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INFORMATION SYSTEMS AND ORGANIZATIONAL MEMORY: A LITERATURE REVIEW

Victor Freitas de Azeredo Barros
Centre ALGORITMI, University of Minho, Guimarães, Portugal

Isabel Ramos
Centre ALGORITMI, University of Minho, Guimarães, Portugal

Gilberto Perez
Universidade Presbiteriana Mackenzie, São Paulo/SP, Brazil

ABSTRACT

The advancement of technologies and Information Systems (IS) associated with the search for success in the competitive market leads organizations to seek strategies that assist in acquisition, retention, storage, and dissemination of knowledge in the organization in order to be reused in time, preserving its Organizational Memory (OM). Organizational Memory Information Systems (OMIS) emerge as an enhancer of the OM, providing effective support and resources for the organization, assisting in decision making, in the solution of problems, as well as in quality and development of products and services. This article is an analysis of some OMIS selected from a literature review about its features and functionality in order to understand how these information systems are seen by the organizations. With this research, we realized that the relationship between OM and IS is still inexpressive, even with the existence of some cases of success in the use of OMIS in the literature. The literature reveals that an individuals' knowledge is not integrated in information systems management process in most organizations; much of this knowledge is generated in the organization retained in an individual himself/herself. It is easy to see that there is a need for strategies and mechanisms in the organization to stimulate and provide better knowledge sharing between individuals which, when associated to IS, allows greater control and effective use of Organizational Memory.

Keywords: Strategy, Knowledge management, Competitiveness, Decision-making.

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Address for correspondence / Endereço para correspondência

Victor F. A. Barros, Researcher at Centre ALGORITMI, University of Minho, Campus de Azurém, 4800-058 Guimarães, Portugal, E-mail: vfbarros@dsi.uminho.pt

Isabel Ramos, PhD in Information Systems and Technology, Assistant Professor with Aggregation at the Department of Information Systems, University of Minho, Campus de Azurém, 4800-058 Guimarães, Portugal, E-mail: iramos@dsi.uminho.pt

Gilberto Perez, Doutor em Administração pela Universidade de São Paulo (USP). Professor do Programa de Pós-Graduação em Administração (PPGA) da Universidade Presbiteriana Mackenzie. Rua da Consolação, 930 - 01302907 - São Paulo, SP - Brasil, E-mail: gperez@mackenzie.br

1. INTRODUCTION

In an increasingly competitive and globalized world, organizations are constantly changing in order to stay in the market. This constant competitiveness leads organizations to seek more and more quality not only in the products and services offered but also in their strategies, decisions and structures. However, these changes in the organization, whether strategic or structural, may result in a loss of the accumulated knowledge retained in an individual.

> "[...] factors such as global competition, changing organizational structures, massive layoffs of middle managers, and the emergence of 'virtual organizations' are causing organizations to lose valuable experiential knowledge that exists only in the memories of individual workers." (Morrison, 1997, p. 300).

Once the knowledge generated in the organization over time is one of the primary factors to remain competitive in the market, it is important that organizations are aware of and seek mechanisms and strategies that enable to keep this accumulated knowledge in the organization. This set of accumulated knowledge accumulated being preserved through time is called organizational memory (OM).

> "OM may be thought of as comprising stocks of data, information, and knowledge (the memories) that have been accumulated by an organization over its history. When an individual accesses OM, he performs an act of interpretation on the memory(ies) that is(are) accessed and may or may not act on it (them)." (Cegarra-Navarro & Sánchez-Polo, 2011, p. 1).

OM provides support both to the development of the individual and the organization. For the individual by aggregating knowledge and learning from the experiences, strategies and actions taken by the organization over time, and for the organization by using this range of accumulated knowledge that, when associated with the current knowledge of this individual, aids in actions and decisions to be taken in the organization as well as in the generation of new solutions, products and services.

In order for OM to be useful and effective for the organization, it is necessary that the organization guides its strategy to the creation of a favorable environment that fosters and encourages collaboration and the sharing of knowledge, ideas, experiences and relevant information among its members, in order to feed this OM consistently. It is also important to ensure that the Information System (IS) supporting its processes facilitates both acquisition and retention and the dissemination of this knowledge in the organization.

> "Since the Organizational Memory shows up as a fertile field of research while challenging, the purpose of this essay was to better understand its mechanisms of operation, associating them with the Information Systems, given the complexity and scope of such systems, which has as one of its main purposes, the preservation of organizational memory." (Perez & Ramos, 2013, p. 543)

Also known as organizational memory information systems (OMIS), these systems should be flexible to adapt to the changes as well as to support the demand of the information and knowledge submitted them over time, increasing the capacity and the speed of response of the organization.

