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Shifting Perspectives on Organizational Memory: From Storage to Active Remembering

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Abstract

This paper provides a critique of current conceptions of "organizational memory" as presented in a number of recent studies. It briefly reviews some of the rich and varied contributions from both administrative studies and information systems concerning this topic, while at the same time noting the vagueness of the term as it is commonly used. What is of interest is the pervasiveness and perseverance of this nebulous concept across a wide range of disciplinary endeavors. The paper provides an important re-formulation of one aspect of "memory" that is implicit if not explicit in most current views, i.e. the notion of memory as a passive store, arguing instead for an active, constructive view of "remembering" that has a long, if forgotten history within psychology and other fields. In the final section, some implications of such an approach are discussed, paying particular attention to the need for empirical studies of "memories in use" and the need to focus on the active construction of common information spaces from information repositories, and expanding the domain of discourse to include sociological as well as psychological perspectives on concepts such as memory, learning, remembering, talking, etc. in the context of organizations. This re-formulation of the issues surrounding organizational memory has significant implications for the kinds of computer "support" for this phenomenon which might be possible or feasible, which can only be touched on in this paper, but will be extended in future work.

1. Introduction

In many interdisciplinary endeavors, there are certain general concepts that serve an orienting function for the community, even if the very concept itself is often found to be problematic, or capable of multiple interpretations, leading to serious misconceptions among members of the particular community. Indeed, we have elsewhere examined how the concept of "interface" for the human-computer interaction community and "cooperative work" for the computer supported cooperative work community are two such concepts that serve both a unifying function for their respective fields, yet on closer analysis, are revealed as complex composites that can be viewed in multiple, even conflicting lights (cf. Kuutti & Bannon (1991), Kuutti & Bannon (1993), Bannon (forthcoming), Bannon & Schmidt (1991).

We are of the opinion that the topic under discussion here, namely "organizational memory", is yet another example of a concept that has served a useful function in orienting people from a variety of disciplines to a set of issues concerning the way organizations use and maintain knowledge in various forms. At the same time, on an initial trawl through the literature where this concept is mentioned, a neophyte might question its very utility, given the variety of definitions that are available in the published literature. This hoary old chestnut can be found in such different fields as administrative studies, organizational theory, change management, psychology, sociology, design studies, concurrent engineering, and software engineering. Indeed, the term seems recently to have gained increasing prominence, with a number of workshops and panels devoted to it at a variety of different disciplinary meetings, including this present one (HICSS-29). The fact that such a concept is appealed to across a wide range of studies, even if its definition is disputed, is testimony to the fact that even if people cannot agree on what exactly the term means, there must be some set of

issues that can be subsumed under its umbrella that people feel are important and worth discussing.

The intent of this paper is to once again examine the concept of "organizational memory" in an effort to disentangle some of the mixed views on the topic. Indeed, some people argue that the term itself is somewhat meaningless, and is an example of the "fallacy of misplaced concreteness" in that only people, and not organizations can be considered to have memories, but for our purposes here wish to see how the term is actually used in practice, and what aspects of organizational life it uncovers, with a particular emphasis on differing conceptions of "memory". In the next section we start out our hunt for the meaning of organizational memory through examining certain papers in administrative and information studies that utilize the concept. Having noted some of the definitions which have a strong emphasis on the "storage" metaphor, we then take a pragmatic stance and switch our focus to systems applications that attempt to support some form of organizational memory, culling examples from a variety of disparate sources. The increasing recognition of the importance of treating information and knowledge in organizations as "living" and active, rather than simply as a passive collection of records, is the aspect of organizational memory which we wish to pursue here, as we believe that this perspective has important implications for the kinds of computer support tools that might be required for keeping information accessible and relevant within an organization over time. We pursue the active approach to memory through the work of psychologists from an earlier period and show that the distinction between memory as a passive store and memory as a constructive act, which has a long history, might open up some new issues for the role of technology support in the area of organizational "memory", where the focus is on memory as a construction, and not simply a pointer to a data repository

2. A sampling of views on Organizational Memory

One of the features of the work on organizational memory is the many and varied places where this term can be found, as it does not exclusively "belong" to any particular research area or discipline. A recurring theme is the idea that the knowledge and experience that resides within the organization needs to be "preserved" somehow - for instance, as members of the organization retire or move on - and also "shared" among organizational members. The intention is to allow current and future projects to benefit from the experience of other projects, both current and previous, and allow for organizational competencies to be continually re-constituted. For example:

"The sharing of an organization's knowledge resources among knowledge workers is essential from two standpoints. First, it avoids duplication of effort in knowledge collection and maintenance. Second, it promotes consistent decision-making since all knowledge workers have access to the same body of knowledge (or subsets thereof). The shared knowledge may be centralized and/or distributed. In any case, knowledge management software must be capable of ensuring the integrity of shared knowledge, enforcing security restrictions that apply to various classes of knowledge workers, and supporting reasonable access speeds." (Holsapple, 1987), p. 82.

