Safety Science 50 (2012) 554–562

Contents lists available at SciVerse ScienceDirect

Safety Science

journal homepage: www.elsevier.com/locate/ssci

Environmental knowledge memory: Contribution of the DIK model

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ARTICLE INFO

Article history:
Received 22 February 2010
Received in revised form 11 August 2011
Accepted 18 October 2011
Available online 22 November 2011

Keywords:
DIK model
Knowledge
Capitalization
Environment
Performance
Contract

ABSTRACT

A company does not only generate goods and services which meet the requirements in terms of deadlines, costs, quality and environment, but it also generates knowledge that must be capitalized. In order for a company to benefit from the skills and competences acquired during the realization of a project, some processes of memorization prove to be necessary. This article fits in this context and aims at suggesting a knowledge capitalization model in order to create a capital of environmental knowledge.

To illustrate our suggestion, we have chosen an Environmental Performance Contract (EPC) signed by tens of Algerian companies which are reputed for their pollution of the environment. Capitalizing this knowledge allows these companies to anticipate on their environmental management and to guarantee the success of the EPC.

1. Introduction

Nowadays, industry has to assume responsibility for environmental concerns. However, in our opinion, the manner of coping with these concerns has to be promoted more particularly in the developing countries such as Algeria where the integration of the environmental concerns in the management process is still at an embryonic stage. It is in this context that 89 Algerian companies signed the Environmental Performance Contracts (EPCs) allowing them thus to anticipate on a progressive application of the Algerian environmental legislation.

Indeed, this EPC project explicitly aims at making the commitment of the managers a reality through implementing an industrial cleanup program. It also aspires to prepare the Algerian industrial sector to adopt environmental management methods based on universally recognized standard criteria such as the ISO 14001, for instance (Bahmed et al., 2009).

In this context, the objective of our study is, initially, to follow through the Algerian companies during the process of implementing the EPC using a model named Data–Information–Knowledge (DIK). This model allows to support the knowledge capitalization of the EPC project. Then, we will show through the indicator of the «environmental behavior of the studied companies» that the DIK model allows also promoting the intelligence of the organization in charge of driving and supervising the EPC project (the Algerian Ministry for Territory Environment and Tourism) regarding the environmental knowledge of the Algerian companies.

In order to highlight our contribution, a brief review will be made on the methodological context of our model called DIK.

Indeed, our study deals with the EPC project which must meet two fundamental requirements: on the one hand, the project performance in terms of taking care of the environmental dimension by the companies which have signed the EPC, and, on the other one, the respect of the anticipated deadline for completing the EPC.

The success of any EPC project will result in the decisions that the Algerian Ministry for Territory Environment and Tourism will have to take in order to face up to the degradation of the environment in Algeria (once the EPC project is over by the end of 2012). However, these decisions are based on the knowledge resulting from the EPC itself. Consequently, the success of the EPC depends on a good management of the environmental issues which cannot be fully dealt with, in our opinion, in any way but by Knowledge Management (KM). This is because the KM is widely used both at a practical level by the companies and at an academic one in the form of research works which deal with all aspects of knowledge: its links to data and information, its effects on the performance of the companies and organizations and especially on knowledge capitalization (Marqués and Simon, 2006).

We ought not to forget that managing knowledge is a set of processes by which the activity and the competence of the organization are promoted using knowledge capitalization which logically

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doi:10.1016/j.ssci.2011.10.008

	Tacit	*Explicit*
Tacit	Socialization	Externalization
Explicit	Internalization	Combination

Fig. 1. The four modes of knowledge creation according to Nonaka (1994).

starts with localization and knowledge creation. In the specialized literature dealing with KM, we find many tendencies in terms of knowledge creation:

(i) Knowledge creation that is based on the relationships between the two types of knowledge (Fig. 1):

(ii) Knowledge creation based on the «Data → Information → Knowledge» sequence in which we distinguish two models of knowledge creation. These are models which show that knowledge is created starting from information which is, in its turn, created from data (Manfred, 1995; Siemieniuch and Sinclair, 1999).
Even though these two models converge on the fact that knowledge is the result of the «Data → Information → Knowledge» sequence, they do not share the same view of what the exploitation of knowledge (its promotion) should be. In the latter case, we find two alternatives for promoting the acquired knowledge (Fig. 2).
Indeed, for Manfred (1995) competence is an area of knowledge exploration for a continuous improvement of knowledge learning and that the wraparound indicates that competence gives rise to new data. Conversely, for Siemieniuch and Sinclair (1999) knowledge is an instantaneous acquisition which evolves into deep knowledge (which is wisdom that is acquired as a result of experience).

