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Organizational Knowledge and Autopoiesis: Towards a New View

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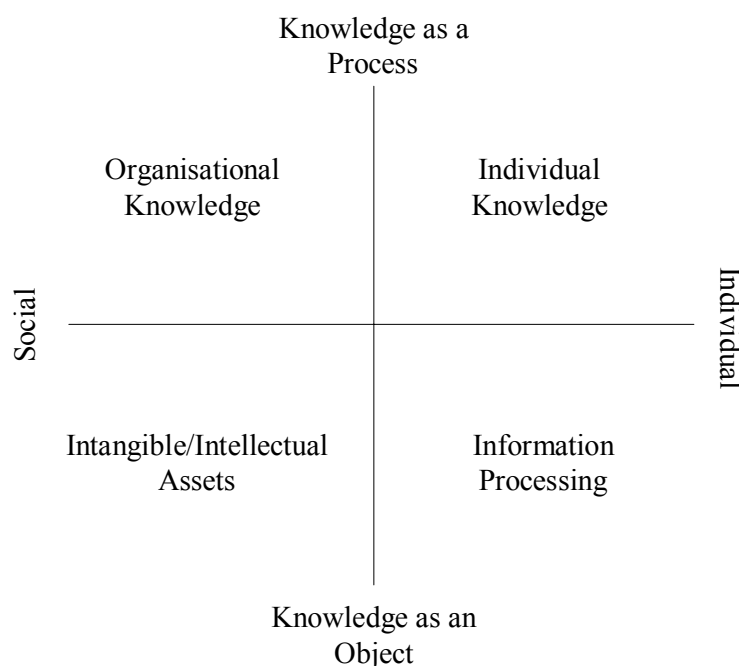dubravka@unsw.edu.au

Abstract

The field of Knowledge Management (KM) promises considerable benefits to organizations attempting to manage their intellectual resources, but it remains unclear exactly what it is that is being managed? Many authors claim that organizations must value "their" knowledge in order to develop and maintain a competitive advantage, in so doing making an assumption that there is such a thing as organizational knowledge. In this paper the notion of organizational knowledge will be examined from an autopoietic perspective. It will be argued that autopoietic theory as developed by Maturana and Varela (1980), offers a useful epistemological basis from which the idea of organizational knowledge may be considered and KM may develop as a discipline.

Keywords

Organizational knowledge, autopoietic theory, knowledge management

1. Introduction

Knowledge management, as a field of study, has suffered from issues of definition since before the term caught the attention of practicing managers and IS professionals. Put simply, what is it that everyone is trying so hard to manage? Various perspectives and research approaches have developed according to the differing assumptions of the people involved. Typically, these different approaches may be conceptualized according to the epistemological and ontological assumptions of their proponents, i.e. ontologically knowledge may be seen as a characteristic of individual people, that (epistemologically) may be held like an object in a database, or conversely, it is a characteristic of an organization and best considered as a process. When considered in this light, most approaches to KM fall into one of four broad categories according to the assumptions that underpin them (See figure 1 below).