"The essential feature of CM/1 is that it uses a graphical hypertext system to capture the full richness and depth of the team's interactions on the problem — whether it takes place over two weeks or two years. It is easy to track and view the flow of the process, which includes the background and rationale *for the decisions, thus creating an* organizational memory." *(Conklin & Yourdon, 1993), p.5.*

"Organizational learning is achieved through the acquisition, distribution, interpretation, and storage of information. Learning should lead to more effective information processing and thus more effective functioning and performance. A key component of learning relates to the memory component of this information processing." (Hoffer & Valacich, 1993), p. 229.

"A need exists to organize, integrate, filter, condense, and annotate collaborative data and other relevant information and place it in a common repository that is easily accessible by team members, managers, and other interested (and authorized) personnel".(Morrison, 1993), p. 123.

Probably the largest body of literature on the concept can be found in the field of organization studies. Given the shortage of space in this paper, this is not the place to provide an exhaustive or even extensive reference to the evolving literature on the theme. Rather, we will refer to a recent major review paper on the topic (Walsh & Ungson, 1991) which collates much of the early material and provides a useful context for our subsequent remarks. Thereafter we switch our attention to the more pragmatic concerns of systems builders, and their attempts to implement systems that support various aspects of organizational memory.

2.1 Organizational analyses

In the organizational and administrative studies literature, one can find at least two distinct approaches to organizational memory (cf. Cook & Yanow, 1993). One focuses on the individual cognitive capabilities of people and views organizational learning and memory as simply defining the learning or memory of *individuals* in the organization; a second view presents organizational memory as some cognitive property of an *organizational collective entity* that itself can be viewed as learning and

memorizing[1]. We would agree with Cook that neither of these two alternatives seems satisfactory. The former tends to eschew any analysis of the real organizational context of the activity, whereas the latter lends itself to an anthropomorphism, which is distinctly problematic and unhelpful, leading us to search for the location of engrams in the basements of an organization. Another notion of organizational memory is the idea that everything in organizations contains some information and is thus comparable with a "memory":

"Organizational memory, broadly defined, includes everything that is contained in an organization that is somehow retrievable. Thus storage files of old invoices are part of that memory. So are copies of letters, spreadsheet data stored in computers, and the latest strategic plan, as well as what is in the minds of all organizational members" (Kim, 1993).

One of the best known and widely cited conceptions of organizational memory is presented by Walsh and Ungson (Walsh & Ungson, 1991). In their review paper Walsh and Ungson develop a model of the structure of organizational memory from the administrative science point of view that synthesizes a large number of previously presented conceptions. The fundamental component of this model consists of five "retention bins", around which both acquisition and retention take place. The "bins" identified are the following ones (pp.. 63-66):

1. Individuals. Individuals store information about their organizations in their own capacity to articulate and remember experience, and they keep records and files as memory aids.

2. Culture. Culture embodies past experience that can be useful in dealing with the future. The cultural information is seen to be stored in different ways, as in language, in shared frameworks, in symbols or in stories.

3. Transformations. Transformations embody the logic that guides the transformation of an input (e.g. raw material, a new recruit, an insurance claim) into an output {correspondingly, e.g. finished product, a company veteran, an insurance payment).

4. Structures. Different roles within an organizational structure provide a repository in which organizational information can be stored.

5. Ecology. The actual physical arrangement of an workplace also embodies information about the organization that can be potentially decoded.

The conceptual framework that is proposed in Walsh & Ungson is comprehensive, but it suffers from an attempt to include virtually everything, so that one is left wondering exactly what, within organizations, is not a part of organizational memory? The attempt to ensure completeness results in an overly complex and unwieldy conception of organizational memory. There is also a distinct bias towards a storage model of "memory" in the paper, despite the occasional references to active features of using memories. This is another point that we will return to later in the paper. So, what of our own perspective on the concept of organizational memory? Our own position is that, given the very loose and non-overlapping definitions of the term, we are not particularly enthusiastic about its use as a coherent conceptual construct in the literature. On the other hand, given its wide usage, we are here concerned to point out certain features of memory, in humans or organizations, which we believe have not received sufficient prominence to date in the debate about organizational memory, which could re-orient some of the work done under its banner. So, for the rest of the paper, we will use the term organizational memory as a general category, without further equivocation, despite our conceptual concerns.

Let us now turn to see how another disciplinary background has brought people to a somewhat different conception of organizational memory.

2.2. Computer-based systems to support Organizational Memory

While it is important not to reify this concept of "organizational memory", and as we have seen the term has been used in a very wide and at times confusing way in much of the organizational theory literature, the label still serves as a useful heuristic to describe a set of concerns about how information is collated, stored, accessed, accreted, updated, and used in organizations. Some theorists express the view that with appropriate information technology, we can supplement the deficiencies of human memory in organizations so as to provide better organizational memories. Huber (1990) provides a particularly explicit example of such a perspective:

"Given what is known about the many factors contributing to inaccurate learning and incomplete recall and to motivational distortions in sharing information, it is not at all surprising that the human components of organization memories are less than satisfactory (...)In the future, smart indexing or artificial intelligence will facilitate retrieval of transaction information and will result in computer-resident organizational memories with certain properties, such as completeness, that are superior to the human components of organizational memories" (Huber, 1990), p.60.