(iii) Another presentation of the knowledge creation cycle, which is close to the two previous models, is that which corresponds to a paradigm hierarchy (Fig. 3).
In Fig. 3, when a subject interprets a datum (D) in order to assign meaning to it, it becomes Information (I). Likewise, when this subject interprets a piece of information, in order to assign meaning to it, it becomes Knowledge (K). In other words, the interaction between the elements of the «Data–Information–Knowledge» trilogy is of a sequential type (D → I → K) (Tuomo, 1999), and information constitutes the link between the data, which are the starting point, and knowledge, considered the final element in the sequence.

On the basis of what has been suggested above, knowledge is constituted of information that is interpreted, whether consciously or unconsciously, by an individual at the end of a learning process. Knowledge may be codified in the form of publications, patents, norms, practical codes and maps, but it may also be found in skills, expertise, experience and the practices of individuals and organizations (Bjϕrnson & Dingsϕyr, 2008).

Furthermore, knowledge has multiple aspects depending on the area that it covers. For instance, in the area of Hygiene, Safety and Environment (HSE), knowledge includes scientific, technological, and organizational aspects. Hence, knowledge is created starting from data (collected in a direct fashion, in the form of measures, or in an indirect one in the form of experts' appreciations) and from information, while its exploitation covers both data and information. Consequently, knowledge capitalization is made a reality by both creating and exploiting knowledge. This leads to a dynamics of interaction between the elements of the «Data–Information–Knowledge» trilogy that will be dealt with in more details in the following section, using the suggested DIK model.

2. Method

2.1. General presentation of the DIK model

The DIK model, suggested in Fig. 4, is represented by an *oriented graph* and includes a set of nodes and a set of arcs. Each node represents one of the elements of the DIK «Data–Information–Knowledge».

Better still, each node may constitute a starting point (*source node*) for knowledge capitalization and may also be a point of arrival at the same time (*target node*). In this way, each node in the model, which is an *inevitable node* in the process of knowledge capitalization, comes as a particular point. Data are first at the basis of knowledge and are, then, at the bottom of the organization; information logically precedes knowledge and, finally, knowledge has information as a necessary matter. This knowledge can be tacit (personal) or explicit1 (transmittable via formal language).

And it is this concept of capitalization which makes the DIK model in Fig. 4 more advantageous compared to the usual paradigm represented in Fig. 3 and even in comparison to the visions mentioned in Fig. 2, in which knowledge creation is considered a linear chain.

Another advantage of the DIK model in comparison with the tendencies mentioned above is the possibility of linking knowledge to decision making. Indeed, decision making is closely linked to knowledge (Vicente and Partidário, 2006). On the one hand, the act of deciding may be perceived as the implementation of the results of a learning process, and the acquired knowledge will, then, be validated and sanctioned by the results of decision making. On the other hand, the very process of decision making is a process of collective learning. During the various stages of a decision making process, the actors will have to confront their representations of the real with those of the other actors and question their perspectives of action.

Therefore, in the DIK model, the link between knowledge and decision making is ensured by the *knowledge* pole, which is, in fact, an *action knowledge* pole. Indeed, this pole corresponds to the strategic level where all decisions to act are taken in order to regulate the functions of the production site following the information brought about through the structuring of data in an informational form or at the foundation of formalized knowledge starting from information (arc L_{IC} in Fig. 4). Hence, a large part of the data is used via the knowledge base which is elaborated from the data (arc L_{DC} in Fig. 4).

2.2. Detailed presentation of the DIK model

The DIK model that we are suggesting is characterized by three abstraction levels that will be dealt with in the following section.

2.2.1. Conceptual level

The conceptual level of the DIK model serves to defining the main concepts associated with the various poles of the DIK model (Table 1).

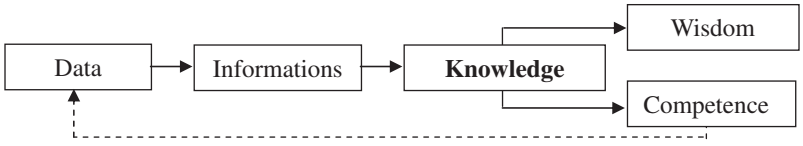

Fig. 2. The knowledge creation cycle according to Nonaka (1994) and Siemieniuch and Sinclair (1999).