious and experiential). Leonard et al argue that most knowledge lies between these two polarised points of extremes. According to Polanyi, in an *ineffable domain*, we know something in our heads but find it beyond our description. The reasons for such ineffability, in Polanyi's point of view, are due to *defective articulation* and also the inability to co-ordinate the essential elements in a coherent manner. Tsoukas (2005) views organisational knowledge as a continuum with propositional knowledge on one end while, narrative knowledge on the other.

Duality Model of Knowledge: As for Hildreth et al (2002), they come up with a duality model of the *hard* and *soft* (basically synonymous with the explicit and tacit terms which has been previously discussed) of knowledge which looks like the Chinese *ying yang* symbol. They maintain that these two forms co-exist and interwoven in all knowledge but with varying degree and in other words, knowledge is to some degree both *hard* and *soft* and thus categorisation of knowledge is not needed. Additionally, both are considered mutually dependent viewing the fact that when one increases, the other decreases.

The *KNOWING* Model of Knowledge: Polanyi (1962, p.vii) regards *knowing* as 'an active comprehension of the things known and action that requires skill'. The component *active comprehension* refers to the formulation and application of theories (e.g. a set of rules considered as maxims or rules of thumb (Davenport and Prusak, 1998) which provide guidance for the *doing* followed by the interpretation of the experience. Polanyi gives an example of science which consists of a set of formulae that have a bearing on experience and without the exercise of operational skills on these formulae, which will be guided by maxims, there will be no shaping of a scientist's knowledge. Another example given is the rules of *art* that do not determine the *practice of art* but merely serve as beacons to an art only if they can be integrated into practical knowledge of art. Seely Brown and Duguid (1998) add a social dimension to *knowing* by claiming that it not only focuses on what that is in the heads but the interactions with the things in the social and physical world. They classify knowledge into the *know-what* (explicit knowledge) and *know-how* (which can have an explicit component) which is *overlapping model*. The *know-what-it-is-like* encompasses knowledge derived from sensations. *Know-how* or also known as *things you do with knowledge* (Davenport and Prusak, 1998), relates to the procedural uses of knowledge, represents the possession of a skill (Scheffler, 1965). He makes a distinction between this *know-how* (having a skill) and *knowing that* a skill is such and such (i.e. information about the skill). Also, he continues to claim that understanding or appreciation of a *know-how* is non-existent. However, skills can generally be honed through practice but one cannot practice *know-that*. Practice will effect an increase in certain skills to the point when it could be *automatic*. *Know-that*

involves the propositional uses of knowledge and Scheffler (1965) not only views it as a verified belief but one which entails the ability to appropriately justify the belief.

A summary of the discussed seminal and contemporary epistemologies including the attributes of various categories of knowledge have been tabulated in Table 1.

3. Organisational Information and Knowledge Management Model

Seeing that knowledge is empowerment and it enhances an organisation's competitive advantage, organisational knowledge theorists and practitioners stress the need to know what knowledge is and how to manage as well as exploit it. This is the reason why the KM field has in recent years, sparked so much interests. In this paper, we shall discuss a novel *Organisational Information and Knowledge Management Model* (in Figure 3) which clarifies the differences between information and knowledge; provides mechanisms for individual knowledge creation, and information sharing. Here, we take the stance on knowledge which, in accordance with the *Cognitive Approach* (in Section 2.2), resides in our conscious mental states or minds of the knowers (Davenport and Prusak, 1998). It has been internalised and is deemed to be meaningful or useful for potential mental or physical *actions.* On the other hand, information is viewed as anything (including knowledge) that is codifiable (embedded in documents, repositories, signals in multimedia sources, etc.) and can be transferred.

Based on the categories of knowledge and their respective attributes which are tabulated in Table 1, we categorised three classes of information: coded information which is all explicitly represented (e.g. books, pictures, icons, graphs, images, etc…); sensory information (relate to perception and transmitted through multimedia channels), and practice or art information (relate to skills and *doing*). Different possible conversions within an individual (as shown in Figure 3) are:

a. information–nothing
A piece of incoming information will either be ignored or rejected when it is identical or totally different from an existing mental structure; can neither be understood nor encoded (as discussed in Section 2.2 – *Cognitive Approach*). This phenomenon could also occur when there are tenacious preconceptions, pervasive mental models, appear unintelligible appearance, or cognitive load where the receiver has been bombarded with too much information at one single point in time.

b. information-information
Information could be exaggerated, reduced when only the gist is abstracted. It will remain as information in the receiver's head as long as it is acquired through rote learning without being internalised.

