Intelligent System Approaches to Enhance Knowledge Management in Organization: Preliminary Study.

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ABSTRACT

This paper presents a preliminary study which attempts to identify the most adaptable methodology that can be utilized in order to develop Intelligent Knowledge Management Systems. It reveals the elements of Intelligent System to knowledge management in organization, as a preface to the sets of methodologies in AI. By using AI and understanding of human's needs, which is utilizing the workers' external strengths, these will support organizations in gaining competitive advantages in the global market.

Keywords

Intelligent System's elements, knowledge management.

1.0 INTRODUCTION

The successful of an organization is not completely depending on technical supports and high budgets but also the flow of information and knowledge sharing among the workers. Organization must practice good environment of knowledge sharing to enhance the amount of quality workers. There are many approaches and methods that can be applied to support this knowledge sharing activities. When we talk about those activities, knowledge management is a domain that will come through our minds. As knowledge management is about the interaction between technologies, techniques and people, it is appropriate for Artificial Intelligence (AI) to assist the needs. AI is not a new field in computer science yet it gets different meanings from different parties.

Basically, the common definition of AI is – "the study of the formal properties of problem and problem-solving methods with the aim of equipping machines with capabilities compared to a human being" (Aziz, 2003). AI consists of various technologies such as Neural Network, Expert System, Natural Language Processing, Fuzzy Logic, Genetic Algorithm, Intelligent Agent and also Machine Learning and Data Mining. Luger (2002) points out that Intelligent Systems are computer systems that apply any AI criteria.

Basically, this paper is a preliminary study on finding out the most adaptable methodology that can be utilized in order to develop Intelligent Knowledge Management System (IKMS). It reveals about AI pertaining to Intelligent System approaches on how they can enhance knowledge management in organization. The problem statement are discussed in Section 2.0 by comparing Intelligent System and natural intelligence because knowledge management is partly about 'moving knowledge from people's head to a tangible company asset' (McNurlin & Sprague, 2002, p.444). Section 3.0 points out four elements in Intelligent System with related justification about the significance of this approach towards knowledge management. The last section discusses on the findings of the review made on those four elements. It contributes as the preliminary input to develop IKMS.

Intelligent System has been developed to fulfill various requirement and specialization. Those criteria are discussed to understand the elements that are needed and can be combined to develop a better knowledge management system. Basically, Intelligent System has included a single AI technology in the system. Therefore, the capability of the system is limited to certain cases only. By doing the literature on these four significance elements, it gave a picture on a better IKMS that can be developed. It is hope that the findings of this study will assist and can be used as a stepping-stone to boost the interest on developing the

Intelligent Systems, mainly for the knowledge sharing purposes, in future.

2.0 INTELLIGENT SYSTEM VS. NATURAL INTELLIGENCE

As Intelligent System utilizes the AI elements, natural intelligence is basically about human intelligence. With relevance to knowledge management, it is noticed that knowledge workers are the most valuable assets in providing knowledge to the organization based on their natural intelligence.

2.1 Problem Statement

The problem is that knowledge in people's head are very difficult to extract and transfer unless there is a very good approach to do so. This paper focused on problems on both parties, people and systems, which are listed in this pros and cons points by Luger (2002).

First, the Intelligent System is remained unchanged as long as the system's program is not restructured. However, natural intelligence will follow the beholder when he or she changed the work place, getting old and died. Second, the Intelligent System can easily be duplicated and well spread. On the other hand, natural intelligence takes time to be transferred from an individual to another and it is not possible that the expertise transformation will reached full percentage. Third, using the Intelligent System is cheaper for a long term although it may reach a high cost in the early phase. For natural intelligence, the expert usually demands for a high cost to get their services.

Those three criteria look at the good side of Intelligent System. However, there are two criteria that stated the weakness of this system. The creativity of this Intelligent System in capturing that knowledge is limited to the knowledge base that it has. For human, we are free to grasp any knowledge using our senses. Secondly, the Intelligent System is emphasis on certain problem or domain only. However, for human experts, they have their own knowledge that is also supported by their experiences in handling many real-world problems and situations.

2.2 Objective of the Study

The main objective of the study is to find the most adaptable methodology that can be utilised in order to develop IKMS. The main question that needs an answer within this study is; what are the main elements of a good IKMS?

3.0 SUGGESTED METHODOLOGIES

Basically, it is significant for AI to lend its hand to assist knowledge management activities. By implementing Intelligent System as the tool, there are advantageous elements that can enhance knowledge sharing processes among workers in organization. These four elements represent different methodology that included in Intelligent System.

3.1 Utilization of Knowledge-based Repository

The general flow of data shown that the raw data is the first element that then transfers into information, which then utilized and adapted and became knowledge. As knowledge management is precisely about knowledge, it is important to comprise a good data repository in the knowledge management system. By implementing knowledge-based repository, the workers can extract and capture the data more accurate and easier pertaining to the specific requirement.

