International Journal of Computer and Communication Technology

Volume 2 | Issue 4 Article 2

October 2011

A Competency Mapping for Educational Institution: Expert System Approach

Pooja Tripathi
Computer Science Department Inderprastha Engg College, Ph D. Pesearch Scholar , (BIT, Mesra Ranchi) Ghaziabad, Uttar Pradesh, India., poojatripathi_75@gmail.com

Jayanthi Ranjan
Information Management Area Institute of Management Technology Raj Nagar, Ghaziabad Uttar Pradesh, India., jranjan@imt.edu

Recommended Citation
Tripathi, Pooja and Ranjan, Jayanthi (2011) "A Competency Mapping for Educational Institution: Expert System Approach," *International Journal of Computer and Communication Technology*: Vol. 2 : Iss. 4 , Article 2.
DOI: 10.47893/IJCCT.2011.1095
Available at: https://www.interscience.in/ijcct/vol2/iss4/2

A Competency Mapping for Educational Institution: Expert System Approach

Pooja Tripathi

Computer Science Department
Inderprastha Engg College,
Ph D. Pesearch Scholar , (BIT, Mesra Ranchi)
Ghaziabad,
Uttar Pradesh, India.
Mob :09810297723
email trippooja@gmail.com, poojatripathi_75@gmail.com

Jayanthi Ranjan

Information Management Area
Institute of Management Technology
Raj Nagar, Ghaziabad
Uttar Pradesh, India.
Mobile: 09811443110
email: jranjan@imt.edu

Abstract: This paper presents the development of expert system to assist in the operation of competence management in educational institution. The knowledge based consists of a rule-based expert system for the competence management and subsequent performance assessment. It is generally recognized that an expert system can cope with many of the common problems relative with the operation and control of the competence management process. In this work an expert system is developed which emphasize on various steps involved in the competence management process. The knowledge acquisition to develop this expert system involved an exhaustive literature review on competence management operation and interviews with experienced deans and the competence managers. The development tool for this system is an expert system shell.

Keywords: Expert systems; Knowledge acquisition; Educational Institutions; Competence based Management (CBM).

1. Introduction

Competence Based Management has become a very crucial element in the effective operation of an enterprise or an organization, due to the increased need of the latter to be agile enough to adapt to quick market changes and re-orientation of its business plans. In this situation, competency based management (CBM) become the core human resource tool, which enables the enterprise to manage and develop the skills of their employees, recruit the most appropriate candidates, and make effective succession planning and employee development plans.

Apart from enterprise competency management systems, research is being conducted on focused on the development of CBM system for academia, which can provide possibilities such as the easy integration and mapping of different competency required in academia. Moreover, research efforts have been realized in the development of in faculty domain with respect to academia. However, very few – if any – systems exist that integrate ES approach to CBM for the faculty domain in academia. The competency mapping of faculty or departmental/organizational skill gap analysis with the appropriate learning objects is crucial in order to develop the correct learning paths and consequently the appropriate competencies of faculties in educational institutions.

This paper focuses on the description of a faculty domain based competency management system. The paper also provides an essential overview of the key concepts in competency-based management, relevant research and as well as a methodology that supports the efficient deployment of such a system in an educational institution.

2. The Educational Institution

Education today is subject to the pressures of the marketplace. According to Brown and Duguid (2000), profound changes in competition have made institutions think like business. The Technical schools (T-schools) behave like educational markets and are becoming global to benchmark and internationalize their curricula. Technical schools also are adjusting themselves and developing strategies to respond rapidly to the changes in technologies and increasing demands of stakeholders.

As mentioned by (Sargenti Patrice et.al, 2006), Technical schools are under constant assault by industry, journalists, and academics to justify their existence, relevancy, and effectiveness, given the rapid rate of change in today's world.