Knowledge as a
Process

Organisational
Knowledge

Individual
Knowledge

Social

Individual

Intangible/Intellectual
Assets

Information
Processing

Knowledge as an
Object

Figure 1: Assumptions underpinning Knowledge Management Research.
In this paper we will focus on the notion of organizational knowledge and attempt to clarify what exactly it might be. In undertaking this discussion we will draw on Maturana and Varela's (1980) autopoietic theory as an epistemological basis from which to build our discussion. Autopoiesis is a biological systems theory and has significant implications for cognitive science and the way in which not only knowledge but also the nature of organizations may be considered. Within the literature on autopoietic theory there has been considerable debate over the past 20 years regarding whether higher order entities, such as social systems may be considered to be autopoietic (see Zeleny & Hufford 1992, Luhmann 1990, Robb 1992, Morgan 1997). This debate stems from the temptation to attribute organizations with the same characteristics as other living systems. As such, if organizations could be considered to have the same characteristics as autopoietic systems, then what implications would this have for the concept of organizational knowledge?
The purpose of this paper is to apply the epistemology developed within autopoietic theory, to the discussion of organizational knowledge with a view to proposing an autopoietic view on the topic. Furthermore the implications arising from this view of organizational knowledge will be explored in terms of attempting to 'manage' organizational knowledge. To achieve this, the next section provides a brief overview of autopoietic theory, this is followed by a discussion of the theory's implications when considering the notion of an organization and furthermore the nature of characteristics of organizational knowledge. Lastly the paper will briefly examine some of the implications autopoietic theory may have for KM accepting the outcomes of the discussions in the previous sections.

2. A Brief Overview of Autopoietic Theory

Humberto Maturana and Francisco Varela's (1980) theory of autopoiesis or self-production, was developed to provide explanations of the nature and characteristics of living systems. Although it is not possible in this paper to fully describe the various concepts and processes that compose autopoietic theory, a brief description of the core concepts is provided here such that subsequent discussions on the nature of organizations and knowledge may be understood. The central idea of autopoietic theory is that living systems are characterized by their self-production, technically

meaning that the components of the system, further produce the components of the system. Based upon this premise autopoietic theory describes a number of rules and processes by which individuals interact with and 'know' their environments and through which their behaviours emerge.

Within autopoietic theory, an individual's behaviour is determined by particular states of nervous system activity (Maturana & Varela 1980), this activity is defined by what Maturana and Varela have described as operational closure, which presupposes that in all cases nervous system activity results from, and leads to, further nervous system activity in a closed cycle (Maturana & Varela 1980). Possible and actual changes in state of the nervous system are therefore defined by the nervous system's structure and not external forces. External or environmental forces may act as triggers for change but it is the nervous system's structure that dictates which forces can be a trigger (Mingers 1991). Therefore changes to the structure of one person's nervous system, and consequently their behaviour, will be unique to that person. The environmental perturbations that act as a change trigger in one person will not necessarily trigger a change in another, or if they do, the change that is triggered may take a different form and/or have different implications for the viability of that person in his/her environment, given his/her history. Although the nervous system is operationally closed it does not have a fixed structure, it is plastic, its structure changes over time and it is this quality that allows for changes in behaviour and subsequently what we describe as learning (Mingers 1991). Therefore as the nervous system's structure changes, so too will the potential range of behaviours that its structural-determinacy makes possible. The ontogeny of a unity (or in the context of this paper, a person) denotes the history of structural change within that person (Maturana & Varela 1992).

When considering the ontogeny of two people, the situation of structural change can be viewed from the perspective of either individual. Depending on which unity is under study, the other simply becomes a component of the environment with which that unity is constantly interacting. When these interactions become 'recurrent', autopoietic unities can become structurally coupled. Hence, there is a history of recurrent interactions leading to a structural congruence between the two unities. Therefore, a unity is structurally coupled to its environment and vice versa. Language is an example of higher-level structural coupling, or what Maturana and Varela would describe as a consensual domain. Within a consensual domain two individuals would be able to observe the attribution of meaning to common events and experience that are very similar for both parties.

This description of autopoietic theory should only be considered as a cursory introduction to some of the major concepts within the theory. The significance of these ideas, however, becomes apparent when they are applied to the notions of knowledge and organizations, as they define the process by which the individual comes to know of their environment and orient themselves within it. If Maturana and Varela's ideas are accepted then the well accepted ways of understanding what knowledge management may involve (such as that presented in the work of Nonaka and Takeuchi (1995)) and in particular what organizational knowledge may be, require significant re-evaluation.