Ram (1993) claims that knowledge-base is form of rules (if-then rules) that derived for interpreting the data. It is shown in the following Figure 1) on three parts of Expert System:

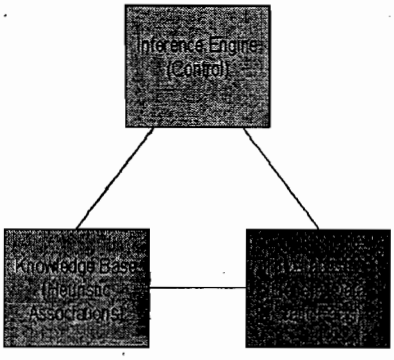

Figure 1 : Three parts of Expert System (Ram, 1993)

Based on Figure 1, it is significance for using expert system in order to capture the expert knowledge, which is tacit knowledge to explicit knowledge that can be utilized even though without the experts around.

Ram (1993) explains that expert system consists of these three parts: database that

contains general data and static facts, knowledge base that is sets of rules with some heuristic element and an inference engine as a controller that is a medium to capture the sets of data that relevant pertaining to the user request. For instance, if the organization implements an expert system on computer troubleshooting, it can be implemented whenever the workers have troubles and the problems may be solved without involving the computer experts. It may seem like an expensive budget in the beginning but the organization must consider it as an investment for a long period plan.

3.2 Personalization Element

E-Learning and E-Training are two ways on how knowledge sharing activities can be done faster and easier. Intelligent Tutoring System (ITS) is a computer-based system that supports teaching and learning processes that used AI techniques to help individuals to learn effectively. It can "modularize the curriculum, customize it for different student populations, individualize the presentation and assessment of the content and also collect data which instructors could use to tutor and remedied students" (Urban-Lurain, 1996).

Based on the above statement, ITS has the personalization element that can focus and suits according to the different capabilities from different users. Therefore, the organization can exploit the system to upgrade the technical workers capabilities to be knowledge workers. In addition, the personalization element also can identify those hardworking and committed workers that have potential to become precious knowledge workers in future.

3.3 Capability to Adapt and Learn

Intelligent System also has the capability to adapt and learn based on particular situation or cases. This can be done by embedding the Artificial Neural Network (ANN) in the system. It is a model that mimics to human neuron system that has ability in manipulating and learning from the set of input or information that the model gets.

In general, Principe *et al* (2000) describe the process in ANN as follow: "First, data is presented, and an output is computed. An error is obtained by comparing the output with a desired response, and it is used to modify the weights with a training algorithm. This procedure is repeated using all the data in the training set until a convergence criterion is met."

Basically, ANN utilizes the previous sets of data and cases in order to predict or forecast the similar situation in future. Using those examples data, ANN can be trained to recognize the pattern of the particular cases, which is called pattern recognition. The following Table 1 (Balci *et al.*, 2003) is examples of pattern recognition cases that can be done using ANN.

Based on the table below, it proved that there are many cases related to knowledge management that need pattern recognition, such as the above cases on financial or marketing data. The share price values data can indicate the organization to buy or sell the share.

***Table 1**: Pattern recognition cases using ANN.*

Input to the network	Output from the network
Input: Digitized Images	**Output:**
of a face	the person's name
Input: Sensor Readings	**Output:**
from an industrial process	the adjustments needed to keep the process within quality and safety limits
Input: Financial or Marketing Data	**Output:**
recent share price values	a buy/sell indicator
personal financial details	the creditworthiness of a customer
exchange rates and inflation trend	the predicted movement of exchange rates in four hours' time
a customer's historical buying patterns	the likely response of the customer to a direct mail campaign

3.4 Manipulating Human Language

One of the importances of knowledge management is to gain knowledge from experts especially the foreigners. Therefore, the workers need to interact and must not passively wait and hope for those experts to learn and explain in our mother tongue. They must be proactive in finding ways to get into their culture and get their reliabilities on the

workers, which finally the experts would please to provide their expertise.

The capability of Intelligent System to manipulate our languages can assist in enhancing the workers confidence to interact with foreign experts. By implementing Natural Language Processing (NLP) technology, knowledge management system will provide the workers with additional elements like dictionary, interactive glossary module and machine translator. NLP is derived to make the computer owns the ability in understanding the natural human languages.

Electronic dictionary applies this method in pattern matching process where the system matches the words that are inquired by users with the words that the system has in the knowledge base. The NLP helps in identifying the root words so the pattern matching will success.

Interactive glossary module also can assist the workers to learn new terms and mine knowledge while interacting with the system. Pattern matching that applies in case-based reasoning that is "another name for "nearest-neighbor" classification. For every input, we find the best matching "case" in the pattern set, and generate a reply based on the associated template" (Wallace, 2003). For instance, there are systems by AI Foundation that implements case-based reasoning by providing users with their required information or knowledge via chatting. One of the systems is capable in managing personal finances of the users as the system revises and understands the user input while the chatting activity is being done (Wallace, 2001). The following Figure 2 is one of the screenshot from the system.

