

# Human Resource Management through AI Approach: An Experimental Study of an Expert System

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## ABSTRACT

This study investigates the impact of an expert system used as a decision aid in a job evaluation system. Both performance outcomes and psychological outcomes are analyzed in an experiment in which the intended users of the expert system served as subjects. The study draws largely from behavioral decision theory for its theoretical support. Although this study examines an expert system within an HRM context in the teaching and learning process, the results are useful as one test of expert system efficacy within the more general area of managerial decision making.

## Keywords

Human Resource Management (HRM), Artificial Intelligence (AI), Expert System.

## 1. INTRODUCTION

In the highly competitive global market the growth of Indian economy substantially depends on its knowledge resources. The demand for skilled personnel is increasing, due to more and more multinational companies entering India for their operations. This has resulted in a surge in the demand for seats in reputed technical institutions. However, the number of institutions supplying the required number of graduates satisfying the needs of the industries happens to be quite low. The gap that exists between supply and demand of graduates has taken as a profitable business opportunity, and participation by the private sector has been very noticeable. The mushrooming of the institutions resulted into imparting a poor quality of technical education which also effected in reducing the competencies of the intellectual capital. There are various issues concerning the setting up and running of technical institutions with the key aspect of quality assurance. The existing quality management process for educational institution utilizes huge information but mostly in a very vague manner. To cater generational changes, a methodical transformation is required addressing the concerns of entire knowledge spectrum. It is the intellectual strength of the employees in any organization that helps it to grow in ever changing global market. In education institution, faculty imparts the content of the curriculum to the students and also enhances their competencies to become employable. The knowledge is created and disseminated through the intellectual creativity and research efforts of the faculty members. This paper is the outcome of the realization of the need for the knowledge based system for the competence management and performance assessment in the educational institutions to improve quality in the teaching and learning process. Expert System, one of the components of ICT, can be proved worthy in organizing and extending the generated information to the stake holders. A web based expert system is developed for Competence Management with special reference to faculty member's competencies, their job descriptions and the behaviors required in educational institutions. The developed system will help in organizing the

knowledge generated by institutions for the substantial growth of quality in the teaching and learning process in the country.

## 2. RELATED WORK

Technical education has seen a remarkable growth in India in the recent years which is reflected through a steep rise in the number of institutions offering graduate and post graduate program. However, the number of institutions supplying the required number of graduates satisfying the needs of the industries happens to be quite low. The gap that exists between supply and demand is taken as a profitable business opportunity, and participation by the private sector has been very noticeable. The education sector provides adequate gains for a business. Stanislav Karapetrovic, (1999)[1] described the environment in which universities operate as rapidly becoming demanding, competitive and globalize. Today, academia faces much the same situation which manufacturing and service companies "in the real world" have been encountering for decades. It seems that universities only with explicit quality assurance and the ability to produce talents needed by the industry will be able to survive in the academic market. He suggested one of the measure as the implementation of meaningful and beneficial management systems, such as the ISO 9000 quality systems and ISO 14000 environmental management systems. Carole Elmonds, (2007)[2] described the education as a process that encourages continual progress through the improvement of one's abilities, and the expansion of one's interests (Bostingl, 1992)[3]. Supporting faculty in their continual efforts to improve instruction so that each student may achieve the mission of all professional development at the P-12(+12 education) and higher education level as well. Fatma Mizikaci, (2006)[4], described quality evaluation in higher education as a site-specific issue such as culture of organizations, values, politics of states and institutions, educational applications, external stakeholders, educational philosophies, although there are some common standards and procedures. Laurie Lomas (2004)[5] described Total Quality Management(TQM) as an all-inclusive quality management strategy that involves support staff as well as academic staff. It focuses on all organizational activities, including teaching, researching, managing, catering and housekeeping. R.A. Alani (2008)[6], demonstrated that close monitoring and accreditation of academic programmes run by the universities in Nigeria will enhance the quality of university education. It is therefore imperative for government, professional bodies, university teachers, and other stakeholders to continue to support the accreditation process. Timothy Manyaga (2008) [7] emphasized on accreditation standards as useful in installing best practices in education and training. However, education and training institutions need to understand and practice them over a period of time to bring about expected results. It is concluded that ensuring quality in education is a multifaceted phenomenon that calls for the joint efforts of all key stakeholders. Ching-Yaw Chen (2007) [8], presented qualified

