
Prof Pooja Tripathi
Associate Professor ,IPEC, Research Scholar BIT MESRA Ranchi.
To whom all the contacts may be sent: poojatripathi_75@rediffmail.com, trippooja@gmail.com

Dr Jayanthi Ranjan
Professor, Institute of Management Technology, Ghaziabad.

Dr Tarun Pandeya

Dr S.L. Gupta
Professor, BIT Mesra, Ranchi India

Abstract - Almost every day we come across with some situation that needs attention where we apply our general problem solving behavior to address it. In most of the cases we apply our intelligence and sometimes the integrated effort by a group of experts to address the issue. Competence Assessment and performance management of the organization is a complex decision making process. To identify a right candidate for the job various factors are to be considered in the form personality, ability, skills and knowledge and to be assessed in the candidate. Competence Management and Performance Assessment have emerged as a multidisciplinary complex science involving several of skills related to number of technology and the behavioral indicators. The paper explores the method for the information gathering from competence experts and choosing the proper formats by the knowledge engineers to represent the information. The Knowledge is represented in form of data bases, facts and rules using suitable data base management system, programming languages as AI tools to develop the production rules like if and then. First Order Predicate Logic is an advanced form of propositional calculus, which is the simplest form of knowledge representation that comprises of statements. The paper discusses the FOPL representation for the Competence Management System.

Keywords - First Order Predicate Logic, Knowledge Representation, Machine Learning.

I. INTRODUCTION

Almost every day we come across with some situation that needs attention where we apply our general problem solving behavior to address it. In most of the cases we apply our intelligence and sometimes the integrated effort by a group of experts to address the issue. For a fixed situation, we normally arrive at a consensus that can be converted to an algorithm that a machine can apply and solve the problem. This is like your income tax calculation, some statistical inferences or making some predictions based on some mathematical models. Observing the
capabilities of a modern computer a new area of application has emerged in which a machine adopts the problem solving behaviour of a human. This area is known as Artificial Intelligence that takes new approaches to solve problem to a very large domain. Artificial Intelligence, otherwise known as AI, is the study and development of intelligent machines capable of performing complex tasks that require thought and behavior normally associated with human intelligence. Computer programs are a common area of specialization in this branch of science. Artificial Intelligence adapts characteristics of human problem-solving skills and then applies them as algorithms easily comprehended by computer systems. Such systems are routinely and widely used today in robotics, corporations, militaries and homes around the world. One application of this technology is knowledge based systems where knowledge of human experts is utilized by the machines to take decisions. The power of machine comes from the power of its knowledge base. Information acquired from experts is stored in it in different forms and formats chosen by the knowledge engineers. Knowledge is represented in form of data bases, facts and rules using suitable data base management system, programming languages or AI tools using production rules like if and then. Some of the benefits of IF-THEN rules are that they are modular, each defining a relatively small and, at least in principle, independent piece of knowledge. New rules may be added and old ones deleted usually independently of other rules.

A Thinking Machine = A Knowledge Base + An Inference Engine

These rules that are used for knowledge representation is used for machine learning. Machines are trained with these rules with different form of knowledge representation. Machine learning programs examine the database to automatically determine the rules (Michalski, R. S.,1983). Machine learning was first used in agriculture to develop rules for diagnosing soybean diseases (PLANT/ds) (Michalski, R. S. 1980.). A microcomputer-based, machine-learning system has been developed for agricultural problems (Fermanian, T. W.,1988). This system was first used to generate rules for a grass identification system (Weeder). First Order Predicate Logic could also be utilized as a tool for machine learning for decision making in human resource and development.

1.1 Theory about First Order Predicate Logic

First Order Predicate Logic is an advanced form of propositional calculus, which is the simplest form of knowledge representation that comprises of statements. For example All men are Mortal and Socrates is Mortal infers Socrates is mortal.

First-order logic permits reasoning about the propositional connectives (as in propositional logic) and also about quantification ("all" or "some"). First-order logic is symbolized reasoning in which each sentence, or statement, is broken down into a subject and a predicate. The predicate modifies or defines the properties of the subject. A sentence in first-order logic is written in the form Px or P(x), where P is the predicate and x is the subject, represented as a variable. Complete sentences are logically combined and manipulated according to the same rules as those used in Boolean algebra.

First order logic is very well understood, and has a sound mathematical foundation. It combines an expressive language with a sound method of inference in that language. Therefore FOL has been immensely popular in AI's attempt to construct intelligent programs.