c. information-knowledge
Information is transformed into knowledge when reflected on (which effects understanding – Dewey, 1960; also see Kolb's Learning Cycle in Section 2.1), reasoned about (Peirce's deduction, induction and abduction), analysed (the whole is broken into parts), comprehended, tested (as in trial and error, or inquired scientifically – in *Empirical and Pragmatic Approaches*), acted out (procedural knowledge), perceived through the 6 senses and processed mentally (sensory information only), observed and mimicked with understanding (art or practice information only).

d. knowledge-information
When knowledge in a knower's head is expressed and codified then it is transformed into information and this is resonated by the following view, 'knowledge can move down the value chain, returning to information and data' (Davenport and Prusak, 1998).

e. knowledge-knowledge
A new piece of incoming information could effect the following changes in an existing knowledge structure: accretion, tuning or structuring (See *Schema Change* in Section 2.2) or restructuring (abandoning the old – Papert, 1980 in *Cognitive Approach*, Section 2.2).

	Views/Models	Key Elements	Attributes of Knowledge							
			Effable	Ineffable	Codifiable	Non-Codifiable	Perceptual	Conceptual	Social	Personal
Seminal Epistemology										
	Rationalist Approach	Theoretical Knowledge (hypotheses)	X		X			X		X
	Empiricist Approach	Empirical Knowledge Experiential Knowledge (through observations) Theoretical Knowledge (through formulation of theories)	 X	X	 X	X	X	 X		X X
	Pragmatic Approach	Pragmatic Knowledge Experiential Knowledge (through observations) Theoretical Knowledge (hypotheses and through formulation of theories)	 X	X	 X	X	X	 X		X X
	Social Approach	Cultural Knowledge Community Knowledge (e.g. Scientific Community knowledge)	 X	X	 X	X	X	 X	X X	
Cognitive Approach										
	Schema Change (Rumelhart & Norman, 1977)	Declarative Knowledge Procedural Knowledge (Maxims only)	X X		X X			X X		X X
	Theory Change (Carey, 1985; Vosniadou, 1995)	Empirical Knowledge Experiential Knowledge (through observations) Theoretical Knowledge (through formulation of theories)	 X	X	 X	X	X	 X		X X

Table 1: Seminal and Contemporary Epistemologies with Attributes of Knowledge (Part 1)

	Views/Models	Key Elements	Attributes of Knowledge							
			Effable	Ineffable	Codifiable	Non-Codifiable	Perceptual	Conceptual	Social	Personal
	Mental Model Change (Gentner & Stevens, 1983; Johnson-Laird, 1983; Vosniadou et al. 1999)	Empirical Knowledge		X		X	X			X
		Experiential Knowledge (through observations)	X		X			X		X
		Theoretical Knowledge (through formulation of theories)								
Pluralist Epistemology										
	Dichotomy Model of Knowledge (Nonaka and Takeuchi, 1995)	Explicit Knowledge	X		X			X	X	X
		Tacit Knowledge		X		X	X			X
	Multiple Model of Knowledge	Cultural Knowledge (Choo, 1998)		X		X	X		X	
		Proprietary Knowledge (Boisot, 1995)	X		X			X	X	X
		Personal Knowledge (Boisot, 1995)		X		X	X			X
		Public Knowledge (Boisot, 1995)	X		X			X	X	
		Common-sense Knowledge (Boisot, 1995)		X		X	X		X	X
		Conscious Knowledge (Spender, 1996) individual explicit knowledge	X		X			X		X
		Objectified Knowledge (Spender, 1996) organisational explicit knowledge	X		X			X	X	
		Automatic Knowledge (Spender, 1996) intuitive knowledge		X		X				X

Table 1: Seminal and Contemporary Epistemologies with Attributes of Knowledge (Part 2)

	Views/Models	Key Elements	Attributes of Knowledge							
			Effable	Ineffable	Codifiable	Non-Codifiable	Perceptual	Conceptual	Social	Personal
		Collective Knowledge (Davenport and Prusak, 1998) – organisational practical knowledge								
		maxims (organisational explicit knowledge)	X		X			X	X	
		individual experience or practice (tacit knowledge)		X		X	X			X
	Continuum Model of Knowledge (Polanyi, 1967; Leonard et. al, 1998)	Conscious Knowledge (Explicit Knowledge)	X		X			X	X	X
		Unconscious Knowledge (Tacit Knowledge)		X		X	X			X
		Experiential Knowledge (tacit Knowledge)		X		X	X			X
	Duality Model of Knowledge (Hildreth et al, 2002)	Hard Knowledge (explicit knowledge)	X		X			X	X	X
		Soft Knowledge (tacit knowledge)		X		X	X			X
	Knowing Model of Knowledge	Know-what								
		declarative knowledge (explicit knowledge)	X		X			X	X	X
		Know-how								
		Procedural knowledge (maxims – explicit knowledge)	X		X			X	X	X
		Procedural knowledge (experience – tacit knowledge)		X		X	X			X
		Know-what-it-is-like (tacit knowledge)								
		Experiential knowledge		X		X	X			X
		Know-that								
		Declarative knowledge (explicit knowledge)	X		X			X	X	X
		Propositional knowledge								