This represents a rather standard view of the human as the fallible element in the system, and the possibility of supplementing or even replacing the human element with computers. We will in a later section question this particular viewpoint, and show that there is a lot more to the concepts of human and organizational remembering than simply accessing large data stores.

Within the computing community, a number of pilot and even some commercial systems have been developed to provide some form of what has been termed organizational memory (the pioneering work of Engelbart

[1] This links into the literature that refers to organizations as "giant brains".

and the NLS team on the NLS Journal system and "community handbook" (Engelbart, 1963), (Engelbart, 1988a). Also, there is work in engineering design concerning shared memory (Konda, Monarch, Sargent, & Subrahmanian, 1992), while others have tried to develop systems to support the software development process through maintaining a design rationale (Conklin & Begemen, 1988) or a design knowledge base (Terveen, Selfridge, & Long, 1993) or more general systems support (Ackerman, 1994b) and organizational support (Fuchs & Prinz, 1993). Let us now briefly characterize some of the contributions at the level of systems before we go further into our analysis of the concept. The intent here is to illustrate a variety of attempts to embed aspects of what is commonly called organizational memory into software systems. The examples chosen are not exhaustive or necessarily representative, but illustrate a variety of approaches which the authors have come across over the years that seem of interest, and which we present for further examination.

Doug Engelbart's vision. One of the few people who foresaw the revolutionary potential of the computer as a medium for improving idea development and group and organizational communication was Doug Engelbart, who conceived a project entitled "Augmenting the Human Intellect" at Stanford Research Institute in the early sixties (Engelbart, 1963). This work of Doug Engelbart and his group has had, and indeed is still having, a profound impact on the development of interactive computing and our interfaces to computers (Bannon, 1989; Engelbart, 1988b). Engelbart's vision encompassed a new kind of computerized working environment in which the emphasis was on how people could achieve significant gains in productivity as a result of the computerized support made available to them. Integral to Engelbart's scheme was the provision of computerized support to enhance communication and collaboration between people. As well as providing electronic mail facilities on his system, users could link their screens together and thus work in a shared space mode, often with a telephone connection as well, so people could discuss and change the joint document they were viewing. With regard to the concept of an organizational or community memory, the system provided a Journal facility for archiving messages and reports to serve this function. Items in this record could be directly referenced in messages, and the receiver could get access directly to the referenced document if required. As well as simple archiving features such as the NLS Journal, he had an explicit design intention to provide in the planned ARPANET Network Information Center (NIC) a community support centre that would support the community by integrating and facilitating dialogue and evolving what he refers to as a community handbook, which is a "system designed to support collaboration in a community of knowledge workers." This would allow for the creation, modification, transmission etc. of messages supporting cross-referencing, cataloguing and indexing and "should also support managing externally generated items." In a more recent exposition of what he had in mind, even though this aspect never really came to fruition, Engelbart & Lehman discuss the vision of this dynamic database or superdocument.

" Tools for the responsive development and evolution of such a superdocument by many (distributed) individuals within a discipline-or project-oriented community could lead to the maintenance of a 'community handbook,' a uniform, complete, consistent, up-to-date integration of the special knowledge representing the current status of the community. The handbook would include principles, working hypotheses, practices, glossaries of special terms, standards, goals, goal status, supportive arguments, techniques, observations, how-to-do-it items, and so forth. An active community would be constantly involved in dialogue concerning the contents of its handbook. Constant updating would provide a 'certified community position structure' about which the real evolutionary work would swarm."

As noted elsewhere (Schmidt & Bannon, 1992) the notion of "a uniform, complete, consistent, up-to-date integration" of the community knowledge is hardly realistic. Interpretative work remains to be done by the actors accessing the community handbook. It could indeed be a valuable *resource* for developing what Schmidt & Bannon term a "common information space" with other actors, but due to the distributed nature of cooperative work the handbook will be necessarily incomplete and partial. However, given the time period, the ideas and implementations of Engelbart's group were quite far-sighted, and his work is still worth reading today in order to understand the breadth and depth of his vision. Only relatively recently have other researchers begun to re-investigate this work in the context of the newly emerging field that has been labeled CSCW - Computer Supported Cooperative Work.