Economic liberalization, de-regulation, and privatization policies of the government of India have led to dismantling of barriers, global trade and capital flow, internationalization of production process, and cross-border mergers and takeovers. Today's corporate managers have to work in this globalized environment with entirely new competitive landscape. In order to meet demands of the dynamic business environment, managers need to possess appropriate skills and capabilities for developing competitive strategies. Indian management education, therefore, can not afford to remain insensitive to changes in the role the managers have to play. The focus of the management education should largely be on producing managers for a globalized economy and generating tailor made packages for meeting the pre-requisites of survival in the ultra-dynamic competitive environment. Over the past few years, management education in India has been undergoing radical changes to meet the corporate demands.

Canen and Canen (2002) discussed ways for fostering innovation management and innovation in management education sensitive to cultural diversity. They explored strands in the literature concerning cross-cultural awareness and argued that logistics could help in understanding, sensitizing and taking into account cultural diversity in management education. Technical institutions in India are always challenged to stay relevant both in terms of education and research. In India, technical institutions generate information about students, courses, faculty and staff that includes managerial systems, organizational personnel, lectures details, quality research and so on. This useful information which serves as a strategic input is very useful to any management institution for improving the quality of educational process. Research shows that many information technology implementations in educational institutions fail not because of technology but because of insufficient attention is paid to issues related to institution's culture. Levine (2001); Friedman and Hoffman, (2001).

Robert (2002) explored different issues on management education in today's scenario. The management institutions in India have been making substantial investments into information technologies to meet their goals to increase the effectiveness of operations and information systems. All management institutions in India are using the information about their students to gain insights into bigger issues like students' performance, placements, students' admissions and students' successes. The regulatory bodies, accreditation bodies are seeking more information to measure and evaluate the effectiveness of the institutions (this process is often termed as ratings in India). Unfortunately the management institutions are giving less importance to institutional structure, process and culture. How ever the rapid growth of emerging and cutting edge technologies have led to the increased adoption of new applications that includes ranking the institutions, assessing the quality of lecture delivery, assessing the programs and courses, measuring the performance of students and faculty, tracking research and developments and enhancing faculty development.

In India, in the last three years alone 400 Technical Schools came into existence (AICTE report, 2008). Few Technical Schools have also established collaboration with some western Universities. Today there are over 1800 technical institutions in India. This proliferation of Technical schools raises a serious question on the quality of education. Where will this proliferation leave us? What will be the quality of students which are produced by these technical institutions? This being so, the other side of the story shows the concern for the Technical school professors is how to produce

good managers with the attributes of increased efficiency and effectiveness, ethics, knowledge, fluency to apply management concepts, theories and tools.

One question every body would like to know the answer is will these new emerging Technical schools lead to the next bubble of Indian economy growth? It is not difficult to remember how bubbles occurred during the dot-com era. Some would argue that the existing schools have not delivered at least so far. Nevertheless, there are many Technical schools from world watching with interest, and indeed with amazement, India's recent economic success. The time will likely come soon when others will have to revisit their focus, and it is very likely that these schools will be engaged more with India.

If we look at some recent studies, Lytras et al. (2007) has shown how Information and Communication Technologies (ICTs) provide a wide range of solutions for several critical issues related with the technical of education. Laha Arnab Kumar (2002) has researched the various Technical school surveys conducted in India regarding the quality of technical education. He expressed that rating parameters can not be compared from one technical school to another. Muniapan Balakrishnan (2008) studied Malaysian technical education and explored various issues in effectiveness of technical education. He et al. (2007) researched on the transformation of technical education in China. This type of rigorous research is required when it comes to transformation of Indian technical education.

Expert system in Educational Institution

An expert system is a computer system that attempts to replicate specific human expert intelligent activities (Mockler and Dologite, 1992). Typically, knowledge-based systems enable users with a problem to consult a computer system as they would an expert advisor to diagnose what may be causing a problem and figure out how to solve a problem, perform a task, or make a decision. Like a human expert, such a computer system can extract additional information from a user by asking questions related to the problem during a consultation. It can also answer questions asked by a user about why certain information is needed. It can make recommendations regarding the problem or decision at the end of a consultation, and it can explain the reasoning steps gone through to reach its conclusions when asked by a user (Mockler and Dologite, 1992). Several expert systems have already been developed in environmental engineering of water and wastewater treatment problems. Tong et al. (1980) were among the first to make use of expert system type rules for wastewater treatment plant operation and control, although they do not use the term expert system. Fuzzy logic was used to provide a qualitative interpretation of the quantitative data. Later, Beck (1984) combined these fuzzy logic rules with a dynamic model to control the process. Jenkins and Jowitt (1987) used Beck's rules to develop a simple expert system in prolog for the diagnosis of an activated sludge plant while Berthouex et al. (1987) extended Beck's work by integrating the expert system to a database to provide plant operators with a more powerful software package. Barnwell et al. (1989) evaluated the application of ES in water quality modeling and concluded that ES will increase the level of sophistication and proficiency of the model user. After them a great amount of literature followed describing various schemes, which include knowledge for expert system, and develop consultation for diagnosis, design and process optimization.

