



# Transactive directories of organizational memory: Towards a working data model

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## ARTICLE INFO

### Article history:

Received 4 February 2007  
Received in revised form 9 November 2011  
Accepted 31 December 2011  
Available online 1 February 2012

### Keywords:

Transactive memory systems  
Organizational memory  
Organizational learning  
Knowledge mapping  
Knowledge sharing

## ABSTRACT

*Transactive memory system* is a term from group psychology that describes a system that helps small groups maintain and use personal directories to allocate and retrieve knowledge. Such systems have been observed at the level of whole organizations, suggesting that they provide a means for conceptualizing the exploitation of organizational memory. In this paper, I describe a longitudinal investigation of a global engineering consulting firm in which I used inductive analysis of interview data to map and then develop a conceptual entity-relationship model of organizational memory. This model formed the basis for a transactive directory to facilitate knowledge retrieval and allocation in the firm.

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## 1. Introduction

What organizations know and apply to routine tasks, problem solving, and decision making has been described as their organizational memory (OM) or knowledge [16]. It exists in a variety of forms and repositories, such as: documents, databases, employees' brains, and group rituals. However, the persistent challenge of using the OM effectively is one of enhancing the scope and availability of the stocks of knowledge within the organization [9]. In my study, I used case study data to identify descriptive entities, relationships, and attributes that employees generally use in order to populate their personal directories for their subsequent information storage and retrieval. I then compared this to an existing transactive model of organizational memory and extended it to accommodate the new metadata.

My exploratory, longitudinal study was conducted within a single organization, allowing OM and the associated transactive systems to be explored in depth over the life of several business projects. My research built on the entity-relationship (ER) model and attempted to develop the basis for the design of a practicable IS to manage OM metadata. The resulting ER model can then be used as a general schema for designing and building *organizational* transactive directories that might be maintained manually by personnel (e.g., using workflow software to record knowledge required or acquired), by implicit software functions embedded in software (e.g., linked tags and author information recorded in

Wikis), or through automated machine intelligence programs "crawling" through documents and filling the database. The resulting data model should be able to answer the descriptive (retrieval) and normative (allocative) questions demanded of a transactive memory directory, such as:

- Where is the knowledge needed to perform this process?
- Who is responsible for this knowledge?
- What knowledge does this activity produce?
- Who needs to be informed of this new knowledge? and
- Where should we save this new knowledge?

## 2. Organizational memory

### 2.1. Background

Knowledge resides in *memory traces* in individuals; it is what they know. We can state what we know, transcribe it, put it in databases, but we always know more than we can tell. Organizations are social groups who absorb and develop systems of knowledge to serve their purposes. Organizations can be seen as information processing systems within which collective interpretations of the knowledge exist and from which it emerges. Thus organizations have a particular memory: the knowledge of how to do things, how to approach problems and issues, and how to deal with one another [1].

The *instrumental* view of organizational memory is that it is knowledge which is useful in successfully accomplishing present activities; it might result in *higher or lower* levels of organizational effectiveness. Although the aim of organizational memory is

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clearly to refine and improve performance through the adoption of superior routines, some memories may inhibit higher performance (e.g., the “not invented here” syndrome). The *sense-making* view of organizational memory is that it involves knowledge that gives structure and meaning to events and allows shared interpretation to develop in the organization. OM is therefore also the set of *mental models* available to the organization; they determine cognitive, regulative, and normative judgments about the world.

There are organizational, social and personal routines that store knowledge in and retrieve it from this memory. This is one critical function of *organizational learning* – being able to draw upon the experience of others in the organization. The processes which contribute to it involve acquisition, retention, search and retrieval (e.g., [6]). Several business activities have organizational learning as a by-product; learning on the job, learning how to work effectively in a team, or discussions in post-project review [3]. Such learning processes can be facilitated by giving personnel *capabilities* (technology, training, time, and space) and *motivation* (recognition, self-fulfilment, rewards) to contribute knowledge to the organization as a whole [14].

OM is stored in several places and the knowledge is intended to help the firm improve its competitiveness and effectiveness [18]. Typically memories include individual's brains, IT storage devices, managerial know-how, rules and policies, workplace ecology and roles and structures. Positive correlations have been found between strong OM in these categories and organizational performance, organizational learning, improvisation and speed of decision making. OM can improve productivity by improving routine work, developing better control over production, logistics and service delivery, and identifying the best skills for a job.