teachers with effective teaching methods enable quality of higher education. Competence Based Management (CBM) has become a very crucial element in the effective operation of an organization, due to the increased need of the latter to be agile enough to adapt to quick market changes and re-orientation of their business plans. CBM has become the core human resource tool, which enables the enterprise to manage and develop the skills of their employees, recruit the most appropriate candidates, make effective succession planning and employee development plans (Heene, 1997)[9]. G Liddon, (2006)[10], described the competence model as a description of Knowledge, Skills, Capabilities and Behaviors. These traits are required to successfully perform any job or functions. Organizations may use a competence based system as a business strategy to determine how competence model are functionally and multi-dimensionally used for hiring and selection, assessment, performance management, training and development and career development. (Lepsinger, Lucia, 1999)[11] also explained a competence model as a descriptive tool to identify the skills, knowledge, personal characteristics and behaviors needed to effectively perform a role in the organization and help a business meet its strategic goals. Delamare, Winter Tone, (2005)[12], described the core competence as the key organizational resource that may be exploited to gain competitive advantage. An Expert System is a collection of computer programs that uses Artificial Intelligence principles to solve a problem in a specific and narrow domain. It encodes knowledge to solve a problem in the domain that is normally solved by human expert. The expert knowledge is obtained from published information, books, databases and human experts in the domain. The knowledge obtained from different sources is encoded in a form that a machine can understand. This encoded knowledge is stored in the knowledge base and can be utilized by the groups of people interested in the domain. There exists the application of expert system in every walk of life. The applications are broadly categorized on their functional areas. Chatchai Unahabhokha, (2007)[13], aimed to present a fuzzy expert system approach to develop performance measurement systems which have forward looking capabilities. A case-based methodology is used to test the conceptual approach in manufacturing organizations. The developed system enables managers to develop systematic ways to predict future delivery performance and identify potential problems in organization. The predictive ability of the developed system is comparable with the judgement of the manager in the case company. The feedback on its uses and difficulties in its developed process is also reported. Tracy Cooke, (2008)[14], described an innovative information and decision support tool (ToolSHeDe) developed to help construction designers to integrate the management of OHS risk into the design process. The study described a new computer application, currently undergoing testing in the Australian building and construction industry. Its originality lies in the fact that ToolSHeDe deploys argument trees to represent expert OHS reasoning, overcoming inherent limitations in rule-based expert systems. Mark A. Robinson (2007)[15], purposed an integrated three-phase methodology for forecasting future competency requirements more effectively than existing methods. It presents the methodologies for forecasting future competency requirements should adopt structured integrated approaches to improve predictive accuracy. Internet technology can change the way that an Expert System is developed and distributed. For the first time, knowledge on any subject can directly be