3. Autopoietic Theory, Organizations & Knowledge

In regard to organizational knowledge, autopoietic theory has a number of implications, however, the most significant relates to the nature of an organization, and whether it (as an entity) may be considered to have knowledge at all. Within the literature on autopoietic theory there has been considerable debate over the past 20 years regarding whether higher order entities, such as social systems may be considered to be autopoietic (see Luhmann 1990, Zeleny & Hufford 1992, Mingers 1995, Robb 1992, Morgan 1997). A number of different approaches have been proposed, with none being completely satisfactory in terms of ontology, epistemology or application. Kay (2001) has summarised the different approaches into three broad streams of debate, termed Scientistic, Sociological & Metaphoric. The Scientistic perspective is characterised by approaches seeking to show that social systems (including organizations) *are* (literally) autopoietic, as distinct from the metaphoric perspective where social systems may be *viewed as if they were* autopoietic. The Sociological perspective, characterised by the work of German social theorist Niklas Luhmann, takes a different approach by using communications as the central component of

the system rather than people. For Luhmann, people constitute part of the environment of the social system that perturbs and triggers the communication. Each of these views has been found to be problematic for different reasons, with none satisfactorily addressing issues relating to consistency with the original theory or utility in terms of providing practical guidance.

The major problem in addressing these issues arises from the important distinction that humans exist in physical space whilst organizations are represented in non-physical space. Therefore although an individual may exhibit particular behaviours through which aspects of their knowledge may be assessed and furthermore have these behaviours distinguished in language, organizations are unable, as an entity, to distinguish anything, as they are a distinction themselves. From an autopoietic perspective the ability of an organization to exhibit a particular behaviour, make a decision, or interact with its environment is nothing more than a description given by an observer, it does not represent an internal correlation of the organization as a system. "The organization emerges as a distinction that describes the interlocking sets of behaviours between humans in the   physical space. As such, the organization exists in a non-physical environment created by the individual, yet against which the individual orients their behaviour. The non-physical space exists as a function of the internal correlations of the nervous system. For the individual, there is little difference between the way in which the physical environment triggers structure-determined changes and the way in which the non-physical environment triggers structure-determined change. The individual behaves as if the organization existed in physical space with physical characteristics. In the context of the internal correlations of the nervous system, both are real" (Kay 2001, p. 474).

This is significant as this position assumes that the organization is no longer a separate entity external to the individual, but rather an embodied aspect of the individual's worldview. As such an organization both influences and is influenced by the continuous functioning of internal correlations within the individual's nervous system and not as an entity in the individual's physical environment. This particular epistemological stance is referred to by Maturana and Varela as objectivity-in-parentheses. It is important to note that the process-of-knowing for Maturana and Varela brings forth 'a' world not 'the' world. Reality (whether physical or non-physical) is an embodied notion that cannot be separated from the living process of the individual. Within Maturana and Varela's conceptualization, the notions of doing, being and knowing are all bound into the single notion of knowledge and all of these notions are subject to structure-determined processes of change. As a consequence of these relationships, knowledge may be considered as the range of potential behaviours that an individual may take part in at any particular point in time. As the nervous system's structure changes, so too will the potential range of behaviours that its structural-determinacy makes possible. This is due to the plasticity of the nervous system (Maturana & Varela 1992).

We will therefore argue that social systems themselves are *not* autopoietic, but that the processes described within autopoietic theory may be used to better understand the generative processes that give rise to organizations and other social collectives. To this end a more useful conceptualisation would see organizations as sets of structurally coupled individuals who through ongoing interactions have developed a consensual domain of action and meaning attribution, based upon the distinction of their common histories. This outcome is important in terms of discussions relating to whether knowledge may be considered a quality of individuals or organizations.