According to Gonzalez (1994), expert systems have a number of distinct advantages as well as disadvantages when compared to other solution such as conventional software or human problem solvers.

The advantages of expert systems in the competence management of the institution are as follows:

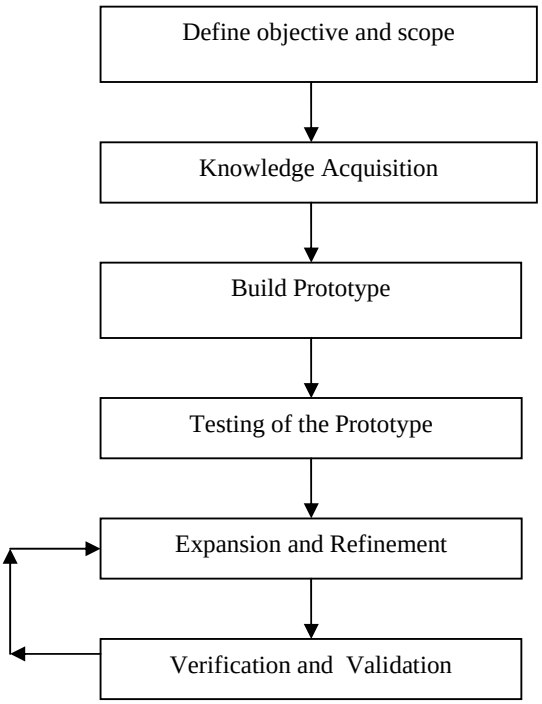
- Expert systems reproduce the knowledge and skills possessed by experts-individuals who are considered to be competence management experts. The ability to reproduce an expert's knowledge allows wide distribution of this expertise available at a reasonable cost.
- As designing an Expert System involves use of heuristic programming where changes are very frequent, the fundamental concept of the separation of knowledge from the reasoning mechanism eases the process of modifying the knowledge.

- Expert Knowledge-based systems, are always consistent in their problem-solving abilities, providing uniform answer at all times. There are no emotional or health considerations that can vary their performance. On the other hand, different human experts often provide dissimilar answers to the same problem. Even the same human expert may provide slightly different answers on various occasions. In some cases, these variations are minor inconsistencies with little or no consequence; in others, they are major flaws resulting from the poor health, emotional disposition, or stress of the expert.
- Expert Knowledge-based systems provide (almost) complete accessibility. They work 24 hours a day, weekends and holidays. They never tire nor take rest.
- Expert Knowledge based systems helps in preserving expertise in situations where the turnover of employees or the expert is very high.
- Knowledge based systems, by virtue of their heuristic nature, are capable of solving problems where complete or exact data do not exist. This is an important feature because complete and accurate information on a problem is rarely available in the real world.

The objective of the study is to develop an expert knowledge based system for competence management of the technical educational institutions. It also expected that the developed system can overcome most of the problems encountered in typically competence based management.

3. Design Methodology

Generally, the various stages of expert system development are (i) task analysis (ii) knowledge acquisition (iii) prototype development (iv)expansion and refinement and (v) verification and validation.