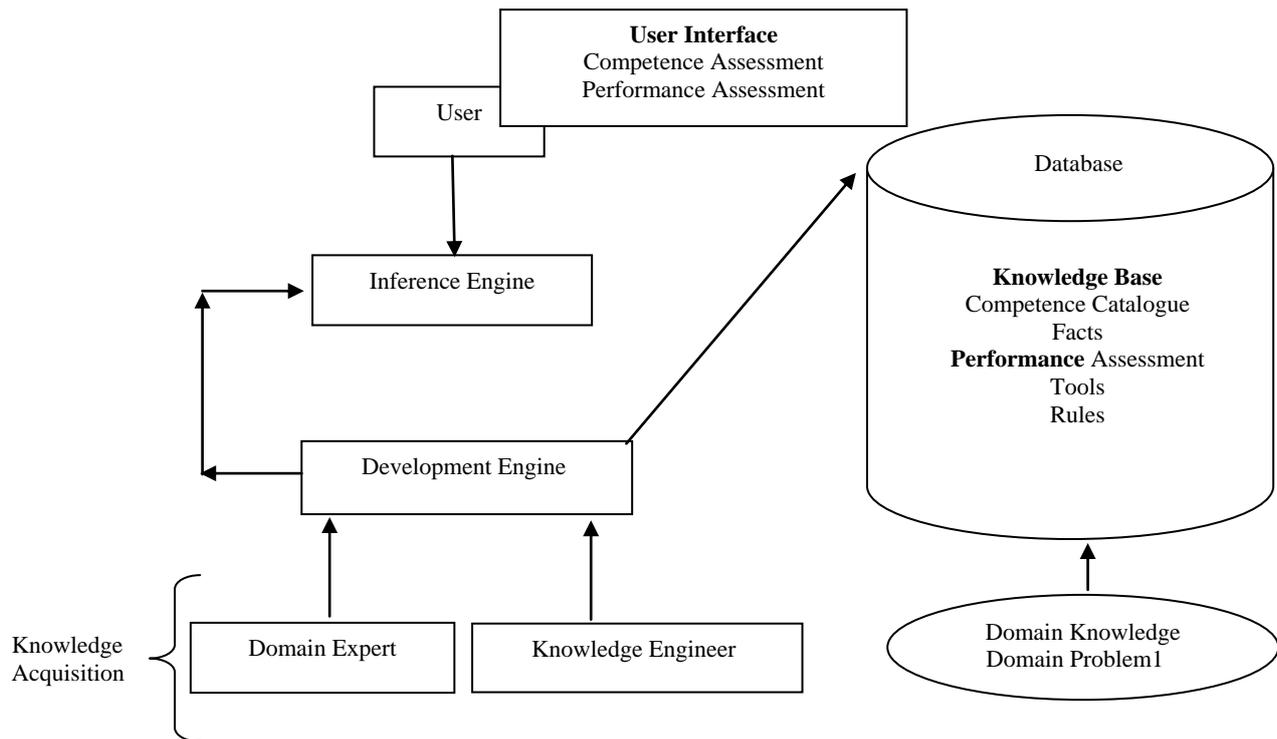
delivered to users through a web based Expert System. Potter (2000)[16], provided some examples of web-based expert systems in Industry, Medicine, Science and Government, and claimed that "there are now a large number of expert systems available on the Internet." He argued that there are several factors that make the Internet, by contrast to standalone platforms, an ideal base for KBS (Knowledge Based System) delivery. These factors include: The Internet is readily accessible, web-browsers provide a common multimedia interface, several Internet-compatible tools for KBS development are available, Internet-based applications are inherently portable, and emerging protocols support cooperation among KBS.

### **3. ROLE OF ARTIFICIAL INTELLIGENCE IN HUMAN RESOURCE MANAGEMENT**

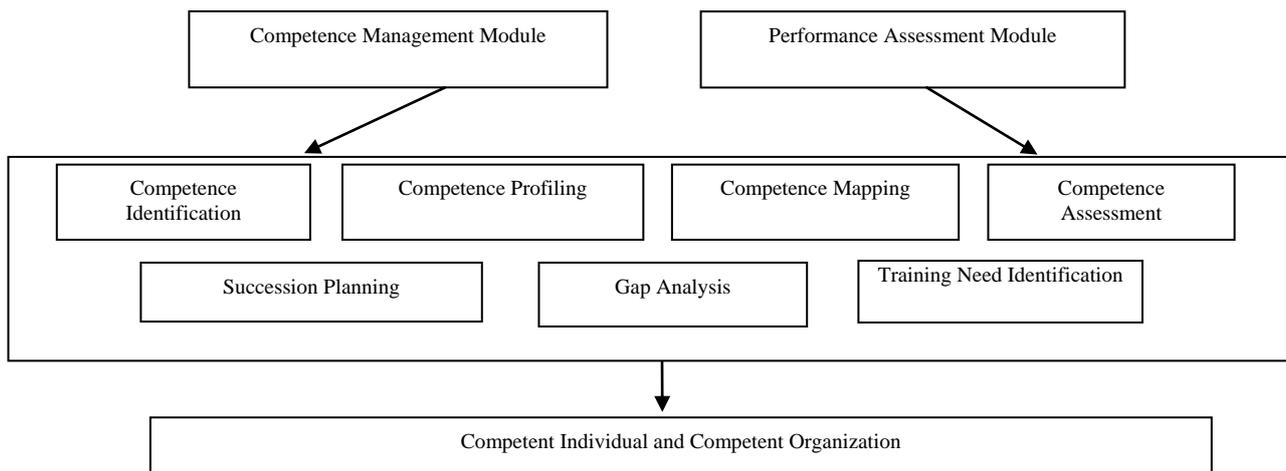
The competence management data in an organization require continuous analysis, interpretation and preparation of databases at various levels of use and applications in different decision-making systems. The need for interaction with the data for the continuous monitoring and identification of individual competencies create the opportunity for application of Artificial Intelligence in general and that of Expert Systems in particular. The development of Expert System utilizes various Knowledge Engineering methods to represent and infer knowledge; software engineering techniques to manage system developments, information and control flows of models and data; intelligent system technology to process and display data.

