

Organisational Memory: Towards an understanding and the role of information systems*

Diego Ricardo Torres Martínez**

Resumen: El propósito principal de este artículo es adentrarse en el concepto de memoria organizacional y su aplicabilidad en las organizaciones. Ya que este concepto está relacionado con el procesamiento de la información, se busca de otra parte explorar el papel y el uso de los sistemas de información en este campo. El marco metodológico del artículo se basa en la exploración de las principales características de la memoria humana y cómo este concepto se encuadra en un contexto organizacional. Para los propósitos de este artículo el entendimiento de la organización misma tiene que ver con la red de interrelaciones en el comportamiento de los individuos. Este artículo intenta motivar otras investigaciones acerca de los procesos de aprendizaje organizacional, de memoria organizacional y de la tecnología de la información.

Abstract: The principal purpose of this article is to show an insight into the concept of organisational memory and its applicability in organisations. Furthermore as this concept relates to information processing, an exploration of the role and use of the Information Systems (IS) in this area is carried out. The methodological framework of the article is based on an exploration of the main features of the human memory and on how this appreciation fits into an organisational context. For the purpose of this article an understanding of organisation is related to the network of relationships between behaviours. This article is intended to motivate further research in the relationship among organisational learning processes, organisational memory and information technology.

1. Introduction

It is widely accepted that information systems (IS) are becoming an integral part of an organisation's effort, to manage information to support its efficiency and effectiveness. The

* Este artículo está basado en la tesis del autor para optar al MA en Management Systems de The University of Hull, Reino Unido.

** Ingeniero de Sistemas de la Universidad Piloto de Colombia, Especialista en Sistemas de Información de la Universidad de los Andes, MA en Management Systems, The University of Hull, Reino Unido. Profesor Instructor del Departamento de Ingeniería de Sistemas de la Pontificia Universidad Javeriana.

history of computer based-technology has been involved from data processing task to knowledge processing. [Dutta, 1997: 79] In data processing the emphasis was on providing efficient data storage and retrieval systems. During the 70's the focus was shifted to information processing, which concentrates on management information systems. The development of IS seems to be related to the increased demand for knowledge work, which is given as a response for the environmental demands imposed on organisations [Stein and Zwass 1995: 86]. Recent IS researchers [Daedalus, 1988], focus on knowledge and the level of intelligence embedded in Information Technology, e.g. Artificial Intelligence.

On the other hand, IS seems to play an important role supporting organisational processes, which have to be enhanced to meet environmental demands: decision making, innovation and information acquisition and distribution [Stein and Zwass, 1995: 86]. In order to meet environmental demands, learn more rapidly and increase flexibility in a world of growing complexity and changes, managers and academics alike have identified "organisational learning" as the process whereby a shared understanding of change is one of the keys to flexibility and competitive advantage in the 90's. [Senge and Sterman, 1996: 196]

Learning in organisations has been considered to improve individual and collective actions through better knowledge and understanding in order to acquire a competitive advantage. Argyris [1994], proposes in this sense that organisations should ask questions not only about facts but also questions about the reasons and motives behind those facts; questions about company cultures and their own assumptions and behaviour, which Argyris called *double-loop learning*. Within this process of collective action and enquiry of why things have happened to improve learning processes, organisational memory plays a role not only as merely storage of data but also to keep assumptions, routines, behaviour, etc., of the organisation that consequently has a contribution in the learning process. Organisational memory is the means by which knowledge from the past exerts influence on present organisational activities, e.g. decision making, organising, designing, etc. IS could be a vital component of this memory.

This article, primarily attempts to give an understanding of human memory which it is made through certain assumptions. Then, the article will discuss how this understanding can be applied to organisations. Furthermore, it presents some ideas about organisational memory as a cognitive metaphor. Finally, it will present the relationship between information systems and organisational memory.

2. Understanding of organisational memory

In order to understand the concept of organisational memory, the next section will explore different assumptions of current appreciation of human memory, then it will describe how assumptions about human memory can be applied to organisations and thus draw different manifestations of memory in an organisation.