The "Answer Garden" project - a more modest proposal?. We now turn to discuss a prototype system with a focused objective of making recorded knowledge in a narrow domain retrievable for future use. The system is called "Answer Garden" and was initially developed by Mark Ackerman as an MIT dissertation project in the early 1990s, and it has developed further since then. Answer Garden is one of the few organizational memory systems that have been developed to a stage, where they are actually usable in practice. Answer Garden is a hypermedia network system that combines database-like and communication features together:

"In the standard configuration of Answer Garden, users seek answers to commonly asked questions through a set of diagnostic questions or other information retrieval mechanisms. (...) If an answer is not found or is

incomplete (or if the user becomes confused or lost) the user may ask the question through the system. Answer Garden then routes the question to an appropriate human expert. (...) The expert then answers the user via electronic mail, and if the question is a common one, the expert can insert the question and its answer back into the database" (Ackerman, 1994b), pp. 244-245.

The first application developed by using the Answer Garden Substrate — the database and communication "engine" — was aimed to serve as an X Window help system (Ackerman, 1994b), another reported usage is to help astrophysicists cope with a multitude of different software packages through which they have to run their research data (Ackerman & Mandel, 1995). The early papers on Answer Garden had grand visions (Ackerman & Malone, 1990), but later papers are more modest, when it comes to the scope of application of the system. Ackerman has acknowledged the problems involved in interpreting preserved data (Ackerman, 1994a) due to contextual factors, and in his latest paper (Ackerman & Mandel, 1995) he explicitly advocates "memory-in-the-small" — task-based data that is so local and short-term that there should be no problems in interpreting it, as alluded to in the work described earlier.

Jeff Conklin's work on gIBIS & CM/1. The work of Jeff Conklin and others on capturing design rationale using the IBIS (Issue Based Information System) framework within a computer-based hypertext framework has been described in several papers (Conklin & Begemen 1988, Yakemovic & Conklin 1990, Conklin & Yakemovic 1991). This viewpoint attempts to capture the existing conversations and information flows as a source of design rationale. Yakemovic & Conklin claim that:

"The IBIS structure of Issues (which state questions or problems), Positions (which state possible resolutions of an Issue) and Arguments (which state pros and cons of Positions) is one form of the natural, intuitive structure of decisions: some choice to be made, some set of alternatives, some trade-off analysis among the alternatives (optional), and a commitment to some resolution."

In earlier work at MCC, Conklin and colleagues developed a computer-based graphical IBIS. The intent was that this system would help groups to capture the design rationale of their projects in the course of actually making the design. Experiences of the use of this system in groups are reported in (Yakemovic & Conklin, 1990), and in (Selvin, 1994). In the former case, in a commercial software development project over an extended period, the authors claim that the method was an improvement over unstructured notes and had several beneficial side effects. CM/1 is the PC-based commercial product developed by Conklin's Corporate Memory Systems, Inc. - a spin-off company specializing in technology to provide for organizational memory and learning through "living documentation". According to CMS,

"CMS's products for organizational learning are based on two technical insights. The first is that decisions, assumptions, and open issues (i.e. events surrounding the making of intellectual commitments) are the pivotal elements on which an organization's actions turn, that this information is never systematically recorded, and that it can be naturally and powerfully captured using a simple method. The second is that for organizational memory to be effective it must dwell within a "living document", that is, it must be embedded in the everyday tools and practices of the organization in a way that makes adding information to it and retrieving information from it easy, natural and compelling."

Selvin discusses issues concerning the facilitation of meetings with CM/1, and notes some of the problems that can occur in trying to use the system in real-time at meetings, such as the problem of classifying the rhetorical type of an utterance and placing it on the decision map (issue net) in an appropriate place quickly enough so as not to inhibit the conversations. He also notes that the "culture" of specific groups can be different, as to their acceptance of the new language and way of discussing issues that is required in using such a tool. In some cases, it has been noted that people who are supportive of the methodology will code up discussions in this formalism after the meetings, rather than having group acceptance and collective use of the tool. In terms of our immediate interest in organizational memory, while this approach is claimed to have the potential for the management of longer-term group memories, it has not yet been fully supported in the tools, to our knowledge, and to date there is little information available on subsequent re-use of this information.

"Living design memory". A recent paper by software developers at AT&T Bell Labs provides an interesting and thoughtful discussion of issues surrounding the concept of an organizational memory as well as a description of the development and use of a prototype system to serve as a "living design memory" (Terveen, et al., 1993). Like many others in the area of software development, the authors are concerned with the high cost of developing software and have developed their tool in an effort to integrate local design knowledge, rules of thumb, heuristics, lessons learned from previous designs, etc., into an evolving knowledge base that is constantly evolving through use. What is striking in the account of what they learned in the process is the fact that the relevant knowledge exists in the form of "folklore" rather than being enshrined in formal organizational procedures, and their recognition of the need to integrate their system into the everyday organizational practice of the community if it is to serve any function: "the members of the community in which a system is to be deployed must *own* the system" (original italics) . Contrary to many in the field of information systems, they recognize that : "knowledge of *facts* is not enough: it also is necessary to know *how the knowledge is to be*

used" (original italics). Thus early attempts promising a corporate memory involving on-line structured text files encountered problems due to the fact that the information was not organized for efficient access (the problem of indexing), there was no way to ensure compliance and no natural way to ensure the evolution of documents. Their solution was to develop a design knowledge base and a designer assistant program which interfaces between the designer and the system, giving advice which the human designer should incorporate into their design document. At design review further information produced is fed back in to the design knowledge base. The paper is very interesting because it provides an account of the iterative design of the system based on experiences of use of the prototype. At the same time, however, we should note that many users still have problems with the current system. The authors claim that this work, while related to that of Conklin described above, goes beyond capturing design rationale and does not stop at integrating a tool into design practice, as with gIBIS, but also at integrating it into existing organizational processes, modifying these processes as necessary.

