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APPLICATION OF KNOWLEDGE FOR THE MAINTENANCE OF THE ENTERPRISE

Assoc. Prof. Daschievici Luiza
Assoc. Prof. Ghelase Daniela
"Dunarea de Jos" University of Galati

ABSTRACT

In the paper we aim to offer a strategic vision of knowledge management (KM) that takes into account the synergy between technological and behavioral issues so necessary for survival in the current economic context.

In this view, all business processes involve creation, dissemination, renewal and application of knowledge for the maintenance and survival of the enterprise.

KEYWORDS*:* knowledge, knowledge management (KM), knowledge-based economy (KBE)**,** machining process

1. INTRODUCTION

The market dynamics is further passed to the mode of operation and management. In a knowledge-based society and economy, operations such as determining the relevant information and aggregating it into pieces of knowledge must be automated, because in such a complex and unpredictable environment, they are indispensable tools for creating, searching and structuring knowledge.

The interaction between the economic environment and the manufacturing system is a major source of knowledge about the economic environment and the manufacturing system themselves. Consequently, it is necessary to exist a knowledge management system to avoid increased costs, waste of time and increassed errors. The recognition of the Knowledge Management (KM) imperative will provide an impetus for enterprises to understand and nurture their knowledge resources and activities. KM has assumed a broad range of meanings from its inception; however, most of the published material remains ambiguous and provides little empirical evidence to support a specific definition for the knowledge management concept. KM has been acknowledged as being important to competitive advantage and organizational progress.

Thus, a clear understanding and agreement about KM should prove to be of great value for enterprises. As enterprises strive to create a competitive advantage with their products and services, they continue to contemplate the KM concept and the impact on organizational success. In a effort to define KM, enterprises must determine which corporate knowledge should be harvested, organized, managed and shared. A general definition has been 'getting the right information to the right people at the right time' in order for them to make better decisions. Knowledge management implementation is an advantage for the enterprise from the viewpoint of the competitiveness. The new knowledge will be used both in the enterprise management and to develop new products and new services or make important changes in the business decisions.

By means of learning, the enterprise which uses the knowledge will be able to adapt and respond continuously to the changes of the business environment.

An important goal of KM is seen to be the sharing of best practice. So, by improving the flow of knowledge through the enterprise the following benefits can be obtained: the sharing of the best practice around business processes; the ability to respond more effectively to customer demands.

Due to the fact that technology facilitates the rapid exchange of information, the pace of acquisition is growing exponentially in both large and small enterprises. The vast amounts

of knowledge possessed by the enterprises are spread across countless structured and unstructured sources.

To improve processes and bring new products to the market faster and more cheaply, the enterprises have to identify, make available and apply this knowledge. Thus, information must be understood, organized and transformed for problems solving. Consequently, information transformed in product is knowledge and coordination of this kind of knowledge is made by means of knowledge management.

As shown above, the manufacturing industry faces the challenge of responding quickly to the ever-changing requirements of customers. It is necessary that in these high competitive environments, enterprises control production system dynamics of such as:

- change in the product types and variants;
- change in the production quantities.

Enterprises have to develop and implement more responsive and flexible manufacturing systems based on knowledge. By this way, they can respond to outgoing and difficult to predict change in production requirements and make products with high quality, low cost and fast delivery.

2. RELATED LITERATURE

The paper is related to several trends in literature.

To be competitive organizations should react adequately, interpret non-standardized information for problem solving and decision making, as well as change their infrastructure and management strategies [1]. Usually there is a lot of information and knowledge within organizations, but at the same time many of them (service organizations, in particular) are "information rich and knowledge poor." The information and knowledge assets, often called an "intellectual capital," i.e., knowledge that can be converted into value, make a great potential for organizations if utilized well.

Knowledge management (KM) has become an effective way of managing organization's intellectual capital or, in other words, organization's full experience, skills and knowledge that is relevant for more effective performance in the future.

Studies in KM mainly focus on organizational knowledge captured in corporate and/or organizational memories and on the development of knowledge management systems (KMS). However these initiatives in organizations have often run into difficulties mainly because the expansion of individual's personal tacit knowledge to knowledge of organization as a whole causes implementation problems.