First-order predicate logic is composed of statements that are assumed to be true. The statements are composed of:

- atoms (symbols),
- predicates (a function with one or more atomic arguments),
- two substatements joined by a conjunction, disjunction, or implication,
- a negated substatement, and

1. OBJECTIVES OF THE RESEARCH

• Acquisition of Knowledge from Domain Expert on Competence mapping and assessment
• Development of Production Rules for Competence Identification
• Representation of these rules using First Order Predicate Logic
• Utilization of these rules for machine learning

II. RESEARCH METHODOLOGY

To identify a right candidate for the job the main factors to be considered are whether the competencies in the form personality, ability, skills and knowledge are found in candidate or not. If the competencies are found in the candidate, then system identifies the candidate with the help of production rules developed for the identification of the right candidate for performing the right job or if candidate is not identified, then it identifies the competencies gap on the basis of production rules developed for the given job in terms of the competencies requirements. A complete detail of the candidate identification process is acquired from the published reports and experts. Production rules are developed using the acquired information and by the help of experts. First Order Predicate Logic is utilized for the representation of these rules. First Order Predicate Logic is also utilized for developing the inference mechanism. The knowledge so represented by the First Order Predicate Logic is utilized for machine learning. The inference mechanism so developed is also applied for machine learning. A suitable programming language is applied for the process development.

2.1 Knowledge Acquiring through Questionnaire Technique

The questionnaire used, began with a brief introduction about the research study...
which specified that the researcher’s interest in their perceptions of what they think the competent faculty should have. The survey was designed to make it as easy, convenient, less time-consuming and as interesting as possible. The data was collected through the personal meet, focus group interviews.

The questionnaire consisted of two parts: the first section gathers some simple demographic data like age, education, gender, teaching experience and other work responsibilities and so on, followed by the second section which consists of a list of competence attributes to be evaluated by the participant. This section entails attributes of the job itself as well as the environment and the physical location of the work place. The final questionnaire was consisting of 58 items which were chosen from the original pool of 73 items. A 5-point scale ranging from 1: ‘Least Important’ to 5: ‘Most important’ was used to study participants’ assessments of individual attributes and values. On an average the survey took about 12-15 minutes to complete.

2.2 Knowledge Representation in Competence Management and its importance

Competence Management and Performance Assessment have emerged as a multidisciplinary complex science involving several of skills related to number of technology and the behavioral indicators. Every discipline has its own physiology and needs a specific environment and technology for its proper growth. Human Resource research involves a large number of discipline and areas that generates competence profiling, competence collection, competence assessment, and evaluation techniques for the same. If the knowledge management will be done by using IT based tools, it will be permanent information that could be accessible for the employee and the management whosoever is interested in the area. It will minimize duplication, better research planning and management by better access and expansion.

III. FUNCTIONAL DESCRIPTION OF DEVELOPED SYSTEM

The system has been developed for the competence management and performance assessment of the faculty members and can be used by the educational institutions. The development of the proposed system includes the development of different sub-systems. The above section describes the different sub-systems in the developed system as well as its functionality.

1. The knowledge base: Developed to enable the expert or knowledge engineer to enter and save domain ontology and domain rules in an efficient and easy way.

2. Web page interface of the proposed system: For using purposes includes entering ontology, knowledge, and the use of the expert system by entering the options and get the output results with reasoning too.

3. The entire control and operation of the system is done by the inference engine; that is developed using ASP dot net (ASP.NET) and the MS SQL server; which handles the knowledge in format of XML to get the result from the XML file (Knowledge base) that stores the knowledge rules. The main roles of the inference engine are summarized as: It applies the expert domain knowledge to what is known about the present situation to determine new information about the domain. The inference engine is the mechanism that connects the user inputs in the form of answers to the questions to the rules of knowledge base and further continues the session to come to conclusions. This process leads to the solution of the problem. The inference engine also identifies the rules of the knowledge base used to get decision from the system and also forms the decision tree.

The user submits the query through the interface to the system. The system generates a series of questionnaire and takes the input from the user. The inference engine accepts
these queries and takes the input from the user and uses this dynamic information together with the existing knowledge on competence management and the performance assessment. The contents of the knowledge base are used to derive the conclusion. The inference mechanism is carried out in four phases.

Select --- Identify --- Match --- Execute.

During the match stage the contents of working memory is compared with the facts and rules stored in the knowledge base. When consistent matches are found the rules are again compared on the basis of the input given by the user and finally one of the rule is executed on selection of the image.

IV. CONCLUSION

As result of using the developed system, a cultural shift occurred within the educational institution. Faculty members became more accountable to teacher candidate competency attainment and teacher candidates became more attuned to becoming an effective prospective teacher. The Competence and Performance expert system implemented quality principles, utilized the value added approach to management and systematically used data that yielded positive results; it has become a model for other teacher education programs.

REFERENCES