Design Engineering. Konda et al. (1992) have written an interesting paper on organizational memory from the viewpoint of engineering design, where they explicitly address the problem of contextuality we have pointed out above. In the paper, they trace the variety and development of different design theories and come to the conclusion that universal design methods have a multitude of problems and that in order to use them they should be contextually evaluated using collected historical experiences. To facilitate this process, they suggest the necessity of a "shared memory". The shared memory concept by Konda et al. can be divided in two forms: vertical and horizontal. Vertical shared memory is the collected corpus of knowledge within one professional group or sub-discipline within such group. This knowledge is more or less universal, collected in textbooks and advanced by research. Horizontal shared memory is a corpus of knowledge with a consensus and meaning shared by different professional groups and disciplines participating a particular design project. Konda et al. insist that some form of a shared horizontal memory is a necessity for any design project. Thus they not only recognize the importance of the maintenance of the contextuality of information, they make it a prerequisite. We will return to some of their concerns in the final section of this paper.

2.3 Summary

What we have seen from the brief accounts of the systems described above are wide disparities in the conceptual frameworks employed, and the empirical evidence in support of the systems developed, yet undoubtedly, these researchers have tapped a rich vein, as they all are of the opinion that some form of shared memory is of importance to organizational development, even if there is still profound disagreement and confusion about exactly what kind of computer support might be possible to enhance this process. For example, note that both ECSCW'91 and CSCW'94 had panels on the concept of organizational memory, both of which, in the opinions of most of the audience, generated more questions than answers. While a large part of the work within the Computer Supported Cooperative Work (CSCW), especially in the area of software development, has to date focused on synchronous interactions, it is likely that in the long term support for various forms of information gathering and dissemination activities will come to be seen as having a much greater impact on organizational functioning. Now that we have examined a variety of approaches to understanding and implementing the idea of organizational memory, it is time to return to a more fundamental re-examination of the metaphors of memory that are implicit in these perspectives.

3. The concept of memory re-visited

"Remembering is not the re-excitation of innumerable fixed, lifeless and fragmentary traces. It is an imaginative reconstruction, or construction, built out of the relation of our attitude towards a whole active mass of organized past reactions or experience, and to a little outstanding detail which commonly appears in image or in language form. It is thus hardly ever really exact, even in the most rudimentary form of rote recapitulation, and it is not at all important that it should be so." (Bartlett, 1932)

While "memory "is one of the central concepts that has interested psychology since its foundation as an area of academic study, and even well before (cf. the Greek work on mnemonist's strategies, and the analysis of the Method of Loci for memorization), over the past 30 years much psychological theorizing has been influenced by work in computer science, in particular artificial intelligence, due to an interest in possible mechanisms underlying human cognitive abilities. It is not the place here to critique this particular turn of events, but it is important that its formative influence on much psychological theorizing be understood as it had serious implications for the way in which conceptions of human memory became intertwined with models of computer storage . Thus, there developed a very direct and concrete linkage between the human act of remembering and some function retrieving information from a computer store. Note that no longer is the computer simply a metaphor for human cognition but rather, "cognition is computation" (Pylyshyn, 1984). The result of this take-over has been the relative casting out of an alternative conception of memory - that also has had a long lineage from Ancient Times - that stresses the active act of remembering over the notion of some form of simple table lookup. Indeed, one can see these two contrasting

perspectives from the early days of psychology proper as well, with the today lesser known views of Franz Brentano and others concerning "act" psychology being defeated by the empiricist associationists. However, the concerns underlying the alternative view have never been completely discarded, and can be seen in what is unquestionably one of the landmark books in psychology by the eminent British psychologist, Sir Frederic C. Bartlett entitled "Remembering" (note: not Memory!) back in 1932. For many people who may have despaired of the meager results and methodological nitpickings that characterize much of the dust-bowl empiricist behaviorist psychological work from the 20's to the 60's, this book will be a relief. It is full of insightful observations, clever experimentation, and thoughtful conceptualizations. Of interest here is its repeated emphasis on the view of human memory as anything but a passive store, but of remembering as a constructive act - "remembering appears to be far more decisively an affair of construction than one of mere reproduction. ...condensation, elaboration and invention are common features of ordinary remembering" (p. 205).