Table 1: Seminal and Contemporary Epistemologies with Attributes of Knowledge (Part 3)

Nonaka and Takeuchi (1995) view every member in an organisation as knowledge workers where new knowledge always begins with an individual. An organisation 'learns' when individuals learn, and team learning is viewed as a fundamental unit of a learning organisation. Tsoukas (2005) claims that knowledge becomes organisational 'knowledge' simply by it being generated or developed, or transmitted by individuals within the organisation through knowledge creating activities. However, based on our information and knowledge conversions, everything that is transferable is information (effable and codifiable) so in our view, that there could only be organisational information in the physical or virtual environment while its collective knowledge resides in individual's heads. Some of the information sharing mechanisms among individuals in a group, are through the typical easily coded and communicated forms, instruction, conferences, meetings, workshops, collaborative inquiry, collaborative projects or problem solving. However, sensory information, and art or practice information can only be shared through multimedia communication channels, narratives, analogies, metaphors, maxims or rules of the thumb (Davenport and Prusak, 1998), the setting up of similar environments for re-enacting the intended experience, highlight or ascribe modality (e.g. very great, great, same, small, very small) to the salient and critical aspects of qualitative phenomenal features known as qualia (Hubbard, 1996). However, sharing of information (individual-individual, individual-group, group-group) requires common language, negotiated or shared meaning, shared mental models, integration of perspectives or views (mentioned by Senge, 1990).

In the organisational information and knowledge management model, the Communities of Practice within the organisation is said to subsume groups or teams. The *practice* component in Communities of Practice (CoP) assumes a situated meaning, which is only meaningful when there is active social participation (Wenger, 1998) that often entails conflicts, negotiations, collaboration, etc…which form the bases of shared understanding (Seely Brown and Duguid, 1991). Generally, CoPs consist of shared trusts, belief, learned lessons, insights, narratives, anecdotes, and values which give its members, a sense of identity (Liebowitz, 2001; Seely Brown and Duguid, 1991; Tsoukas, 2005), and is central to the social construction as well as sustenance of *soft* knowledge (Kimble et. al, 2002). If an organisation values knowledge creation and information sharing, then it should provide a conducive ground to facilitate the growth and continuous improvement of CoP (McDermott, 1999) which if sustained, will be institutionalised (Tsoukas, 2005).

Lastly, according to Senge (1990), engineering knowledge is created when a new idea has been invented and proven to work in a controlled environment (e.g. laboratory in the Research and Development Department). The Kuhn paradigm shift phenomenon will occur when the testing of an idea is followed by an invention, when replicated on a large scale, becomes innovation which will revolutionise the organisational business model, processes and operations.