### **4. DEVELOPMENT OF EXPERT SYSTEM FOR THE COMPETENCE MANAGEMENT SYSTEM**

The developed competence management expert systems focuses on Educational Institution career guidance and succession planning based on the personality, ability, knowledge and skills competencies. The developed system also has an additional human resource function of talent development, retention, and career paths, which is performance management. Competency assessment data gathered in the system contributes not only to develop competence management but also builds a skeleton to performance management in several in ways. The developed system helps to identify the job performance standards and the measures. It conceptualizes the job behaviors required to accomplish the specific job requirements and meet the job responsibilities. It helps us to describe the difference between the average performers and the superior performer in key jobs. The various results obtained through the expert system helps the managers in taking decisions about rewards and recognitions. If, however, a candidate has little individual control over his/her results, outcomes, e.g., in a university pass outs results percentage etc., rewards based solely on results criteria can demotivate superior people. In these cases, the system also captures the information regarding the job behaviors i.e. the overall feed back about the faculty members during the course duration. Competency and job behavior data are usually used for decisions about development. Besides these functions the developed system also helps the managers and candidates by providing and identifying a pool of ready replacements for key jobs, and provide professionals with a clearly defined career path and a process to optimize their advancement. It helps the individuals by providing the clear detailed career paths with key job steps and profiles.



**Fig. 1: Expert System Architecture**



**Fig. 2: Architecture for Competence and Performance Assessment**

The Competence Based Management (CBM) involves generation of a competence model that describes the combination of knowledge; skills and characteristics needed to effectively perform a job/role in an organization and is used as a human resource tool for the selection, training and development, appraisal and succession planning. Identifying and mapping these competencies is a complex process. In any organization determining whether the workforce possesses the abilities for its success is indeed difficult. Likewise, Educational Institutions are also finding difficult to develop competence models that can help to identify the essential knowledge, skills and attributes needed for successful performance in a teaching and learning process by keeping the institution's mission and strategy in mind.

The competence system developed within educational institution expects the following needs:

1. **Faculty Selection System:** Interviews are looking for the same set of abilities & characteristics.
2. **Faculty Training and Development:** It provides a list of behavior and skills that must be developed to maintain satisfactory levels of performance.
3. **Succession Planning:** It focuses on the same set of attributes & skills relevant to success on the positions under consideration.
4. **Performance Management:** It clarifies what is expected from the individuals.
5. **Appraisal System:** It focuses on specific behaviors offering a road map for the recognition reward for recognition reward & possible advancement for the faculty role.

## 5. RESULTS AND DISCUSSION

The developed expert system is used for the competence management and performance assessment process with in the educational institution. The overall application of the developed expert system is to provide the career guidance and help the individuals to align their development to meet the institutions vision.

### 5.1 Functional description of competence management

The developed system has basically three modes of operations (i) Employee Login (ii) Administrator Login (iii) Manager Login. All the logins have the privileges based on their jobs and responsibilities.

The Employee Module has the facility to add the competencies and their score. The Employee Login has the facility to see their self analysis and develop their career plans.