During the 1970s and 80s the information-processing perspective in cognitive psychology was so dominant that its metaphors became a part of everyday talk and for a layman — including non-psychological researchers — it was synonymous with the whole of psychology. Thus Bartlett's work was not as influential as it should have been during this time. We do find renewed interest in the late seventies when aspects of the computer model were being called into question, and more emphasis was being given to ecological factors in human cognition, which did not accord well with simple computational accounts of phenomena (cf. Neisser, 1982). It is important to remember that information processing psychology is even in the domain of cognition but one among the many traditions of psychology. Some of the other traditions have a distinctively different view on cognition and memory and it might be worthwhile to recall some of them because we believe that they offer a more realistic starting point for the discussion about memory and remembering. One such psychological tradition that also shares Bartlett's concerns with the active nature of human memory processes that emphasizes remembering as purposeful action in some definite context is Russian cultural-historical psychology, founded by L. S. Vygotsky in the 1920s. Cultural historical psychologists see remembering as processes of structuring and storing past experience to make possible its use in activities. It is a purposeful action relying on the use of socially developed signs and depending on the goals and motives of the activity within which it takes place. One of the best-known memory researchers within the tradition is a contemporary of Bartlett, P. I. Zinchenko:

"Within this framework, memory processes can be viewed neither as a mechanical coupling, as a connection, of subjective images and experiences nor as external relations. To treat them as the function of some metaphysical capacity for memory, a capacity to preserve and reproduce impressions, is also unacceptable. Nor can they be viewed as a metaphysical capacity of the brain, of the brain conceptualized outside the actual process of the subject's life. Memory processes must be understood as processes that constitute the content of a specific action. They must be understood as remembering or recollection responsive to and functioning in a particular task."(Zinchenko, 1983), p.76.

Each action of memorizing or storing information and each action of recalling and remembering take place in the context of an activity. If storing context and recalling context are the same activity, the interpretation of the material may not be problematic. But if remembering takes place in a different activity where material has been stored, the material will be reinterpreted with respect to the new object of activity , and there is no automatic guarantee that the material is relevant anymore in the same way than it was in the context of storing it. We believe that this problem of contextuality has been somewhat neglected in the studies of reuse, design rational etc. mentioned earlier and further elaboration's are necessary.

The import of this work for our discussion here on the much broader concept of organizational memory is that in the vast majority of cases, underlying any mention of the term memory is a view of memory as some passive register of experience. Yet we now know that such views are certainly not appropriate to understand human memory. This does not of course therefore imply that providing some register of events or some form of storage is inappropriate in an organization, as of course we are required for legal reasons alone to maintain such records, but it does become important in situations where people are designing systems that are supposed somehow to allow people in organizations to store and later retrieve accounts of experiences which can hopefully be shared throughout the organization. So, what are the consequences of taking such an approach to organizational memory? In the next and final Section, we begin the process of re-constructing this concept according to this alternative perspective, and hint at possible questions that are raised, and issues that need to be explored more fully.

4. Implications / consequences of our position

Cooperative work is not facilitated simply by the provision of a shared database, but requires the active construction by the participants of a common information space where the meanings of the shared objects are debated and resolved, at least locally and temporarily. Objects must thus be interpreted and assigned meaning, meanings that are achieved by specific actors on specific occasions of use. (Schmidt & Bannon, 1991)

The purpose of this paper has been to survey a number of quite disparate activities in a variety of fields concerned with the theme of organizational memory and learning. We have shown how much of the work in the organizational field has been based on an implicit, if not explicit, view of organizational memory as akin to human memory. Models of human memory that tend to be discussed emphasize human memory as the storing of experience, so memory is viewed as a storage bin. How to "capture" information in the organization, and then re-circulate it then becomes simply a matter of developing suitable hypertext and electronic communication systems to help in the "input" and "output" of the engrams, traces, or information nuggets that exist in the organization. It is in a sense a great irony that in much of this work we have a circular set of concepts and definitions - computer systems are used by information-processing psychologists to develop theories of human memory, these models of human memory are in turn influencing organization theorists in their views of organizational memory, and in turn are the basis for computer systems!

We have examined briefly some computer systems that have been developed to support aspects of organizational memory, and noted some of their features, positive and negative. While some of these systems have been developed with a limited pragmatic purpose in mind, in the majority of cases there is still an implicit perspective of "capture" of relevant information. What we have attempted to show in the middle section of this paper is that there is an alternative conceptualization of memory which has a long tradition that focuses on the active constructive aspects of remembering. In our view, this perspective is not only of import for psychological or sociological theory, but has implications for the construction of computer "support" systems for any such processes. For example, a number of information systems projects that attempt to capture all the activities of groups within an organization would appear to be going up a blind alley, as such data capture is unlikely to be able to be interpreted and re-worked to be useful for a later situation. Time passes, and both the people, settings and context in which the original "information" was produced change also. Thus the likelihood of being able to characterize what kinds of information in an organization are potentially significant and worth keeping is an impossible task, as we must take into account the fact that people are actively making sense of the information presented, either intra- or inter-subjectively. At another level, the very idea of what is required in order to make people in organizations function more effectively, i.e. access to more information, is open to question on a number of counts. For example, the recent study by Kidd (1994) makes a number of interesting observations about how knowledge workers learn, and emphasizes that it is the act of making notes, rather than the resulting notes, that are of value in many situations, a finding that has major implications in the current context.[2]