By arguing for a position where organizations, rather than considered as entities themselves are viewed as distinctions made by an observer, we have in essence argued for a view where knowledge is considered a quality of the individual, which may be observed to be a characteristic of an organization by an observer. However, such observations are nothing

more than distinctions and are not indicative of something that may be quantified in a physical sense. As such it does not make sense to discuss organizational knowledge in similar terms to the way that knowledge is discussed with reference to individual people and their capabilities. Notions such as useful, timely or meaningful are not innate characteristics of a piece of knowledge or information[1] but rather observations that the practitioner makes about such knowledge or information. These observations are a function of the practitioner or observer's own particular cognitive structure that has developed over time through ongoing and recurrent interactions with the environment. As such to describe an organization as having knowledge would be, from an autopoietic perspective, to suggest that a particular linguistic distinction were a knowledgeable entity, a position which does not make much sense, nor is particularly useful.

Having argued that, strictly speaking, organizations are not knowledgeable entities, there remains a number of unexplained issues. For example such a perspective would fail to account for the activities of organizations that arguably are the result of collective action by their members, actions that would be impossible for an individual to undertake and as such are arguably attributable to the organization or social group. At a simple level, this could be illustrated by two people cooperating to lift and move a piece of furniture from one room to another without damaging it. Neither individual could undertake the operation by themselves and as such the outcome is the result of a collective coordination of their respective capabilities. Although this particular example could be explained in terms of the separate actions of each individual, such an approach is not scalable and quickly becomes too complicated to be of much practical value. This issue becomes obvious where examples of high complexity such as those described by Weick and Roberts (1993) are concerned.

Weick and Roberts examined the processes involved in the safe operation of flight decks on aircraft carriers arguing that organizations enact aggregate mental processes. Central to their point of view are ideas drawn from Sandelands & Stablein (1987), Wegner, Erber and Raymond (1991), and Hutchins (1990, 1991). These authors argued for different approaches to the notion of group or collective mind, based upon metaphoric parallels between the human brain and organizations (Sandelands & Stablein 1987) leading to the assertion that intelligence may be found in patterns of behaviours rather than individual knowledge; degrees of cognitive interdependence between actors focused on memory processes (Wegner et al 1991) leading to the enaction of a single transactive memory system between individuals, and that overlapping knowledge between individuals provides for redundant representation allowing people to take responsibility for all parts of the process to which they can make a contribution (Hutchins 1990). Based upon these different views, Weick and Roberts proposed there own perspective on the notion of 'collective mind', where they paid "…more attention to the form of connections than the strength of connections and more attention to mind as activity than mind as entity" (1993, p. 360). The distinction made here to mind as activity rather than entity is important as it emphasises the idea that the knowledge of the collective or organization is not an objective notion that may be 'captured', but that it does represent something distinct from the knowledge of the individual. They note, "Our focus is at once on individuals and the collective, since only individuals can contribute to a collective mind, but a collective mind is distinct from an individual mind because it inheres in the pattern of interrelated activities among many people" (Weick & Roberts 1993, p. 360).

Weick and Robert's work carries a number of parallels with the autopoietic perspective under development in this paper. Firstly, it does not assume that knowledge is a characteristic of an organization but at the same time admits that there is something distinct about the actions of collectives that cannot be accounted for in the knowledge of individuals, secondly it recognises the importance of interactions and activity in the development of coordinated behaviours, thirdly, it also provides a locus for considering the observation of organizational knowledge, through the distinction of patterns of behaviour exhibited by individuals. Following on from these key assumptions, we would argue that, the concepts of structural coupling, and consensual domains described within

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[1] It is important to note that the authors do not use the words knowledge and information interchangeably here as they represent significantly different concepts. Rather that the processes by which they are identified by an observer are subject to the same processes and rules within autopoietic theory.

autopoietic theory provide a biological basis for considering organizational knowledge that is not based purely on metaphor, and does not require the reification of organizations or their knowledge.