2.1. Human memory and its appreciation

This section briefly outlines some of the prevalent assumptions made of the representation of knowledge, the taxonomies or forms of memory and the processes of remembering in human beings. The history of works in human memory has shown different forms of representations

of knowledge as well as forms (taxonomies) of human memory. It seems that there is not an unified solution to the problem and/or understanding of the representation of knowledge and forms of memory. Two of the assumptions about the representation of knowledge are episodic and semantic representations, [Johnson and Hasher, 1987: 635] that are completely associated with taxonomies of the memory. The former, episodic memory reflects personal experience, which means that there is a process of cognition through retrieval from an individual's memory of past events. [Higgins and Bargh, 1987: 395] The latter, semantic relates to the generic knowledge. Johnson and Hasher [1987] provide an overview of four areas of work that grew from this assumption, these are as follows:

- *Lexical access*: that concerns to our understanding of words, and focuses on studies of access to word meaning.
- *Semantic decision* (relation between words and their referents): it concerns with the speed and accuracy in response to signal in activation and/or decision making.
- *Concepts*: it relates to an abstraction process in which the importance of specific information related with events is emphasised.
- *Schemas and Scripts*: Schemas are the generic knowledge about an immediate situation that guides encoding or memory retrieval (e.g. the traffic-lights' red-light). Scripts are a variant of schema theory that asserts the existence of representation of familiar events (e.g. eating in a restaurant). Both these concepts support the idea of schemata as filters of media messages which have begun to be explored.

Klavehn and Bjork [1988] argue that there are two kinds of representation of memory: implicit and explicit memory. Taxonomies or forms of human memory when referring to the effects of an episode that is expressed without awareness of remembering, are called *implicit memory*. When there is awareness of remembering, this kind of memory is called *explicit memory*. Implicit memory works on tasks that do not require reference to a specific prior episode¹. This kind of memory is revealed when performance of a task can be made unconsciously. Explicit memory is a form of subjective awareness of a prior event. Previous experiences are important here in order to retrieve material from an episode to be used in a new "reexperiencing" of the episode. It is important to notice that explicit memory can be intentional, as a result of an awareness to remember, or involuntary when events occur spontaneously.

Johnson and Hasher [1987], present assumptions of the process of remembering in humans. Firstly, source discrimination proposes that inferred information or self-generated information can be manifested through thoughts and actions. This self-generated information is completely different from the perceived information from external sources. Secondly is overwriting, which pertains to inconsistent information that will replace originally stored information. Thirdly, interference as a consequence of the coexistence in memory of two or more sources of related information, which makes the process of remembering difficult. And finally changes in context

1 This kind of memory has also been nominated for some writers as procedural memory. e.g. see [Tulving and Schacter, 1990].

and retention: changes in environmental context between acquisition and recall have smaller effects on the process of remembering.

2.2. Appreciation of human memory and its applicability to the organisational memory

2.2.1. What is an organisation?

Before presenting an insight of the organisational memory concept, it is important to outline an overall understanding of organisations. There are many different models or metaphors,² which are helpful to provide a good explanation of organisations with which we can create images of organisations in order to acquire a better understanding of them. Organisations can be seen as the following: as a machine, as an organism, as a brain, as a culture (beliefs, values, roles), or as political (power relation). A creative mix of all these visions allows appreciations of the main issues that an organisation faces. [Flood and Jackson: 1991] The types of relationships and actions experienced by members of the organisations in those metaphors vary considerably, as for example in a mechanistic view, where observation and measurement create a physical description of the worker and the job. However, in an organic view of the organisation, the whole organisational structure should encourage democracy and autonomy being human-needs oriented.

The cultural perspective - which stems from an interpretative approach - sees organisations as patterns of symbolic discourse and action. Culture is dynamic, via culture people may create the world in which they live and it is possible to maintain subcultures. Management cannot control culture, but can influence its evolution.

The political view sees an organisation as loose networks of people with divergent interest and power relations which are intrinsic, i.e., the exercise of power is continuous and also relates to morality. Management should seek a balance between autonomy and control at different levels.

In summary, what is important to notice here is that rather than actions and relationships between individuals, an organisation is focused on relationships between behaviours. [Lloyd and Ralph, 1987: 136] The organisation does not reside in the individual in isolation. Furthermore, isolated individual behaviour does not mean the whole of the organisation but rather the relationship between the individuals' behaviour and their role in participation. It is this that defines the energy and dynamism of the organisation. This overall view of organisations as a network of behaviours and the relationship between them is the concept on which this article bases an understanding of the concept of organisational memory.