> "[...] the impact of OMIS on knowledge receipt from the recipient side can be intervened by the firm's potential absorptive capacity. The internal systems of the recipient affect the extent to which a firm recognizes and evaluates the usefulness of knowledge transferred by the focal firm and the

> extent to which a firm can internalize the knowledge." (Yu, Dong, Zuo, & Xu, 2012, p. 7).

The purpose of this article is to explore how information systems, more specifically OMIS, enhance and support the creation, storage, and dissemination of knowledge in the organization over time in order to ensure an effective management of OM.

To support this research, section 2 discusses the methodology adopted, followed by section 3 with a synthesis of some of the main theoretical concepts and definitions of organizational memory (OM) and organizational memory information systems (OMIS) addressed in this investigation. From this, section 4 shows an analysis of some selected OMIS in the literature regarding its structure, features and advantages for organizations. Finally, sections 5 and 6 are, respectively, a discussion of the results obtained and some final thoughts about this study.

2. MATERIALS AND METHODS

This research is characterized as exploratory, since it seeks to understand through content analysis (Bardin, 2000) the context in which this study is fitted and to provide greater familiarity with the subject of study (Cervo, Bervian, & Silva, 2007). For its accomplishment, a systematic review of the literature was carried out, making it possible to identify, evaluate and interpret relevant studies addressing the topics of the research, in particular, organizational memory (OM) and organizational memory information systems (OMIS). To achieve this, the following steps were followed: (i) planning the review; (ii) identification of the main sources of literature; (iii) selection of literature based on keywords, followed by criteria for inclusion and exclusion.

In the review planning step, the research was directed according to the purpose of the article, namely, to explore the approaches to OM and OMIS existing in the literature, with the aim of analyzing the described concepts, models, application, features and functionalities. The selected scientific sources of the research work were the Scopus, Web of Science, IEEEXplore and AIS Electronic Library (AISeL) because they are commonly considered the most representative scientific bases around the information systems (IS) area.

To find relevant articles, it was carried out a systematic search in the selected scientific bases articles including, either in the title, abstract or keywords, the two central themes of this study: information systems and organizational memory. Table 1 describes the number of publications over the last 20 years (1994-2013).

Table 1. Number of publications over the last 20 years (1994-2013) on scientific bases Scopus, Web of Science, IEE Xplore and AISeL and search code on information systems and organizational memory.

YEAR [1994-2013]	SCIENTIFIC BASIS			
	Scopus [137]	**Web of Science** [60]	**IEEEXplore** [09]	**AISeL** [09]
1994 [01]	-	-	-	1
1995 [08]	5	3	-	-
1996 [02]	2	-	-	-
1997 [12]	8	2	2	-
1998 [16]	11	4	1	-
1999 [22]	13	7	1	1
2000 [20]	12	8	-	-
2001 [09]	4	4	1	-
2002 [13]	7	6	-	-
2003[11]	6	4	1	-
2004 [13]	9	3	-	1
2005 [20]	13	5	1	1
2006 [15]	9	5	-	1
2007 [16]	14	1	1	-
2008 [12]	9	2	1	-
2009 [09]	5	3	-	1
2010 [05]	3	1	-	1
2011 [05]	4	1	-	-
2012 [02]	1	-	-	1
2013 [04]	2	1	-	1

From this search, it was obtained a set of 215 scientific articles that were read and analyzed, and are discussed in the remaining sections of this article. For the analysis of the gathered articles, a set of keywords related to the central themes of this research was selected to a further selection of articles for this literature review (Section 3) without compromising the quality of the obtained results; for the selection of the main OMIS described and discussed in this article (Section 4), a subset of the latter group of articles was chosen. Table 2 shows the related keywords that were used to refine the set of articles to analyze within the central topics of this study (OM and OMIS).

Table 2. List of the keywords related to OM and OMIS found in the literature review.

CENTRAL SUBJECTS	KEYWORDS
Organizational Memory (OM)	Organizational Memory; Corporate Memory; Cooperative Memory; Social Memory; Collective Mind; Group Memory; Corporate knowledge management; Knowledge Memory.
Organizational Memory Information Systems (OMIS)	Organizational Memory Systems; Organization Memory Information System; Knowledge Management System; Corporate Repository; Knowledge Repositories; Process Memory Systems; Shared knowledge Base.

Following the execution of these delimiters emphasizing the articles clearly related and relevant to the aims of the study being, 20 scientific articles were selected because they are clearly related to OMIS and quote one or more cases relevant to this study. Based on this set of scientific articles, 7 OMIS were selected. Table 3 shows the main OMIS found from this literature review, the description of the author and the year of publication, as well as the research method used by the author (s).

Table 3. Relation of Organizational Memory Information Systems (OMIS).