The related concepts of structural coupling and consensual domains provide an important bridge between the cognition of the individual and the patterned behaviours that are often described as organizational knowledge. At an individual level through ongoing recurrent behaviours in a common context, two individuals may become structurally coupled. This denotes a degree of structural congruence between the individuals involved, developed through their common experiences. The gradual structural coupling of two or more individuals forms the basis for the development of consensual domains, where "...the domain of interactions specified through…..ontogenic structural coupling appears as a network of sequences of mutually triggering interlocked conducts…" (Maturana 1978, p. 47). Consensual domains (or the sets of interlocking behaviours) operate essentially as closed systems i.e. they are self-organising. At the same time the consensual domain is open in terms of the individuals that produce the behaviour, therefore others can replace the component organisms so long as their structure is congruent with that of the already coupled organisms. It should be noted that a consensual domain, as the term is being used here, does not denote a domain of consensus or agreement. It specifically refers to a set of interlocking behaviours emerging from the process of structural coupling, these sets of behaviours may be described as coordinated behaviour.

We would argue these concepts provide the basis for a description of not only collective activity based upon the aggregated behaviours of individuals, but also the apparent emergence of a distinct collective behaviour. This is compatible with the perspective put forward by Weick and others in the sense that the behaviours have become the locus for study rather than knowledge of the individuals or groups. It is also consistent with the ideas found in the work of Sandelands and Stablein (1987), Wegner et al (1991), and Hutchins, (1990, 1991), in the sense that the behaviours although, autonomously generated, are a function of the ongoing interactions of the people within the group and as such are overlapping and interdependent. An important distinction remains to be made, however, in regard to the use of patterns of behaviour, rather than individual knowledge and that is the effect of context.

The significance of context becomes clear when one attempts to distinguish the difference between the patterns of behaviour observed in a group and those associated with a general crowd. Weick, following Ryle (1949) approaches this problem by considering the mind as a disposition to act with heed. "People act heedfully when they act more or less carefully, critically, consistently, purposefully, attentively, studiously, vigilantly, conscientiously, pertinaciously (Ryle 1949, p. 151)." (Weick 2001, p. 263). Here Weick, Roberts and Ryle place value judgements upon the observed behaviours in order to support the idea that behaviours may be combined either intelligently or stupidly. Weick and Roberts (1993) observe, "Heed is not a behaviour but refers to the way in which behaviours…are assembled. [Behaviour]…is called heedful, not so much because…[it]…involves action preceded by thought but because the behaviours patterned into the action …suggest to the observer qualities such as noticing, taking care, attending, applying one's mind, [etc]…". As such in distinguishing between a crowd and an apparently purposeful group, Weick and Roberts argue for a position where the actions of the crowd are essentially lacking in the levels of heed one might observe for example in a football team attempting to shoot for goal. Within Weick and Roberts conceptualisation, heedful interrelating between individuals creates the context for the collective mind to operate.

From an autopoietic perspective, the notion of context is accounted for quite differently. Maturana and Varela (1992) are quite clear when distinguishing the role of value judgments within their epistemology. Put simply, they consider them to be nothing more than a distinction made by an observer, they do not form an innate characteristic of the object under study. As such, to distinguish one group of people i.e. the football team, as purposeful in their actions, and another i.e. people just walking down the street, as purposeless, does not denote innate characteristics of the two groups, it is simply the point of view of the observer. This is not to suggest that an individual's observed behaviours have no effect on others. The triggering of structural changes may and does occur through the observation and distinction of those behaviours. These descriptions become information in the environment of the individual. The nature or characteristics of this information being both perturbed

by and a perturber of the individual's structure. Behaviours, therefore, become information when observed depending upon the context of the observer.

Whitaker (1996) examines the notion of 'context' from a number of different perspectives, however, it is his discussions of context from an autopoietic perspective that are of interest here. From an autopoietic perspective, 'context' becomes the process through which the individual relates to their environment, rather than a static object. Whitaker, (1992) describes this process as 'contexture' - an interweaving of referentiality and signification. The 'context' is not a function of the environment or the individual but the continuous process of structural coupling that occurs between the two, a position supported in the work of Uribe. "Observers know and create their environment through interactions with it. This interaction involves an explicit or implicit prediction about the environment" (Uribe 1981, p. 51)

The implication of the autopoietic perspective is that it is not useful to consider two individuals as being in the same 'context', even though for example they may be in the same room. The room is the environment; the context is the process by which each individual relates to it. As such action also forms an integral dimension of the context. "The observer sees as behaviour, or conduct the changing relations and interactions of the organism with its environment, which appear to him or her to be determined by sequences of changes of state of its nervous system" (Maturana 1978, p. 41) Knowledge, for Maturana and Varela, is therefore as contextually dependent as it is observer dependent.