2 Morgan [1986] considers a wide range of different approaches to the study of organisations and uses insight from a variety of disciplines including behaviours, sociology, cybernetic, management theory, political science, social psychology and biology.

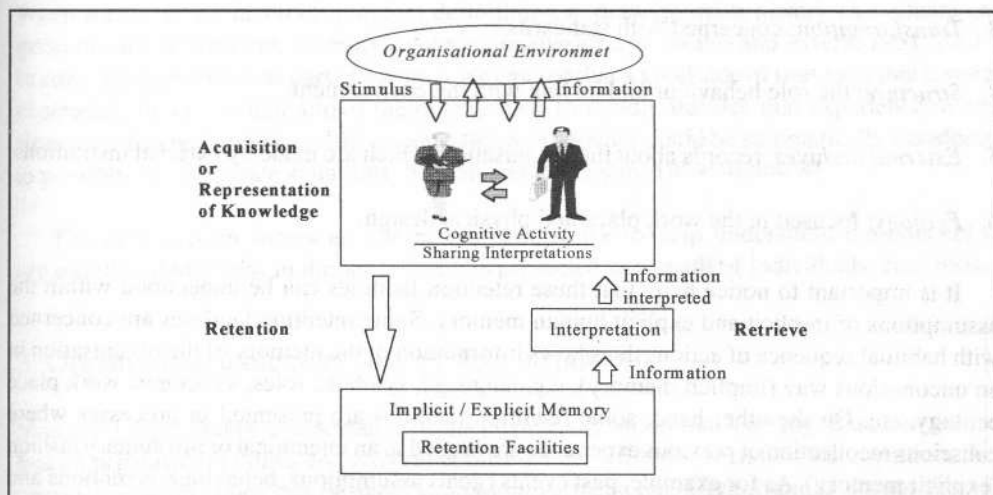
2.2.2. organisational memory

Walsh and Rivera [1991] show different theories that have been developed from different viewpoints to understand the concept of memory in organisations³. These theories seem to present an analogy with generic knowledge in a particular domain and characteristics of its representation and storage, which may be in terms of either abstraction or exemplars. [Johnson and Hasher, 1987: 640] Abstraction is concerned with symbols, e.g. in an organisation abstractions can be represented by standards and procedures and/or structural artifacts (roles). Exemplars, or distributed connection among elements, are represented in organisations through past events, goal assumptions and behaviour stored in the memory and are retrieved consciously. The latter assumption can be seen as learning agents embedded in organisational memory. In a particular situation they can create new knowledge and/or could support decision making.

2.2.3. Manifestation of memory in organisations

This section tries to explore different manifestations of memory in organisations and their possible relation with human processes. There are three key points in understanding human memory; these are as follows: i) Knowledge acquisition and representation. ii) Retention or how information is stored according to assumptions of forms of memory, and iii) Retrieval or recall. These process have been translated from the process in individuals to organisations. Figure 1 illustrates the overall process of acquisition, retention and retrieval knowledge in an organisation.

Figure 1. General process of acquisition, retention and retrieval knowledge



3 Later theories viewed organisational memory in terms of structural artifacts e.g. roles that, over time, lose their efficacy and become obstacles to change [Starbuck and Hedberg, 1997]. March and Olsen [1976: 62-63] believe that past events, goals assumptions behaviour, are stored in memory, whereas Argyris and Schon [1978:19] assert that learning agents' discoveries, inventions and evaluations must be embedded in organisational memory.

2.2.3.1 Knowledge acquisition

Processes of knowledge acquisition in an organisation is given through information processing systems of the environment and its interpretation. [Walsh and Rivera, 1991: 62] This process of interpretation is made through a cognitive activity by individuals: within the organisational network, relations become a process of sharing interpretations among decision makers who are concerned with the problem solving. This process can be started by particular stimulus in individuals or as a response of the organisation to these stimulus. It is important to notice that stimulus are appreciated in the first instance by individuals, therefore, it seems to be that individuals start the process of representation of knowledge through an episodic and/or semantic way, and then, through a process of sharing of interpretations. In this sense a retention facility for the organisation is permitted.