How do we "capture" these meanings that are required in order to make sense of any situation or fact? Our very concepts for discussing such issues are not well developed, although recently there has been work from a variety of quite different sources which at least acknowledges the problem, and offers some suggestions as to what direction we might head. For example, in an ambitious and important programme of work briefly discussed earlier (Konda, et al., 1992) , a group at Carnegie-Mellon University in Engineering Design are involved in the building of a shared memory, but in contradistinction to much of the work in the area, they have taken on board some of the concerns expressed here. They are aware that collaboration does not simply consist of a transfer of information between parties but that for any sort of shared memory to be developed there must be shared meanings: "one cannot have a meaningful shared memory without shared meaning, since a memory that is neither accessible nor understandable can hardly be called sharable."(Konda, et al., 1992) This view is strikingly reminiscent of comments made in another paper, concerning the notion of a "shared information space" (Bannon & Schmidt, 1991) or more recently, a "common information space" (Schmidt & Bannon, 1992): "A common information space encompasses the artefacts that are accessible to a cooperative ensemble *as well as* the meaning attributed to these artefacts by the actors." They elaborate "Objects must thus be interpreted and assigned meaning, meanings that are achieved by specific actors on specific occasions of use. Computer support for this aspect of cooperative work raises a host of interesting and difficult issues that have not been fully addressed within the field to date."

The implications of these views for building corporate repositories of information is only beginning to be addressed. In both cases, the problem resides in the fact that information does not simply exist "out there", but is produced by specific people in specific contexts for specific purposes. While this does not imply that it is bound solely to that whole context, it does mean that one cannot in any straightforward way extract and abstract from this web of signification items of "information" which can be stored in some central resource for later use without having some conception of this whole "context" question. What is good information changes depending on the time, the originator, the context, etc. ....and without these cues, the relevance of items of "information" becomes deeply problematic. The views of the Carnegie-Mellon group, Bannon & Schmidt, and the authors of this paper is that no universal language will be possible for encoding information, nor is there any algorithm to determine "relevance". Information is always produced in a context, and must be re-interpreted in other contexts.

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[2] Our thanks to Yvonne Rogers for pointing us to this reference and providing other useful comments.

Understandings, either between people or between artefacts or information and people, are achieved, not given. Neither human remembering, nor human interaction simply occurs, but it is an outcome that is dependent on the interplay of many factors[3].

Within the field of CSCW, there is increasing attention being given to the issues of how people construct understandings based on texts and artefacts produced by others. As noted by Schmidt & Bannon, "the focus is on how people in a distributed setting can work cooperatively in a common information space - i.e. by maintaining a central archive of organizational information with some level of 'shared' agreement as to the meaning of this information (locally constructed), despite the marked differences concerning the origins and context of these information items. The space is constituted and maintained by different actors employing different conceptualizations and multiple decision making strategies, supported by technology."

What is surprising is that there has been little focus among the various disciplinary groups concerned with organizational memory on the details of how organizations actually develop and use organizational memories - the ways in which procedures embed knowledge, the possibilities for changing organizational routines as a result of organizational learning, the ways in which artefacts and their uses can inculcate a particular way of doing things throughout the organization, the care and evolution of corporate information repositories, the role of gossip and the grapevine in contributing to organizational memory, etc. The material that does bear on such issues is often developed by people from outside this community. For example, the work of JoAnne Yates on the history of managerial control and communication mechanisms in American organizations (Yates, 1989) provides a rich historical analysis of material of relevance here. Likewise, from a cultural-historical activity perspective, the work of Engeström and his colleagues, e.g. (Engeström, Brown, Engeström, & Koistinen, 1990) is concerned with the historical analysis of work activities as a part and parcel of their developmental work research tradition. Also, there are numerous ethnographic studies of work that provide important insights into how people use records, documents and artefacts of all kinds to accomplish their work activities, and engender shared ways of viewing the world within specific communities. (see e. g. (Hughes, King, Mariani, Rodden, & Twidale, 1993; Sachs, 1994; Suchman, 1987) The role of "war stories" that are swapped around among various groups, detailing interesting, difficult problems with equipment, and their resolution, is relevant here. While our emphasis in this paper has been to bring to the attention of researchers on organizational memory a hitherto relatively neglected body of psychological literature that provides a re-framing of the nature of human memory and of the "memory" concept per se, it is also important to note that within the field of sociology there is also a strong body of work that emphasizes the constructive aspect of remembering as a social phenomenon rather than memory as some passive store (Hughes, O'Brien, & Rouncefield, 1995). Both sets of views reinforce the position that , at a pragmatic level, computer-based support systems for organizational memories that simple consist of some passive capturing, storage and eventual re-play of information will have very limited if any use for the practical accomplishment of activities within an organization.