Fig, 5 Steps in developing an expert system.

i. Task analysis

The first stage of developing the expert system involved analysis of the tasks. During the analysis phase, the main objective was for the knowledge engineers to identify and understand the

problem to be solved. The scope of domain in this research is wastewater treatment which consisted several modules. The modules belong in three levels, data level, distributed knowledge level and case based learning module. The details are as shown in Table 1.

ii. Knowledge acquisition

Knowledge acquisition is the knowledge engineering job of acquiring and organizing the knowledge needed to develop an expert system. The job of acquiring and representing knowledge involves organizing and representing the knowledge in a way that ensures an accurate replication of the knowledge and the decision situation under study in a form useful for transferring the knowledge to a computer system. The goal of knowledge acquisition and representation is the transfer and transformation of problem-solving and decision-making expertise from some knowledge source into a form useful for developing an expert system. There are two stages of knowledge acquisition in this research. The first stage involved a knowledge acquisition from engineer interacting with written and other knowledge sources which includes using sources such as books, journals, documents, technical manuals and databases. Table 2 shows a list of books/literature used to acquire the knowledge to develop the prototype. The second stage involved knowledge engineer interacting with domain experts who involved unstructured interview and observation of the experts. The unstructured interviews with several domain experts can be effective in exploring the background knowledge involved in a situation. Observation of the expert involves the knowledge engineer observing domain expert as they (i) perform a familiar task, solve a problem, or make a decision, (ii) deal with a simulated situation, case study, or real world problem, and (iii) describe possible decision situation scenarios that might be encountered on the job.

iii. Prototype development

In this stage, knowledge expertise will be transform into computer programmed. Prototype developments enable testing and refining the concept of a system. At other times, prototypes will be developed of different segments or modules of a system, as the overall system is developed in increments. In developing prototypes, an effort is made to select only the most critical factors and show only their most basic relationship, in order to test the underlying structure and concept of the system.

Rules are written for the knowledge base in this development process. IF-THEN rules are the common way to represent knowledge in current expert systems. The rule contain premises or conditions in the IF clauses, and conclusions in the THEN clauses. IF-THEN rules in expert systems can be modified easily to meet changing needs. Hence, it was easy to update. It also has the capability to ask users questions about information needed to deal with specific problems during consultations.

iv. Expansion and refinement:

This stage required the expert to add more knowledge expertise from interviews, field observation and research publication such as proceeding and journals. The prototype reviewed repeatedly and rapidly until a sufficiently satisfactory prototype is achieved.

v. Verification and validation:

An important step of an expert system development process is the evaluation of the performance of the systems, which involves both testing and validation. It is very important that expert systems are tested and validated before their effective employment in the intended user environment. Many validation criteria such as effectiveness, accuracy, performance, ease of use, adaptability, adequacy, reliability and credibility were considered in this case study. The system is compared to the expert's prediction of the final results to validate the system. Although validation is a prerequisite step before any expert system can be implemented, there does not seem a globally accepted method of conducting this activity.

Table-1 Task analysis

Module	Function
(i)Data level	This level receives all the information from various components of the competence management systems, the competence management, and the performance management. Two categories of information received and stored to the knowledge based system are from: (i) Secondary data taken from case study. (ii) primary data taken from the review of the literature available on the websites and the journals
(ii)Distributed Knowledge Level Competence Identification	Module supervising the operation of the competence gathering and the job identifications.
Competence Profiling	Module supervising the operation of the competence mapping.
Competence usage	Module supervising the Competence Modeling of each roles available in the departments
(iii) CASE based learning	
Performance Assessment	Module supervising the process of the assessment of the individual faculties in the departments.
Gap Analysis	Module supervising the process of identifying the gap between the competencies required and the competencies available in the departments.
Training Need Identification	Module supervising the identification of the training and development programs required to fill the gaps identified
Succession planning	Module supervises all the competence management processes for the succession planning in any department and suggests the heads the steps that should be incorporated in order to cater the future requirements in the departments.

Table- 2 Knowledge source to develop the Expert System

S.No	Domain	Author	Year	Remarks
1	Stock Exchange	William Leigh, Ross High Tower, Naval Modani	2005	Forecasting the SE Comp Index and the interest rate
2	Resource Allocation	Ricardo Moreioa Bastos et. al	2005	Automatic RA
3	Solving the forecasting problem	Tzu Chiang	2005	ART counter propagation neural n/w
4	Voice Analysis	Sung Min Bae	2005	Web based system for the call center customers.