In the paper [1] there are defined tacit knowledge and explicit knowledge. Tacit knowledge is personal knowledge gained through experience. It may be shared and exchanged through direct communication with others. Explicit knowledge is represented in documents, emails, knowledge repositories (data and knowledge bases), etc. Explicit knowledge can be formalized in words and numbers and it is easily distributed and shared. Acquisition of explicit knowledge is indirect because it must be encoded and decoded in one's mental models where it is kept as tacit knowledge.

In [2] it is shown that the concept of managing knowledge has become increasingly popular both in the practical and in the academic discussion in the fields of engineering and management. Successful management of knowledge-related resources of companies has been recognized as a key basis for acquiring competitive advantage and other organizational success and the acquisition and application of knowledge has even been argued to constitute the focal role of organizations in the society [3].

The paper [4] is concerned with a

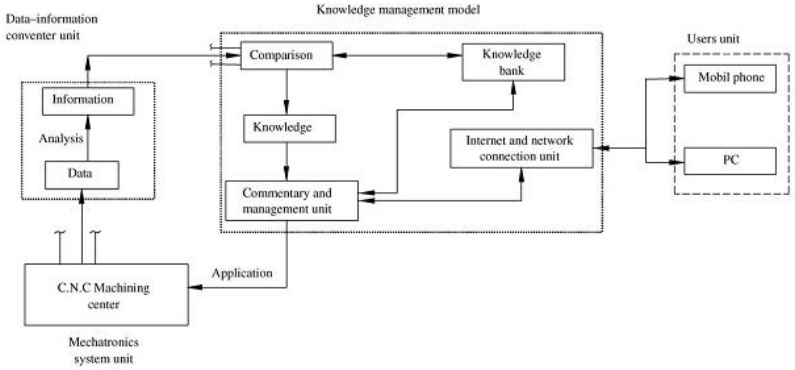

Fig. 1 System diagram of KM of internet-based mechatronic system

application of knowledge management on the mechatronic system. The Internet – based CNC machining center has been considered and its knowledge management model has been prepared. The model prepared has been analyzed for machining performance of the manufacturing system. The architecture of KM model of internet – based mechatronic system is presented in figure 1.

The system presented in this paper consists of KM model (PC), mechatronic system (CNC machining center), user unit (PC, SMS) and data, information converter unit. KM model consists of knowledge bank compare, internet and network connection, commentary and management units. Operations of CNC Machining Center which is the main production unit of the system can be controlled both by the machine tool control panel and by e-mail, network from distant places. Also, the machine tool equipped with a lot of sensors so that the machine tool performance can be monitored and unexpected conditions can be controlled.

Motivated by the literature discussed above, this paper presents a knowledge management structure of the machining system to provide competitiveness of the enterprise.

3. KNOWLEDGE MANAGEMENT IN ENGINEERING

Knowledge discovery in databases (KDD) is the non-trivial process of identifying valid, novel, potentially useful, and ultimately understandable patterns in data. It can acquire implicit and useful knowledge in large scale datasets, and involves an integration of multiple disciplines such as statistics, artificial intelligence, machine learning, pattern recognition, etc. KDD has had great success in commercial areas, and has begun to be used in knowledge acquisition of engineering disciplines. The overall KDD process includes data selection, data preprocessing, data transformation, data mining, interpretation, and evaluation, as shown in Fig. 2 [5].

Defining data, information and knowledge is difficult. It is possible to distinguish between data, information and knowledge on base of external means or from the perspectives of the user.

In [4] it is shown that data are considered as raw facts, information is regarded as an organized set of data, and knowledge is perceived as meaningful information.

Data consists of symbols that represent objects, events, and their properties. Information is data that has been made useful. Information answers who, what, where, when, and how many questions. Information is helpful in deciding what to do, not how to do it.

Knowledge consists of instructions and know-how. Knowledge answers how questions. Knowledge is more than information. Information is data organized into meaningful patterns. Information is transformed into knowledge when a person or an intelligence system reads, understands, interprets and applies the information to a specific work function.

4.KNOWLEDGE MANAGEMENT ON MACHINING SYSTEM

The system shown in Fig. 3 consists of KM model, CNC Machining System, Marketing Knowledge.