OMIS	AUTHOR(S)	YEAR	RESEARCH APPROACH
Answer Gardner	Mark S. Ackerman	(1994a)	Field Research
	Mark S. Ackerman	(1994b)	Field Research
Lotus Note	Kenneth Moore	(1995)	-
	Thomas H. Davenport	(1998)	Case Study
Project Memory System	Joline Morrison	(1997)	Literature Review
	Mark Weiser and Joline Morrison	(1998)	Laboratory Experimentation (Prototype)
KnowMore System	Andreas Abecker, Ansgar Bernardi, Knut Hinkelmann, Otto Kühn and Michael Sintek	(1998)	Laboratory Experimentation (Prototype)
	Andreas Abecker, Ansgar Bernardi, Knut Hinkelmann, Otto Kühn and Michael Sintek	(2000)	Laboratory Experimentation (Prototype)
Handbook	Thomas W. Malone, Kevin Crowston, Jintae Lee, Brian Pentland, Chrysanthos Dellarocas, George Wyner, John Quimby, Charles S. Osborn, Abraham Bernstein, George Herman, Mark Klein and Elissa O'Donnell	(1999)	Case Study
Thoughtflow	P. Balasubramanian, Kumar Nochur, John C. Henderson and M. Millie Kwan	(1999)	Case Study
KnowledgeScope	M. Millie Kwan and P. Balasubramanian	(2003)	Actual Experimentation (Implantation)

From this selection of OMIS existing in the literature, it was performed an analysis based on concepts, features and classifications, which allowed the classification of OMIS, considering as criteria the types of knowledge supported by these systems and the process of acquisition, retention, storage and dissemination of these knowledge through individuals.

3. LITERATURE REVIEW

3.1 Organizational Memory (OM)

Day after day, most organizations lose a great volume of their generated knowledge due to the lack of mechanisms that allow its retention for the organization, keeping great part of this knowledge retained only in an individual.

According to Walsh & Ungson (1991, p. 57), "to the extent that organizations exhibit characteristics of information processing, they should incorporate some sort of memory". In this sense, when the organization can obtain, retain and store the knowledge over time and make it available as necessary, it could be said that this organization can assure and feed consistently organizational memory (OM).

> "[...] with updated hard memories, individuals will have the advanced tools to increase efficiency through automated workflow features or enhance individual achievements through application of explicit knowledge. Therefore, providing the appropriate Hard-OM is critical in the future success of today's companies [...] is the streamlined, interconnected backbone of an entire company, into which all individuals will be able to connect and share information." (Cegarra-Navarro & Sánchez-Polo, 2011, p. 13).

In this scenario, Walsh & Ungson (1991) created a model of OM (Figure 1) providing a possible explanation for how an organization obtains, retains and retrieves the generated information, enabling this information to be used in actions and decisions that are taken by individuals in the organization and emphasizing that "the structure of organizational memory is composed of a number of storage bins: individuals, culture, transformations, structures, ecology, and external archives." (Walsh & Ungson, 1991, p. 81).

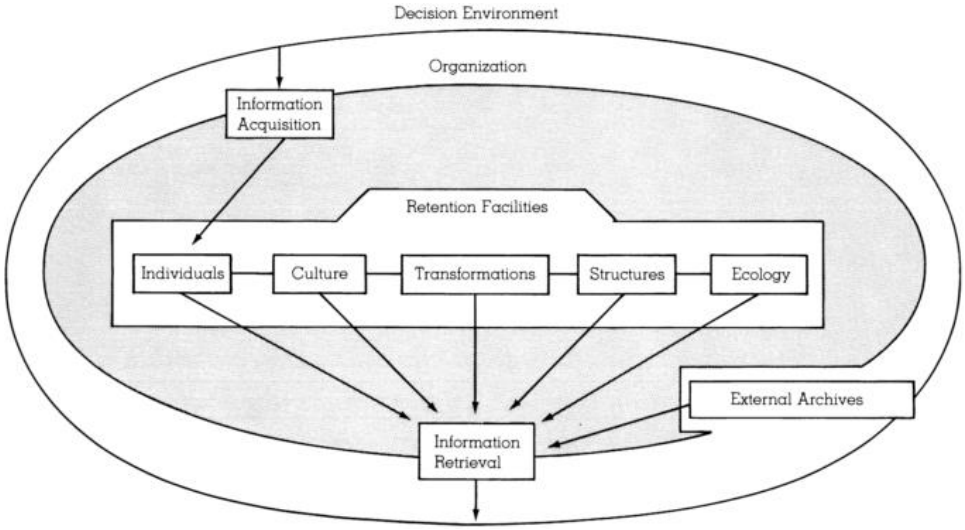

Figure 1. The structure of Organizational Memory (OM) proposed by Walsh & Ungson (1991, p. 64).