2.2.3.2. Knowledge retention and retrieval

In human memory there is a distinction between abstract representation and memory trace by information of specific events [Klavehn and Bjork, 1988: 640]. These representations, according to their manifestation can be either implicit or explicit, with or without awareness of remembering. Conversely, Walsh and Rivera [1991] present the representation of memory in organisations through six retention facilities in which the memory of the organisation can be found, these are as follows:

1. *Individuals*: based on their own experiences, observation and their capacity of remembering.
2. *Culture*: manifested through its language, symbols, stories and shared frameworks.
3. *Transformation*: concerned with standards.
4. *Structure*: the role behaviour and its link with the environment.
5. *External archives*: records about the organisation, which are made by external institutions.
6. *Ecology*: focused in the work place and physical design.

It is important to notice here, that these retention facilities can be understood within the assumptions of implicit and explicit human memory. Some retention facilities are concerned with habitual sequence of actions that shows information of the memory of the organisation in an unconscious way (implicit memory), e.g. language, symbols, roles, structures, work place ecology, etc. On the other hand, some retention facilities are presented in processes where conscious recollection of previous experience are needed in an intentional or involuntary fashion (explicit memory). As for example, past events (goals assumptions, behaviour, inventions and evaluations), which, if stored in memory would be very helpful.

Furthermore, the relationship between procedural memory with routines and processes in organisations is applied in organisational memory concept. Earlier theories postulated that memory is embodied in standards and procedures. [March and Simon, 1958] Later, Cohen and

Bacdayan [1994] develop the idea that organisational routines are stored in procedural memory through the similarity of individual skills and organisational routines. They manage assumptions of procedural and declarative memory. Procedural memory in humans appears to be the form that stores, for motor and cognitive, components of individual skilled actions. It is distinguished from 'declarative' memory, which provides the storage of facts, propositions and events. These assumptions of procedural and declarative memory are associated with implicit and explicit memory respectively. In addition, as outlined earlier, Cohen and Bacdayan claim that "organisational routines are an interlocking, reciprocally-triggered sequence of skilled actions".

2.3. Use of memory and its utility in organisations

Organisational memory provides information from the past that supports current activities in an organisation. For example, past experiences can influence in the way that organisations developing processes presently, i.e. transfer experience to new situations in order to contribute to effective and efficient decision making. Although there are different manifestations of organisational memory, it is clear that one of the principal uses of memory is in the process of decision making. In decision making processes, retrieval or recall of memory through information processing can be the competitive edge to support decision makers.

House and Singh [1987: 700-702] present a review of how decision makers usually have an ambiguous set of alternatives that are defined by the situation context, preferences, values and rules with which they have to choose the best alternative and so on. In addition, choices are dictated by environmental conditions that can exceed limited cognitive capacities of managers, where organisational memory can produce both, negative and positive effects. A negative effect in the sense of producing bias is i.e. the past does not permit creation of new ideas, it is a continuous fashion of doing things that do not permit a different vision of present situations. When memory can facilitate problem definition e.g. drawing upon history to evaluate and generate new alternatives, memory can have positive effects. [Walsh and Rivera, 1991: 72-73] In considering routines as part of memory we can see that a good side of routine is that it stores experience in a form that allows the organisation to rapidly transfer that experience to new situations. In a negative sense, the organisation's experience could be automatically transferred to possibly inappropriate situations. [Cohen and Bacdayan, 1994: 406-408]

The next section shows an alternative perspective to help understand the concept of organisational memory, in the sense that it is presented as a result of individuals' cognition.

3. Organisational memory: a cognitive metaphor

Matthew [1995] shows an alternative perspective on organisational learning. Based on the fact that an organisation thinks and remember through the influence of individual cognition, then organisational memory can be seen as a cognitive metaphor. Organisations do not literally remember [Argyris and Schon, 1978], but this process may be raised through a combination of individual cognition and sharing interpretation. Implicit and explicit organisational memory could be helpful in order to support this cognitive process through providing information to individual cognition and thus arise a learning process. In this sense, IS play an important role.

From the point of view that memory is an important part of the process of both remembering and knowledge representation and thinking, some of the features of the assumptions of human learning and human memory are very helpful to organisations, in order to understand their processes of learning and of how an organisation can generate memory. As was explained earlier, organisations are products of the thought and action of their members, therefore organisational cognition would be a metaphor, [Matthew, 1995: 74] which provides an interesting explanation of the role of organisational memory and its applicability.