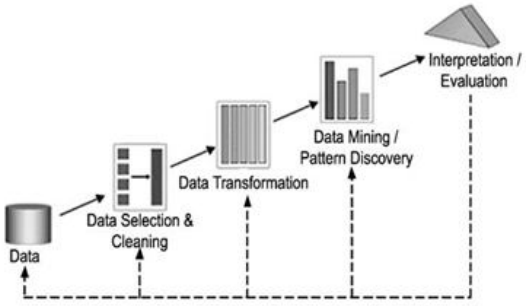

Fig. 2 The process of knowledge discovery

KM model contains very important features of the system.

KM model consists of knowledge bank, compare, modeling and control units. The knowledge bank is formed according to the characteristics of the system.

It is very important that information which concerns with subject, correct, update, concordant must be converted knowledge and they must be stored in this unit. It is necessary that this unit becomes a flexible structure because it can be updated depending on the market dynamics and technical characteristics of the new manufacturing products.

The information coming from the Marketing Knowledge-unit is diagnosed by the comparison unit. Also the comparison unit has information-receive ability from knowledge bank. The essential function of the comparison unit is to compare the information and knowledge with each other. The output information from the comparison unit is new knowledge. This new knowledge has been sent to modeling unit.

Not only does the modeling unit receive information from the comparison unit, it also interacts with the knowledge bank. The output of the modeling unit is the model which is analyzed in the control unit. This unit sends the manufacturing instruction for to the CNC Machining System. Through on-line learning, the output information from the CNC Machining System unit becomes the new knowledge and has been sent to the knowledge bank.

The machining system receives contracts

after the tenders (competitions) generated by the market offer quatations. The competitive control means competitiveness assessment, and based on it, an intervention on the machining system through instructions regarding the progress of the machining process in order to obtain maximum competitiveness. On the other hand, after assessing competitiveness, the management system should enable to develop competitive offer for the tenders. To achieve these two objectives, the competitive control uses the reinforcement learning to get to know the market and the non supervised on-line learning technique to get to know the machining system.

The learning process, in general, is an action in which the machining system can improve its ability to react so that, during subsequent requests, this should take actions more efficiently.

Devising a real-time modeling methodology, based on reinforcement learning (which is a specific non supervised learning technique) of the machining system relationship with the economic environment means that the machining system 'learns' what actions to perform in certain situations, based on the data supplied by the economic environment, so that such actions increase the possibilities of achieving the aim pursued. The system should 'exploit' what it already knows to get profit, but at the same time it must 'explore' the possibility of finding other suitable actions for the future. The machining system should try a variety of actions and then choose those that seem best.

According to the competitive management, regarding the market- machining system relationship by reinforcement learning, from the data supplied by the marketing section of the enterprise (auctions situation), an evolution of the economic environment for a period of time is carried out and an overall modeling is provided on the basis of past events.

Reinforcement learning is to be understood as the machining system capacity to 'learn' in permanent interaction with the economic environment, to inform and update the information about the auctions and to anticipate, before deciding to conclude a contract, the level of costs, profit and which is the best way to act.

Modeling the market- machining system relationship simulates, based on a state of the environment and an action of the machining system, the behavior of the assembly and can predict what will be the next state and the result obtained.

The relationship is used for planning, to make decisions regarding the behavioral modeling of the machining system – market assembly while considering possible future cases before such situations are experimented.

After each possible situation, the machining system will adapt its behavior, so that it tends towards its next most favorable state. By the learning process, the machining system will be allowed to execute a number of actions in accordance with the instructions from the behavioral model operation of the assembly and that action will be selected likely to bring it to the maximum competitiveness state.

5. CONCLUSION

Using and comparing marketing knowledge with stored and updated ones, the machining model is carried out, analyzed and on its basis are generated instructions regarding the progress of the machining process in order to obtain maximum competitiveness.

By modeling and simulations, the manager can decide if the order is accepted and the machining system controlled to satisfy the customer demands.

To achieve these objectives, the competitive control uses the reinforcement learning to get to know the market and the unsupervised on-line learning technique to get to know the machining system.

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