For the authors, maintaining a rich and functional OM, it is necessary to interlink all information repositories in the organization and, in particular, individuals who compose it. "The most important keys to understanding acquisition, retention, and retrieval processes is to understand the nature of the individuals that compose the organization." (Walsh & Ungson, 1991, p. 77).

As individual influences directly the OM, everything that involves an individual in the organization, i.e., the organizational setting in which this individual is, also influences the behavior of the individual. "[...] the acquisition, retention, and retrieval of knowledge and experience from retention repositories (i.e., memory) influence individual behavior by the company." (Walsh & Ungson, 1991, p. 58).

Therefore, all this accumulated knowledge, whether retained in the individual or in the environment, in both physical and organic structure, the transformations and changes in the organization, as well as the culture and policies adopted by the organization, are the main factors that feed the Walsh & Ungson model so that the organization may have an effective OM. "This knowledge integrates and coordinates all organizational activities even the transmission of new knowledge throughout the system. This facility, of course, is an organization's memory." (Walsh & Ungson, 1991, p. 72).

In addition to all this internal knowledge management for an effective OM, the authors also consider as part of OM the knowledge that can be acquired from the organization's social context, whether obtained from associations, partner companies, customers, suppliers, working groups, public institutions, among others. "Just as when an individual's memory fails, he or she can turn to others to help recall the particular event, an organization is surrounded by others who follow its actions." (Walsh & Ungson, 1991, p. 66).

For authors like Morrison (1997), Cegarra-Navarro & Sánchez-Polo (2011) and others, the organization's knowledge can be acquired and stored in OM both in the form of explicit knowledge (also called hard, concrete knowledge or "Hard-OM") and of tacit knowledge (also called abstract, episodic knowledge or "Soft-OM").

Tacit knowledge is that which cannot be expressed, such as the individual's experience, structures, myths, culture, contexts and actions; whereas explicit knowledge refers to any information that can be expressed in documents, numbers, processes and transactions (Cegarra-Navarro & Sánchez-Polo, 2011).

Table 4 summarises the "types of knowledge" that could compose the OM that were found in the selection of literature classified by levels of abstraction of knowledge, with the description of their origins and importance to the organization.

Table 4. Classification of types of knowledge that could compose the organizational memory according to the level of abstraction of knowledge, with the description of their origins and importance in the organization.

Abstration/Level	Type	Description	Importance
Concret/ Hard/ Explicit "**Hard-OM**"	Record of transactions and data bank	Documents of transactions in the organization from reports, data regarding to database archiving.	Contains trends, historical contexts and varying interpretations.
	Documentary record	Items of information dissemination such as summaries web pages, articles, news, among others; formal documents such as reports and versions; manuals, reports, digitalized documents.	
	Individual record	Informal documents related to creation of artifacts (e-mail, memos, letters, etc.)	
Abstract/ Episodic/ Tacit/ **"Soft-OM"**	Process e Rules	Interpretative, systematic and observable components; production process, work process, concepts.	Knowledge, experiences, events and standardized artifacts, remembrance, single interpretations and diagnosis of multiple point of views determining improvements in actions and decisions in the organization.
	Experiences and Transformations	Mind of the specialists, decision-makers, Project developers (individuals), practices, observations, organizational decisions. New projects, budgets, market, planning, procedures, among others	
	Structure, Myths, Policies and Culture	Acquisition, retention and knowledge share in the organizational structure; symbols, stories repeated in the set of information transmitted among the individuals in their organizational environment, physical structure and organizational policy	

Source: adapted from Blue, Andoh-Baidoo, & Osatuyi (2011); Cegarra-Navarro & Sánchez-Polo (2011); Morrison (1997); Walsh & Ungson (1991).

As a way to enhance this organizational memory (OM), information systems (IS) came to support the process of acquisition, retention, storage, and dissemination of knowledge in the organization, thus enabling new strategies for the sharing of knowledge, ideas, experiences and information thus making more effective the decision making, troubleshooting, innovation and quality of products and services. These systems are referred to in this study as organizational memory information systems (OMIS).

3.2. Organizational memory information systems (OMIS)

As a way to enhance, "feed" and support the organizational memory (OM) in organizations, information systems (IS) should make possible the acquisition and retention of knowledge, whether explicit or tacit, the storage and dissemination of this knowledge when needed. The supporting of an effective knowledge management process is the challenge of organizational memory information systems (OMIS).

Nevo et al., (2008) argue that the model by Walsh & Ungson (1991) is appropriate to support the research efforts in the field of information systems and technologies. The basic assumption is that information technology can be used to create a uniform, complete, consistent, updated and integrated set of knowledge that can be made available for the decision-making processes at all levels of the organization.