In summary, organisational memory is the mean by which knowledge from the past exerts influence on present organisational activities. [Stein and Zwass, 1995: 89] It is clear that the past affects the present, and rather than have knowledge about the past, an understanding of the situation context about why things have happened, through asking questions not only about objective facts but also about the reason and motives behind those facts is useful in order to learn. [Argyris, 1994: 79] But, it seems that in certain cases the past can produce bias to decision makers. It is very important to distinguish between what Walsh and Rivera [1991] define as retention facilities and the information contained in these, which is interpreted by individuals. Good or bad results to an organisation as a consequence of the interpretation of information, are related to the decision makers' skills. Memory retention in an organisation is not only limited to the individual memory of the agents within the organisation, but also to the culture and structure of the organisation. But the interpretation of the information obtained depends of the meaning given by the organisation, and the situation context that the organisation experiences at that moment.

The process of understanding both organisational learning and memory has a narrow relation with different assumptions about aspects of human behaviour. Therefore, there is a school of thought that interprets what happens in organisations is based on assumptions of human actions. In addition, from the perspective of organisational learning based on a combination of individual cognition, the concept of the cognitive metaphor is a strong alternative to be considered. The cognitive metaphor provides essential and fundamental explanation of the process of learning in organisations. Organisational energy is born through the behavioural relationship of individuals.

The next section of the article presents some of the current uses and relationships between information systems and organisational memory.

4. Information systems and organisational memory

According to what has been explained earlier, organisational memory exists in many different forms, which can be either explicit or implicit. Examples of explicit memory are patents, written procedures, books, manuals and so on, these show prior events or experiences. Examples of implicit memory of a company include: company culture manifested through roles, routines, stories, etc. This kind of organisational memory seems to be more difficult to identify, due to the fact that it is non-verbal, intuitive and unarticulated by the organisation. [Dutta, 1997: 81]

Some knowledge about the company and its business can be obtained from information by assigning it meaning and interpretation. [Ibid: 79], According to what was explained earlier, this interpretation is given by individual and represents the memory of the organisation which

could be exploited. Therefore, for some writers [Dutta, 1997; Stein and Zwass, 1995], it is unclear how contemporary organisations can make decisions or engage in knowledge-intensive work without gaining access to past events, designing solutions or plans through their information systems in current and changing environmental situation. Technological advances have made possible to support organisational memory and organisational complexity through the use of database and expert systems [Stein and Zwass, 1995: 90], which represent the most important application of advanced information technology for knowledge management. [Dutta, 1997: 80]

Technologies such as manager database (MDB), and emerging technologies as the intranet, electronic mail and electronic document interchange (EDI), are some examples of technologies that widely support the memory of the organisation⁴. These technologies seem to reduce the cost of communication, e.g. computer conferencing technologies permit us to hold formal meeting "virtually".

In considering explicit memory, Stein and Zwass [1995] present some IS that have been either proposed or implemented, concerning the evolution of small and large projects, evolution of product design or policies. The main objective of these systems is to support the memory of groups or teams. For example: business groups/teams working on a set of projects and involving a large number of meetings with participants who are possibly in a variety of locations - computer conferencing technologies permit us to carry out this kind of formal meeting. One of the most important features of IS is concerned with its capability to share information within the organisation through computer mediated communication, as for example, the use of electronic mail and electronic document interchange (EDI). [Rapaport, 1991: 148]

Andreu and Ciborra [1996: 122], present how information technology (IT) supports and enables core capability diffusion. Core capabilities are capabilities that differentiate a company strategically, fostering beneficial behaviours not observed in competitive firms. [Ibid: 112] The support of these capabilities are through what has been called 'systems of scope': systems that help the sharing of global knowledge, where explicit and implicit memory are included. This system makes sure that 'Know-how' embedded in the core capabilities is checked against environmental conditions and makes individuals and groups well aware of what these capabilities are, why, and how they contribute to them. [Ibid: 123]

Now, according to the experience of the author, database technologies present capabilities to support organisational memory. Rather than storing information in an organised way, a well-designed database can support IS that deliver pertinent information to interpret past events within an organisational meaning. One of these experiences relates to a database design which gives the history of the customers of a financial corporation. This system gives the company access to the history of conversations and/or negotiations carried out with their clients, in order to support the decision-making process (approbation of new business, place for new products, etc.). This system stores, in addition to the documents generated, relevant issues, for example issues that have been problematic in the mediating process, and acts that were applied, to support the management vision in order to define even newer policies. This design was made using relational manager database technologies and was more focused on explicit memory.