Nonetheless, a major challenge facing the development of systems to support OM is the modelling of its memory. A system that unifies the organizational knowledge can be used to gain insight into how information might best be stored in the organization's memory, thereby opening the possibility for systematic and deliberate improvement. The goal of a transactive memory system (TMS) approach is to create a unified OM: a directory structure which provides a unified mental model of the firm and which matches the information needs of business with its appropriate content to improve performance. In this research I wished to continue to develop a sound way to model an organization's memory in its diverse forms and manifestations.

A TMS contains the processes used to maintain and use the knowledge of groups. When knowledge is sent to a group it is *allocated* to a responsible member. In the process, it is *encoded* by the group members into their personal directory structure to tell them that *this* person has charge of *that* piece of knowledge, and they can *retrieve* it from the expert when they need it, using their own *directories*, possibly in combination with other people's directories or external aids, such as diaries. The concept of TMS has thus been extended to describe knowledge storage and retrieval in organizations. Thus organizations can be seen as collections of personal and technological directories which, when current and accurate, provide access to OM when and where it is required.

There are four classes of meta-knowledge about the entities: conceptual (their meanings), descriptive (the general attributes), cognitive (the meta-memory of capabilities), and persuasive (the nature of the retainer). The schema accommodates the instrumental and the sense-making view of the OM, so that practical, cultural, and explanatory knowledge can be stated in the predicate entity, whilst the conceptual entity contains the underlying mental models that exist in the organizational reality of invoices, orders and schedules, punctuality, or quality.

It was the schema that I hoped to extend in the course of my research. Furthermore, I pursued the approach of others by viewing the OM metadata schema as providing TMS directories to

any form of information, hard or soft, and noting that the processes by which this metadata is maintained consisted of a complex set of routine and ad hoc, formal and informal, technological and social interactions [10]. My focus in modelling OM was the storage, sharing, and retrieving of the cognitive, regulative, and normative contents of the OM through a TMS: I did not try to cover other dimensions such as generality and specificity of knowledge, or the epistemology of OM, etc.

I combined the OM literature from management science, TMS research from group psychology, and data modelling techniques, in an attempt to develop a general purpose data model of an organization's group-level TMS directory. Because TMS research in psychology and management science has focussed on how to measure a TMS [11], the performance benefits of a well-developed TMS [20] and the antecedents of TMS development [2,15], focussing my work on the structure of the group TMS directory seemed a logical next step. OM and group memory research in IS has tended to focus on the capture of the memory provided by databases and Intranets. This does not address the fact that OM is stored in many different containers that vary by task or project type, and that most of an organization's knowledge is tacit and will remain so.

TMS seems most beneficial in reducing task time in large groups solving a dynamic task with volatile knowledge needs [17]. The better the group transactive directories, the better the group performance and the greater the amount of knowledge exchange [19]. The degree of sharing of mental models, combined with strong transactive memory (ease of finding the knowledge), the better the group performance [4]. A positive correlation exists between strength of TMS and knowledge worker team performance [12]. TMS is positively correlated with group capability for many reasons: its facility to store and utilize more knowledge than a single individual, better knowledge exploitation, appropriate matching of problems to expertise, better anticipation of performance and appropriate allocation of tasks, better decision making through expertise evaluation, and cognitive load reduction permitting more specialization.

## 2.2. Research on organizational memory

Exploring the structure, content, and processes of organizational memory requires access to rich data in a natural setting. Therefore an in-depth case study is suitable. OM and organizational learning concepts provide powerful metaphors for open-ended, exploratory interview questions and allowed me to extract wide-ranging information about an organization's needs and to determine how it goes about using its memory effectively. As the patterns and structure of OM are not known a priori, factors that constrain or facilitate the performance of OM help in identifying its salient descriptive or structural features. I used a research technique based upon a method proposed by Walsh and Ungson<sup>1</sup>:

1. Determine the constitution of the memory of the organization through detailed data collection, induction and mapping.
2. Determine how people find and use the memory components, analysing any issues to see if there are patterns in them which inhibit or facilitate their access.
3. Create a schema that describes the OM, considering design solutions that provide functions to maintain the metadata and facilitate access to the OM in whatever form or location it is stored.

Although this approach mirrors classic analysis used for the preparation of a conceptual database design, my purpose was not

<sup>1</sup> J.P. Walsh, G.R. Ungson, “Organizational Memory”, In: Knowledge in Organizations, L. Prusak (Ed.), Butterworth-Heinemann, Newton, MA, 1997, pp. 177–212.

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