OMIS can be defined as any IS used in the organization that allows to enhance the process of acquisition, retention, storage, and distribution of knowledge over time, even involving those individuals who are not part of the organization, promoting (i) an effective knowledge management process and organizational memory; and (ii) optimizing the processes of decision-making, problem-solving, quality assurance and development of products and services in the Organization (Kwan & Balasubramanian, 2003; Stein & Zwass, 1995).

> "Broadening the repertoire of the information-systems support for organizational memory helps human actors cope with a possible information overload and supports their roles as information processors. [...] With its response repertoire constantly replenished from the arising cases, the system is a part of the company's organizational memory." (Stein & Zwass, 1995, p. 90).

Knowledge-based systems, document management systems, semantic networks, object-oriented and relational databases, decision support systems (DSS), expert systems, collaborative systems, social networks, intranets, simulation tools, distributed systems; document management; geographic information systems (GIS); contextual indexes; metadata; navigator; e-mail; search/retrieval of tools; information repositories; web server; agents/filters; external services server; videoconferencing; knowledge-based systems (KBS); data mining; information and communication technologies (ICTs); artificial intelligence (AI); database technology; modeling; among others are examples of systems and tools that support organizational memory (Alavi & Leidner, 2001; Dorasamy, Raman, & Kaliannan, 2013).

To support this concept, Stein & Zwass (1995) created a framework to represent OMIS based on theoretical criteria of organizational memory. This framework can be viewed in Figure 2.

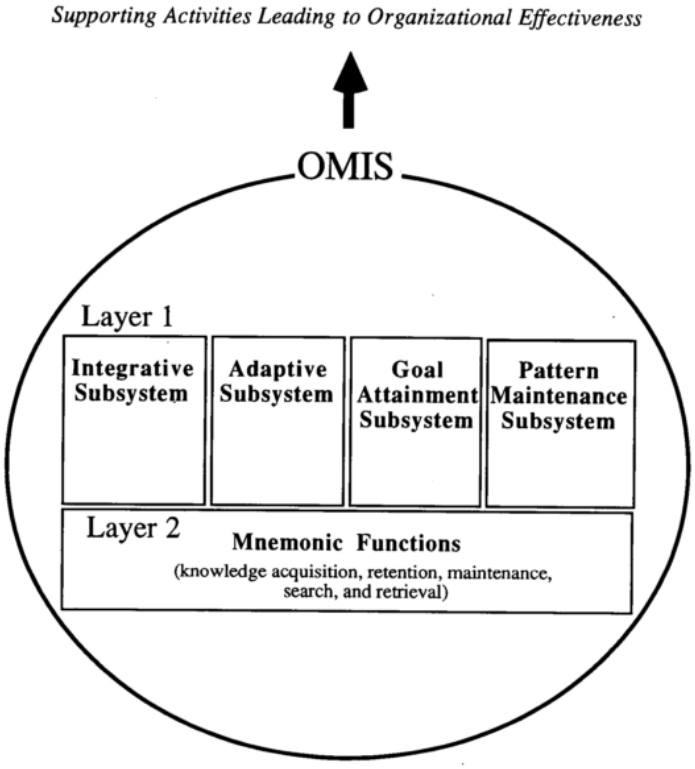

Figure 2. Framework for an organizational memory information systems (OMIS) proposed by Stein & Zwass (1995, p. 98).

According to Stein & Zwass (1995), OMIS consist of two layers; the first layer is subdivided into four sub-processes: (i) the integrative, that supports the organizational knowledge sharing through time at all levels of the organization; (ii) the adaptive, which recognizes, captures, organizes and distributes knowledge in the organizational environment adapting it to the changes of environment over time; (iii) the attainment, which seeks to achieve the performance goals of the organization not only the storage of knowledge goals; and (iv) the maintenance, which preserves the knowledge development in the organization throughout the time through attitudes, values, standards, routines and self-knowledge, contributing to the cohesion and morale of the organization.

The second layer corresponds to the process explored in the previous section (section 3.1) with regard to acquisition, retention and availability of knowledge. The authors have added the maintenance process and research that are directly linked to the process of acquisition, retention and availability of knowledge, respectively. The maintenance process represents the capacity of the system to assimilate the new knowledge that is being retained with the existing knowledge, and the search process refers to agility and reliability in the pursuit of that knowledge already stored in the system for their reliable recovery.

All this focus on what ensures the consistency of this model in order to perceive how knowledge can be acquired by the organization, the way it will be stored and maintained over time, as well as the agility and reliability of providing the representation of knowledge in information systems.

Some systems such as: Answer Garden, Project Memory System, Knowledge Scope, among others, are some examples of systems that present characteristics of an organizational memory information system (OMIS). These systems were chosen to be described in section 4.