The knowledge sharing activities can effectively be done with good capabilities in mastering other foreign languages. The Machine translator is the engine that can understand both languages that have been set in its programme. To complete a translation process, the system must be able to understand both languages by analysing the grammar part that forming the representation for the texts in that language. Estival (1994) mentions that the system developers need to generate rules that make the machine translator comprises two main components, which are linguistic ability and translation skill. The third way that is used that is simple English grammar checker applies NLP method as this method has capability in understanding the syntax of a sentence. Luger (2002) points out that it is based on a set of rules that can define a grammar for specific type of sentences.

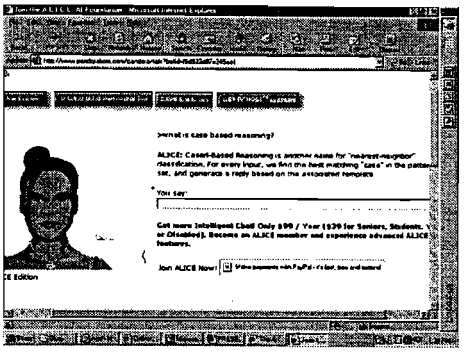

***Figure 2**: Screen shot from ALICE AI Foundation (Wallace, 2003)*

4.0 DISCUSSION AND CONCLUSION

This paper has revealed four significances of Intelligent System, which represents AI, to enhance knowledge management activities in organization. It is about the advantages of Intelligent System that can be exploited but the management must not have over expectation on the ability of the system. They must concern about their human assets, especially the knowledge workers that can derive and implement those systems. Intelligent System cannot possibly do everything as it has its own limitation. For instance, the top management must not blame the system on false prediction or forecasting as the cases may effect with other element such as climates, economical problems or even human problems.

This paper discussed a preliminary study that is the first part of the analyzing phase in developing IKMS. The second section has pointed out the comparison between Intelligent System and natural intelligence that is relevant to understand the problem arose. By understanding each other pros and cons, it may assist in giving ideas on how is the next IKMS will be.

To develop a better IKMS, there are several ways to overcome the weaknesses. First, the system must have a good knowledge-base repository that comprises good sets of rules pertaining to the particular cases. It must contain heuristic element that is not basically on the facts but also based on the other elements and possibilities such as from the past experience and based on the culture of the environment applied. Second, IKMS can implement hybrid technologies to enhance the abilities of the system rather than focusing on a

particular technology of AI. There are current systems that combine two technologies, for instance, Neuro-Fuzzy system combines ANN and fuzzy logic.

This study shows that the best methodology is by combining all four elements of AI and come out with one hybrid methodology that can assured adaptability, personalization as well as user-friendly with the NLP element. However, further research need to be done to make sure whether this hybrid methodology is possible and practically implemented.

As a conclusion, AI is created in order to enhance the human capabilities so that human can understand and appreciate the uniqueness and the advantages that they have compared to other creation. Therefore, Intelligent System can be exploit not to replace human but to assist them, as it needs human powers and capabilities to generate the system. This is also applicable to knowledge management as it is meaningless without proactive human participation.

REFERENCES

Aziz, A (2003). *The Tale of Two Stories: Malaysia-Singapore A.I Success Stories.* In Proceedings of I:SeS 2003 – Intelligent System 2003 Seminar. UUM, Sintok, Kedah: Artificial Intelligence Special Interest Group and Faculty of Information Technology UUM.

Estival (1994). *Reversible Grammar and their Application in MT.* p.296. USA.

Luger, G.F. (2002). *Artificial Intelligence – Structures and Strategies for Complex Problem Solving.* Harlow: Addison-Wesley.

McNurlin, B.C and Sprague Jr, R.H. (2002). *Information System Management In Practice.* Fifth Edition. New Jersey: Prentice Hall.

Balci, O., Gilley, W. S., Adams, R. J., Tunar, E., and Barnette, N. W. (2003). *Online CS Module: Neural Networks.* Retrieved September 12, 2003 from http://courses.cs.vt.edu/~csonline/AI/Lessons/.

Ram, A. (1993). *Artificial Intelligence Lecture Notes*, College of Computing, Georgia Institute of Technology, Atlanta, Georgia. Retrieved September 12, 2003 from http://www.cc.gatech.edu/classes/cs3361_98_winter/expert.txt

Urban-Lurain, M. (1996). *Intelligent tutoring systems: An historic review in the context of the development of artificial intelligence and educational psychology* (Ph.D. Annual Review). East Lansing, MI: Michigan State University. Retrieved December, 24,2002, from http://www.cse.msu.edu/rgroups/cse101/ITS/its.htm.

Wallace, R. (2001). *A Personal Finance "Spreadsheet" in AIML.* Retrieved September 12, 2003 from http://www.alicebot.org/articles/wallace/spreadsheet.html

Wallace, R. (2003). *ALICE AI Foundation.* Retrieved September 12, 2003 from http://alicebot.org/claudio.h