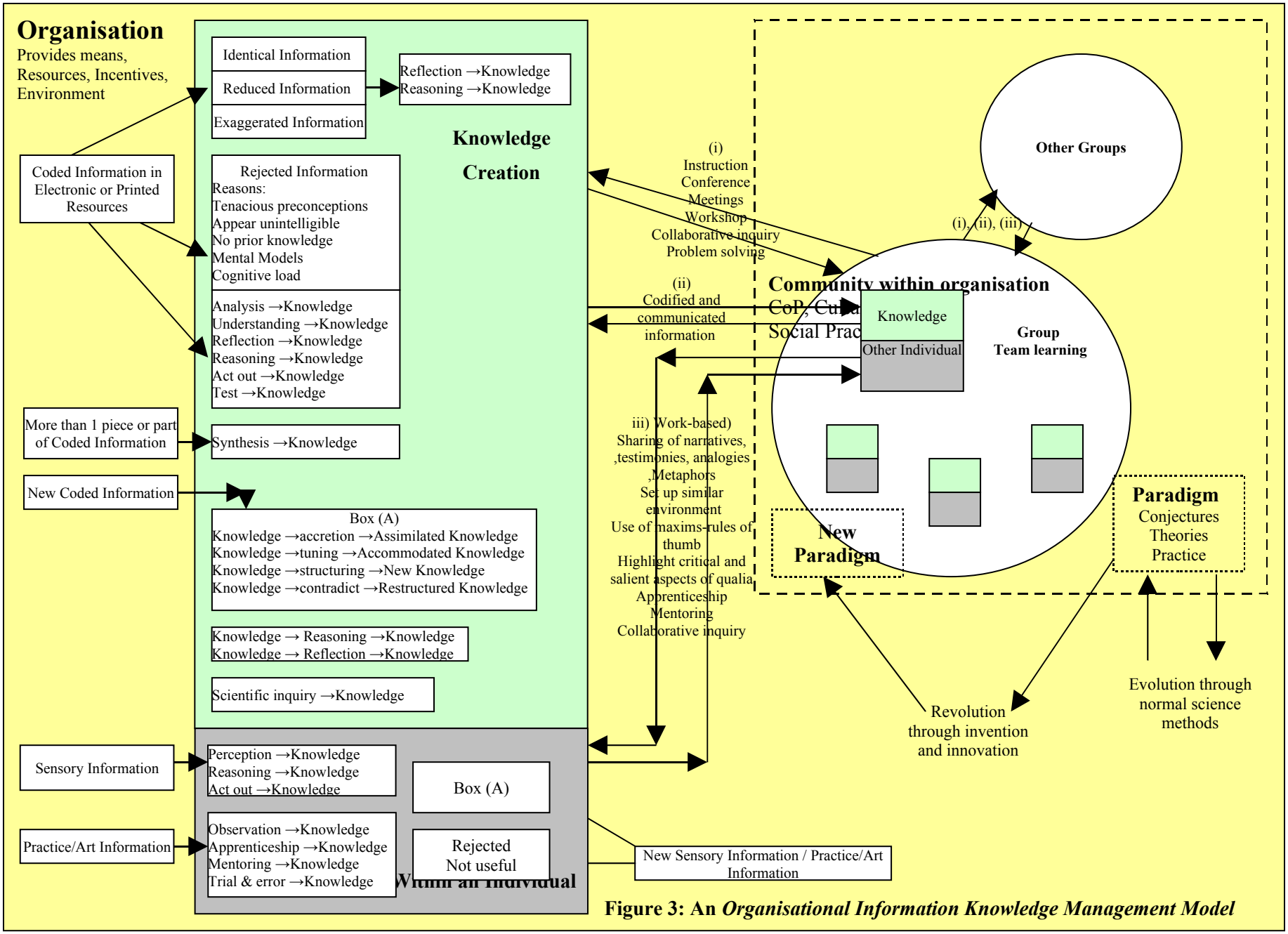

Figure 3: An *Organisational Information Knowledge Management Model*

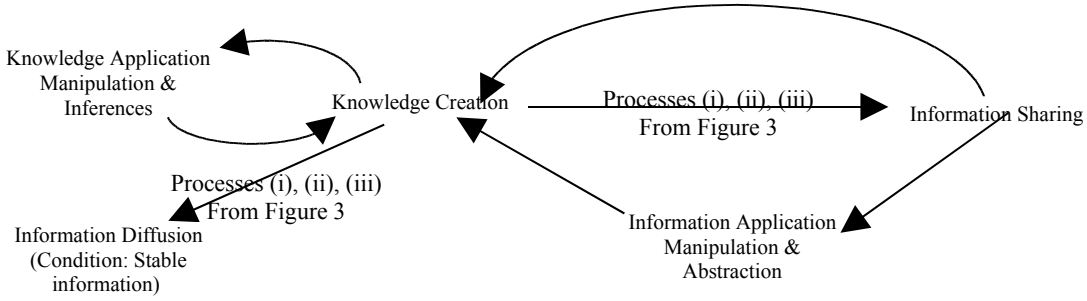

Figure 4: IKM Cycle

Figure 4 illustrates the information and knowledge cycle, which is an abridged form of the organisational information and knowledge management model shown in Figure 3. It entails creation, application, codification, and transfer activities. When created knowledge is coded, it becomes information which can then be communicated and shared. Information sharing mechanisms are processes (i), (ii), and (iii) in Figure 3, which will facilitate schema change (Rummelhart and Norman, 1977) or cognitive growth (Piaget). When knowledge has been proven over time, and information is stable then, it could be disseminated to other organisations using the same transfer processes within the organisation and this is known as information diffusion.

4. Conclusion

In our discussion we have demonstrated how the seminal and contemporary epistemologies could be synergised for the benefit of an organisation. In figure 3, it shows that knowledge creation within individuals happens when there are information and knowledge conversions (within individuals) facilitated by reflection, reasoning, testing, acting out, perception, apprenticeship, and etc… In order to promote information and knowledge management, an organisation must provide incentives and motivation for individuals to create knowledge through continual learning, codifying information in multi-modal representations, providing the diverse means and resources for information sharing between: an individual and another individual; an individual or a group; a group and another group. This is followed by information diffusion. This paper has also presented an Organisational Information and Knowledge Management Model which distinguishes the differences between information and knowledge, as well as mechanisms for the conversions between information and knowledge. For our future work, we will validate and revise this model by using it to investigate ways by which individuals as well as groups create knowledge and share information within an organisation.

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