4. ANALYSIS AND COMPARISON OF ORGANIZATIONAL MEMORY INFORMATION SYSTEMS

As already discussed in the previous sections, the effective management of the organizational memory (OM) supported by information systems (IS) improves the organization's capability to acquire, retain, store and disseminate the knowledge generated over time, not only the explicit, which is commonly stored and made available in organizations, but also the tacit, which is retained in the minds of individuals and that most often is not shared among the members of the organization.

In the literature, it was found some conceptual models and applications that have characteristics of an organizational memory information system (OMIS). In this section, some of these systems found in the literature will be described and related to the characteristics of the OMIS reference model proposed by Stein & Zwass (1995) and the type of organizational knowledge described in Table 3.

4.1. Answer Gardner

The Answer Garden provides an environment for questions and answers categorized by subject. It is composed not only of an extensive database, but also of a panel of experts who, if the user does not find the solution to her/his problem, the system itself selects a specialist according to the specific nature of the problem. These experts, in turn, provide such a solution if it had not been found before and update the database.

According to Ackerman (1994b), who examined six organizations which used the Answer Garden, only one organization actually makes constant use of this system. One of the problems is that it does not provide contextual information of the problems, which complicates the resolution of new problems and, in many cases, does not answer the questions of the users. Another difficulty is that individuals feel its use is very complex, reducing the motivation to access the system and to update the database.

For organizations that use information extensively, this system is very useful, since it is always changing, emerging from new questions and answers being fed into the system.

However, feeding the database and answering the questions of the users demand a lot of time and work, requiring that this system be integrated into the workflow of the individuals in the organization so that it does not cause a lack of interest both for the users and the experts.

4.2. Lotus Note

Companies like Price Waterhouse, HP and others used the Lotus Notes system arguing that this system played an integrating role in the organization (Davenport, 1998). At Price WaterHouse, for example, this system was used to integrate all the knowledge of its members located throughout the world; this extensive sharing of knowledge reduced costs and time to perform particular processes, in addition to

optimizing decision making (Kawell Jr., Beckhardt, Halvorsen, Raymond, & Greif, 1988).

Another company that included that system in the organization was HP, which used the Lotus Note as a mechanism to assist the sharing of ideas, collaboration and learning between individuals in the organization, recognizing that this strategy was one of the factors of success and growth of the company (Davenport, 1998).

Lotus Notes is a software used by several organizations in the world and is based on a platform of mail flow. It has as tools the electronic mail integrated with discussion groups and allows individuals to create, index, alter and update various documents whenever necessary (Kawell Jr. et al., 1988). Thus, every individual can perform the necessary changes, making its use and supplementation more flexible, given that the Lotus Notes "empowers individuals and organizations to collaborate and share information." (Moore, 1995, p. 427).

Considering the concept of organizational memory information system, it might be said that the Lotus Notes fits perfectly in it, because it supports the storing of all the information of an organization and makes that information available so that all parts are connected.

4.3. Project Memory System

The system, Project Memory, uses approaches for managing data projects that can capture the processes, contexts, fundamentals, or artifacts in a way that allows members of new projects to familiarize themselves quickly with all the history of the project (Weiser & Morrison, 1998).

This system basically breaks down the information on a particular project into five distinct classes: projects, users, events, meetings and documents. In addition, the model describes the people, temporal events (such as meetings or items of an individual scheduling in a meeting) and archival documents that are created within a project or support some of its aspects (Morrison, 1997).

A positive point of this system is that information retrieval is based on any contextual information, such as the date on which the project was created or last revised, the keywords of the project, the one who created this project or even the relation of this project with others projects in the organization. A disadvantage of this system often mentioned in literature is that all individuals are represented as members of the project and do not take into account their roles, relationships and affiliations.

4.4. KnowMore System

The KnowMore system aims to provide a support for a large amount of tasks performed in an organization from a system able to retain knowledge and make it available taking into account the context (Abecker et al., 1998).

According to Abecker et al. (2000) the KnowMore Project has as its main feature the possibility of integrating the workflow of the organization so that the system becomes an assistant able to provide information as necessary. This is, in a particular task to be performed or in a particular process running in the organization, a query to the system's knowledge bases and the actions taken within a certain workflow performed automatically and presented to the individual during the performance of this activity/task/execution.

The advantage of this system functionality is that it assists the individual in performing various business activities and tasks by providing relevant information recovered from the organization's knowledge base.

From a technical point of view, the process and modeling are based on ontological knowledge, metadata and heuristics, thus ensuring the reliability of its execution. It provides a framework for easy handling, with boxes of tools that help create applications to support the user (Abecker et al., 2000). Thus, at any given time when the individual performs a certain task, the system leads him/her to relevant information providing suggestions and aiding in decision making.