The development of a consensual domain between individuals therefore signifies a congruity of context. This means that the process by which an individual is relating to their specific environment, has converged with that of other individuals as a function of the ongoing process of structural coupling. These congruencies produce sets of behaviours that are mutually triggering for the structurally coupled individuals. As such organizational knowledge exists through the development of consensual domains, domains that are enabled through the congruencies in the respective contexts of the individuals involved.

4. Implications of Autopoiesis for Organizational Knowledge

This view has significant implications, not only for the way in which we define and think about organizational knowledge, but also for the way in which we conceptualise Knowledge Management Systems (KMS). Firstly, knowledge is not an object that may be captured, packaged, processed and distributed. It is an embodied notion that implies a KMS by definition cannot possess or process knowledge – individual or organizational. The best we can aim for is that the KMS may support actors' processes of contexture. It becomes an additional medium through which interlocking behaviours may converge and the congruities of context, that give rise to consensual domains, develop. This process is facilitated by actors accessing the information, held in the KMS. The information helps to orient the actions of organizational members through the triggering of structure-determined changes in behaviour.

A KMS only becomes useful, however, once a certain degree of congruity has been developed between its users. It is this congruity that allows the users to relate, or attribute meaning to the information in a way that supports their interlocking behaviours and therefore the creation of what may be termed organizational knowledge. Without a satisfactory level of congruity the information would likely be ignored or remain unrecognized. Consequently significant focus must be drawn towards the patterns of interaction between members of an organization and the way in which these patterns may be supported to give rise to consensual domains.

That organizational knowledge exists in the patterns of interlocking behaviours between members of a group or organization, rather than the individuals themselves, means that work practices and the process by which they evolve become the focus for study. This is why the

degree of turnover in the number of group members becomes a critical issue. Too high a staff-turnover, and the consensual domain which forms the basis of the organizational knowledge begins to break down. The specific patterns of interlocking behaviours unique to each group take time to form, as they require ongoing interactions between members in order to develop the higher levels of structural coupling. By the rapid change over of members, however, the original patterns of behaviour that could have been described as that particular group's knowledge, will be lost and change to reflect the new mix of people within the group. The change in patterns may or may not support the outcomes the organization's leaders were after.

Achieving changes in the organization's knowledge may also be better informed through this view. Understanding the process by which the patterns of behaviour emerge allows for more informed decision making in regard to the way in which the organization is structured and how the knowledge of individuals within the organization may be shared.

5. Conclusion

This paper was an attempt to apply autopoietic theory, to the notion of organizational knowledge with a view to proposing an autopoietic view on the topic. The approach described requires a shift from considering organizational knowledge as an object entity, towards a distinction made in relation to the interlocking behaviours of participants in a social system. This has significant implications for the way in which KMS are developed and implemented within organizations as it requires a shift in thinking from a view where knowledge is captured, stored and distributed by the KMS, to a view where the processes by which the interlocking behaviours that underpin an organization's knowledge, may be supported and strengthened by the KMS, through the distribution of orientating information.

There are many open questions, however. While the theoretical basis for an autopoietic view is presented here, considerable work remains to be done in terms of translating the concepts of structural coupling and consensual domains into practical solutions for the workplace. While these questions are of general interest for understanding organizations, they are of particular interest to IS. Namely, in IS we would be interested to explore the actual or potential role of IS (or IT) in these processes in practice. Such an understanding would help us develop and maintain KMS that deserve their name.

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