In recent years, we have witnessed the development of a variety of accounts of phenomena that taken together, present a very strong case for the importance of the contingent nature of human activities, that stress the role of talk and interaction as the basis for mutual understanding and intelligibility. There is an increased interest in the role of stories and narratives as methods for encoding and disseminating information in all aspects of human life. It is not the stories per se but the discussion and debate that they stimulate that is important in developing real understanding. Wynn (1979) notes "In an office as it presently operates, the knowledge which is both means and product is dependent on interaction between people for its quality, relevance and appropriateness. These interactions are in turn dependent on social practices" (Wynn, 1979) pg. 165. More recently, Blacker notes: "Talk about computer-mediated information and the transformation of isolated problem-solving attempts into a shared activity are crucial to the effective operation of the "informated" organization. It is only through such processes that the process of collective interpretation can be reached."(Blackler, 1994), p.12. Within the CSCW community, the work of Julian Orr on story-telling as an important practice in learning on-the-job has attracted attention: "Diagnosis is observed to have a strong narrative component in the integration and assessment of known facts; the technicians tell themselves what they know about the machine. This narration prepares them to tell others of their experience, either in asking for help or telling of a new problem, and stories of interesting problems circulate quickly through the community. These stories inform the community; they also demonstrate and celebrate the competent practice in maintenance of the service situation which is the basis of the community."(Orr, 1992), p.6. As Brown & Duguid note:

"In some form or another the stories that support learning-in-working and innovation should be allowed to circulate. The technological potential to support this distribution — e-mail, bulletin boards, and other devices that are capable of supporting narrative exchanges — is available. But narratives, as we have argued, are embedded in the social system in which they arise and are used.

[3] In discussing human remembering, Bartlett refers to this set of factors as a "schema" although he was well aware of the possible misuses of this term, and certainly his notion is far removed from later AI attempts to reify this concept (Minsky, Schank).

They cannot simply be uprooted and repackaged for circulation without becoming prey to exactly those problems that beset the old abstracted canonical accounts." (Brown & Duguid, 1991), p. 54.

In contradistinction to the explicit socially sanctioned role of story-telling, we also see an emphasis on the importance of talk in work settings: "....(the) important function served by serendipitous talk about work is its importance in constructing and maintaining an up to date "intelligence" concerning the current activities of the team. This working "intelligence" or "memory" can be seen to be collectively constituted in the team's conversations." (Middleton, 1988), p. 14.

As Bannon (Bannon, 1991) notes: "These stories not only impart information, they also provide a context for use of the information, and they also serve as a way of bonding the group together. They are vehicles for group cohesiveness and identity, and as such cannot be replaced with simple factual information about the original problem that is the basis of the story. Can such stories be put into a community information base without losing their dual function as both information bearing and social bonding entities? We must admit we cannot answer that question at this stage. What are the pre-conditions for having people commit to contributing and sustaining such a system? Can the motives be completely altruistic? What are the rewards, both personal, social, organizational, for those that contribute to this information repository, either directly, or when explicitly asked? What kind of support structures, either embedded in the computer network itself, or external to it, might be of use to support this kind of cooperative learning and exchange of information? Are there software needs that can be identified that would assist in the development of such a community memory?"

5. Concluding remarks

In this discussion paper, we have provided some commentary on the concept of organizational memory, arguing that its current uses are so broad as to render it of little use as a conceptual construct. At the same time, the term serves an orienting function among a range of disciplines towards concerns about the preservation of information and the re-use of knowledge within organizations. We have attempted to go beyond the prototypical conception of memory as a storage facility and stressed the active, constructive aspect of remembering in human activity at both a personal and collective level. This perspective has implications in the context of organizational memory, as it puts the spotlight on the ways in which information is initially produced and stored and subsequently interpreted and understood by other people, in other settings, at other times. For example, while records can be stored, on each occasion of "re-use", actors must develop a common information space in which meanings are developed, and computers might support the development of such interpretations through allowing access not just to the physical artefacts or records but possibly to the actors themselves and to a richer picture of the context for which the information was originally produced. To end on a somewhat provocative and reflexive note, perhaps what is now required of all of us within the information systems community is more involvement in analyzing the ways in which organizational memory - in whatever form it is conceptualized - and its computer support is built and used in real organizations by human actors in particular settings than in developing additional corollaries or hypotheses about the nature of the beast[4]! It is to this task that our future work in the field will be dedicated.

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4 It is interesting to speculate about the relationship between the ideas of business process re-engineering (BPR), or at least one variant of it, that argues for doing away with traditional practices in a wholesale fashion, on the one hand, and the concern with aspects of organisational memory, the preservation of aspects of organisational tradition, on the other. Investigating this seeming paradox would take us too far afield however, but see (Bannon, 1994) and (Kuutti, Virkkuen & Young, 1995) for some further comments.

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