The structure of the system is able to provide some support information, if the user has some difficulty handling or understanding the information provided. In addition, the system can direct the user to other individuals in the organization who hold relevant knowledge to achieve a successful decision.

As points for improvement for KnowMore Project, it is highlighted the way it deals with the data acquisition and retention from the ongoing activity. In the KnowMore system, all kinds of information are treated in a similar manner, whether they are formal and/or informal data. In addition, it is entirely focused on resources only for recovery of knowledge, not processing the knowledge of activity/task/thing in question.

4.5. Knowledge Scope

The KnowledgeScope is a system capable of capturing representations of knowledge generated in the organizational setting supporting the integration of processes and information in a workflow, organizing all acquired knowledge acquired to be used whenever necessary.

The Knowledge Scope, the process of acquisition and retention of knowledge is performed through the capture of documents, processes and strategies of the organization and the system provides a version control of these documents. What distinguishes it from the traditional systems is that this system supports an integrated workflow management, making available user strategies, projects, ideas, among other forms of knowledge already in use, which can be retrieved at any moment.

> KnowledgeScope organizes knowledge around the organizational processes in which the knowledge is created, captured, and used. [...] KnowledgeScope to (1) reduce the documentation burden by automatically capturing knowledge and its context as it is created, and (2) provide knowledge with contextual information to the right person at the right time in the right place." (Kwan & Balasubramanian, 2003, p. 483)

In addition, the system has a discussion forum and may have different standpoints on certain actions of the project. It also provides a guide of notes so that the user can make notes of any ideas that, then, are stored in the system. The system also provides a search system for an individual to find specific items of interest such as projects, customers and any other individual with characteristics necessary for executing her/his project.

4.6. Other OMIS

The PRISM system, described by Palvia, Perkins, & Zeltmann (1992), is one of the most extensive human resources information system, deployed to the Federal

Express Corporation. This system maintains the history of training, safety, benefits and structural changes of the entire organization.

The HandBook is a system that captures the knowledge of the process (Malone et al., 1999). As the processes contain descriptions of different types of processes from different organizations, the system classify them by using an approach that incorporates the concepts of guidelines to objects of inheritance and abstraction.

The gIBIS organizes the logic of a design process using a knowledge structure based on an argument that defines the interchange of knowledge in a discussion in three categories: issues, positions and arguments. The gIBIS captures only the contents, but not the context in which the discussion takes place, such as the roles of the participants and the tasks from which problems arise (Conklin & Begeman, 1988).

Other systems use this logic of structure and integrate all information of the documentation processes. One such system is Thoughtflow that organizes the logic of a process in a form of an audit trail of goals and decisions picking up the context of decisions, decision roles, resources, schedules, and so on (Balasubramanian et al., 1999).

4.7. OMIS Comparison

With the description of some of the existing organizational memory information systems (OMIS), it is possible to highlight that organizations are seeking effective ways of knowledge management and memorization because there is a prevalent notion that they are crucial for improving the organization's performance. Table 5 provides an overview of the systems presented in the previous section showing to which process of knowledge memorization they provide support.

The memorization processes that we used to create the table are knowledge acquisition, retention, storage, and dissemination as proposed by Morrison (1997). As for the process of acquisition and retention, it is considered the recovery and storing of information in databases (AR1); the user requests of information, namely: searches and information recovery performed by individuals (AR2); periodic queries to individuals in the form of satisfaction surveys and reports about usage (AR3); and information (external and/or internal) directed to the individual as memos, lists, forums, among others (AR4). For the dissemination process, two possibilities are considered: the active (ACT), for willful and conscious recovery; and the passive (PAS), for information retrieved in informal personal contacts or internal communications.

Table 5. Overview of types of knowledge supported by systems and strategies for acquisition, retention, and dissemination of this knowledge.

OMIS	Type of Knowledge						Acquisition/Retention				Dissemination	
	TDBR	DR	IR	PR	ET	SMPC	AR1	AR2	AR3	AR4	ACT	PAS
AnswerGardner				X	X		X	X	X		X	
LotusNote	X	X	X		X		X	X		X	X	X
Project Memory System	X	X	X	X	X		X	X				X
KnowMore System		X	X	X			X	X	X	X	X	X
KnowledgeScope		X	X	X	X		X	X		X	X	X
HANDBOOK				X			X				X	
Thoughtflow		X	X	X			X	X			X	

Legend:

TDBR = Transaction and Database Record

DR = Documental Record

IR = Individual Record

AR1 = Information put in database by individuals

AR2 = User requests data

ACT = Proposital and Aware of individual

PR = Processes and Rules

ET = Experiences and Transformations

SMPC = Structure, Myths, Policies and Culture

AR3 = Regular consultations to individuals

AR4 = external and/or internal information directed to individual

PAS = Informal contact or internal communication

From the table, it is possible to identify a wide variety of knowledge types that are handled by the systems, with an emphasis on individual records and processes. As for acquisition and retention strategies, it is clear that individuals use the systems to access necessary documents and some systems collect requests by users.