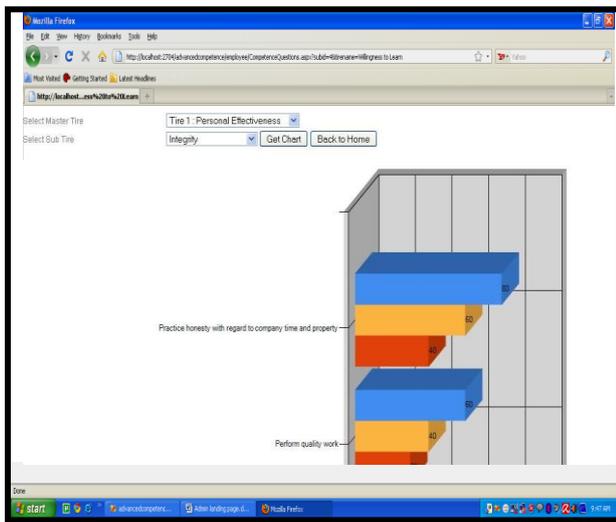


Fig. 3: Results of Self Analysis of the individual

This report helps the individual in finding out their areas of improvements and helps them to analyze their career growth. This report acts a catalyst to find the trainings required and the gap.

### 5.2 Administrator Login

The Administrator has the access to various master screens such as Designation master, Employee master. He also has the right to enter the competence, their predictor and the desired rating for particular level with the help of different tiers masters.

### 5.3 Manager Login

This module is same as the employee login. But have the additional roles and responsibilities. The employee designated as the Manager. He has the responsibility to manage the department and the team of faculty members. He has the responsibility to select the right person for the right job by assessing their competencies and their performances.

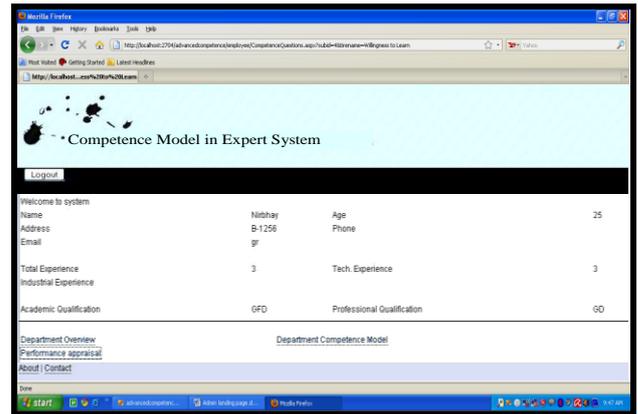


Fig. 4: Manager Login Screen with Performance Appraisal link

The manager has the option for viewing the strength and weaknesses of the candidates even in the tier level by selecting the competency model view of the candidate and can find out the gap and then training can be imparted to the candidate to overcome the weaknesses.

## 6. MANAGER IMPLICATIONS

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.

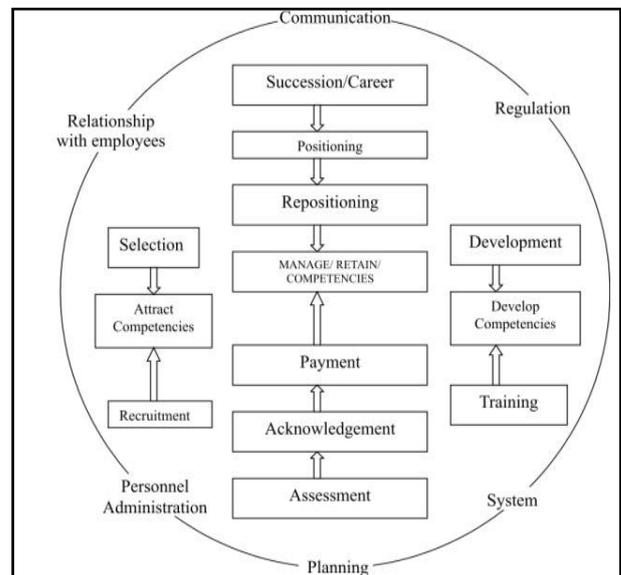


Fig.5: Overall Competence based Management

This research was carried out to address the following problem: “What are the competencies required for the teaching and learning in an educational institution?” This problem was solved when we found the combination of the personality, ability; knowledge and skills competencies in a

proper ratio for a competent faculty to train the students to increase their employability.

## **7. ACKNOWLEDGMENTS**

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