4 See Rapaport [1991], for application of computer mediated communication.

We can see now, how information systems have had a relevant role in order to support organisational memory and have developed interest in some IS researchers, as for example: Dutta [1997], who presents how the relationship between knowledge based systems (KBS) and the management of an organisation's knowledge assets could be supported through using information technology, where KBS depict the interpretation and meaning that the individuals or the collective give to organisational information.

5. Conclusions

Organisational memory is the mean by which knowledge from the past exerts influence on present organisational activities, playing an important role in processes of learning in an organisation. Current information technology could be useful to support organisational memory. Information systems could be the bridge between exploiting organisational memory and supporting learning processes in an organisation. But, IS should play a role beyond one of just support, which would mean IS "learning" as well as learning with and within an organisation, perhaps with IS becoming the mind of the organisation. A framework for organisational memory information systems will be a topic for further research.

References

- Andreu, R., and Ciborra, C. *Organisational learning and core capabilities development: the role of IT*. In: Journal of Strategic Information Systems, 5, 1996, 111-127.
- Argyris, C. *Good communication that blocks learning*. In: Harvard Business Review, July-August, 1994, 77 - 85.
- Argyris, C., and Schon, D. A. *Organisational learning, A theory of action perspective*. Reading: Addison-Wesley, 1978.
- Cohen, M., and Bacdayan, P. *Organisational routines are stored as procedural memory - evidence from a laboratory study*. In: Organisation Science, 5(4), 1994, 403-429.
- Daedalus, *Special issue on artificial intelligence*. Winter, 1988
- Dutta, S. *Strategies for implementing knowledge-based systems*. In: IEEE Transactions on Engineering Management, 44 (1), 1997, 79-90.
- Flood, R., and Jackson, M. *Creative problems solving: Total systems intervention*. Chichester: John Wiley and sons, 1991.
- Higgins, E. T., and Bargh, J. A. *Social cognition and social perception*. In: Annual Review of Psychology, 38, 1987, 369- 425.
- House, R. J., and Singh, J. V. *Organisational behaviour: some new directions for I/O psychology*. In: Annual Review of Psychology, 38, 1987, 669-718.
- Johnson, M. K., and Hasher, X. *Human learning and memory*. In: Annual Review of Psychology, 38, 1987, 631-668.
- Klavehn, A. R., and Bjork, R. A. *Measures of memory*. In: Annual Review of Psychology, 39, 1987, 475-543.
- Lloyd, E. S., and Ralph, E. S. *The concept of organisation mind*. In: Research in the Society of Organisation, 5, 1987, 135-161.
- March, J. G. and Olsen, J. P. *Ambiguity and choice in organizations*. Oslo: Universitets - Forlaget, 1978.
- March, J. G. and Simon, H. A. *Organizations*. New York: Wiley and sons, 1958.
- Matthew, J. *Organisational learning: collective mind or cognitivist metaphor*. In: Management and Information Technology, 5 (1), 1995, 61-77.
- Morgan, G. *Images of organisations*. Beverley Hills: Sage, 1986.
- Rapaport, M. *Computer mediated communication*. New York: John Wiley and sons, 1991.

- Senge, P. M., and Sterman, J. D. *System thinking and organisational learning: acting locally and thinking globally on the organisation of the future*. In: *Modelling for Learning Organisational*. New York: John Wiley and sons, 1996.
- Stein, E. W., and Zwass, V. *Actualising organisational memory with information systems*. In: *Information Systems Research*, 6(2), 1995, 85-117.
- Tulving, E. and Schacter D.C. *Priming and human memory systems*. In: *Science*, 247, 1990, 301 - 306.
- Walsh, J. P., and Rivera, U. G. *Organisational memory*. In: *Academy of Management Review*, 16(1), 1991, 57-91.