However, regarding the Structure, Myths, Policies and Culture, they are given no involvement and interaction by the systems, making it difficult for the users to use them at a time that is appropriate. For dissemination, in most of cases, the systems support its intentional search.

The Answer Garden, for example, while providing an environment for questions and answers that help individuals whenever they have any questions, with support from experts, does not provide information according to the context, making the interpretation of recovered information harder.

The KnowledgeScope, Project Memory System and KnowMore System systems can retain knowledge together with its context, allowing individuals to understand a particular process or task being performed, and use it in the current context as a support for solving a particular problem or for decision-making.

Moreover, the KnowledgeScope and the Lotus Note systems, in addition to retaining knowledge, assist in the exchange of experiences among individuals of this organization, allowing to add and/or modify any component of an existing project to a current reality without having to remake the whole process.

5. DISCUSSION

This research, in the form of a literature review on organizational memory (OM) and organizational memory information systems (OMIS) makes it possible to understand the extent and nature of the studies carried out within the field of organizational memory (OM) and information systems (SI), which includes the process of acquisition, retention, and dissemination of knowledge in the organization. From an extensive search in some of the major scientific bases it was possible to understand that, over the years, there are few authors who perform studies addressing OM. These authors have been demonstrating that organizational memory processes supported by information systems help to increase organizational performance and productivity, thereby becoming effective in supporting organizations in accomplishing their goals.

It is necessary to mention that, despite the focus on the need of retaining knowledge, few case studies analyzed how information systems are used in organizations to assist the process of knowledge construction.

The issue of terminology is also a factor that hinders the studies in this area. There are several terms used to refer to organizational memory information systems. This terminological inconsistency points to the need for a greater consensus about the term to use so that research on OMIS can be consolidated.

From the models selected and described in section 4, it can be highlighted that while OM research focus on how organizations memorize knowledge, the area of OMIS has been focusing on a particular kind of knowledge, explicit knowledge or information. Moreover, the literature also stresses clear difficulties in managing that information, so it can be reused in a different context from the one where it was produced. Thereafter, it is important to have more studies to develop a better understanding about which knowledge/information can be retained by OM and how this knowledge/information can be retained to ensure its effective reuse to support future decisions.

This is the case, for example, of the KnowledgeScope and the Lotus Note systems, which can promote the exchange of knowledge and experience between individuals, allowing to change, add and/or modify stored information as well as include new information readily available to all organizational members.
The performed literature review also confirms that it is not enough to have an organizational memory information system in place to ensure an effective OM. It is also necessary an organizational culture that fosters the use of this knowledge in a shared and collaborative manner so that it can generate more knowledge, more ideas, more creativity and innovation to the organization.

6. CONCLUSION

Organizational memory information systems (OMIS) can be used to retain organizational knowledge (explicit and tacit), therefore they are used to support the structuring of organizational activities, and the communication and knowledge sharing between individuals in the organization. Thus, these systems play an important role in OM, structuring and enhancing OM's role in decision making, in solving problems as well as in the innovation and quality control of products and services in the

organization. OMIS also add knowledge management functions, creating an environment that encourages the collaboration and the sharing of ideas and experiences between individuals, aiming to enhance the acquisition, retention, storage, and distribution of organizational knowledge over time, which are major functions of OM.

Regarding the literature review, organizational studies applying empirical research, including case studies and/or action-research are necessary. This way developed theoretical models and frameworks can be applied and validated so that they can become effective tools for organizational interventions aimed at diagnosing and improving OM. Moreover, this applied research would enable a better understanding of factors underlying the success of OMIS in organizational settings.

As to the analysis of the selected OMIS, it was observed that organizations are aware of the importance of OM and invest in the preservation of relevant knowledge that can provide them with competitive advantage.

The challenge for organizations is, then, in identifying and implementing a system that adequately supports organizational memory, by assisting organizations in the decision-making process. An OMIS should provide a well-defined environment for the acquisition and retention of the semantically correct knowledge, allowing its reuse in a reliable and safe manner. It should also provide, facilitate and encourage collaboration and sharing functionalities.

It is expected that this literature review can provide the necessary basis for further analysis of the relationship between organizational memory (OM) and information systems (IS), whether in its theoretical context, with conceptual analysis of the relationship between OM and IS, and/or in its practical context, with analysis of the used information systems and their impact on OM; and they can ensure a safe competitive advantage in the market, since they represent key components for the effective management of the knowledge generated in the organization.

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