5	Budget Planning	Wu Wen	2005	National Defense
6	Marketing Plans	S. Wesley Changchein	2005	Case Base Reasoning
7	E commerce	Yu Li, Liu Li	2005	Multiple Interest based and content based filtering
8	Transportation Research	Davy Janssens	2005	Markov chain modeling heuristics
9	Product price	Xiaoshuan	2005	Forecasting support system
10	Bankruptcy prediction model	Kyung-shink shin	2005	Support vector machine
11	Comparison of country risk model	Julina Yim	2005	Hybrid NN, clustering, discriminate analysis
12	DSS for computing facility	Ohbyung Kwon	2005	Intelligent DSS for deploying ubiquitous computing techniques.
13	Optimum curriculum for the Schools	Yen Zen Wang	2005	Genetic algorithm based methodology
14	Reduction of the knowledge base of the appln. of the vacuum cleaner	M Kernal	205	Rule based reduction
15	Recommender system	Sunghwan Min	2005	Detection of the customer time variant pattern
16	Order Splitting	Wout Dullart	2005	Evolutionary algo for multiple transport alternatives.
17	Fuzzy cash flow model	Jing Shing	2005	Valuation of the discounted
18	Medicine	Chun-Lang Chang	2005	CBR to diagnostic screening of the development delay children
19	Fault Diagnosis	Qian Yu	2005	Knowledge maintenance modules for the fault finding in the chemical process.
20	Education Systems	Ruben peredo Valderamam	2005	Intelligent Reusable learning objects
21	Pharmaceutical Formulations	Aleksander	2005	Neural n/w as DSS

22	Medical	Inan guler	2005	Automated diagnostic systems for the ECG beats
23	Optimization of emission and the fuel consumption	Yavuz Kilagiz	2005	Fuzzy diagnosis and the advice system
24	Highway construction system	Nang Fei Pan	2005	Impact of the rain on the productivity and the construction activities.
25	Finance	So Young Sohn	2005	Scoring model for the credit guarantee fund
26	Web Shopping Mall	Kun Chang Lee	2005	DSS integrating the VR and avatar
27	Image retrieval	Hun Woo Yoo	2005	ES for the color image retrieval
28	Ecommerce	Yeong Bin Cho	2005	Mining changing of the customer behavior for collaborative recommendations
29	Finance	Kyong Joo Oh	2005	GA to optimize the index fund
30	Data mining	Ismail H. Toroslu	2005	Deductive database using query flocks
31	Simulation	Felix T.S. Chan	2005	DESIGN OF pcb Plant
32	Medicine	Rafael Valencia	2005	Intelligent framework for the robotic assisted surgical operations
33	Stock market prediction	Se hak Chun	2005	Dynamic adaptive CBR
34	Forest Protection	Spiros Kaloudis	2005	Insect identification
35	Data mining	Mu Chen chen	2005	Distribution Centers for the aggregation of the orders.
36	Manufacturing	Hedi Chtourou	2005	Machine selection
37	Recovery system for the broken relics	Ho Seok Moon	2005	Using least square filtering and vector similarity techniques
38	Construction	Abbes Berrais	2005	ES for the earthquake resistant design of reinforced concrete buildings
39	Biological Knowledge management	Hei Chia Wang	2005	Using Gene sequence pattern
40	Monitoring Systems	Bruce Stephen	2005	Unsupervised user modeling
41	Strategic Planning	Wu Wen	2005	KB DSS for the enterprises mergers and acquisitions

42	Diagnostic	Bernd Vindevogel	2005	Analysis of the market basket techniques for the promotions
43	Product concept development	Chun Hsien Chen	2005	product definition and the customization system
44	Petroleum/Process Industries	Matlas Alvarado	2004	Autonomous Agents and Computational Intelligence for managing the applications such as petro data , reservoir characterization etc.
45	Automation system	Francisco P Maturana	2004	Distributed Multiagent Architecture
46	Contigency mnaagment	Leonid Sheemetov	2004	Distributed Multi agent approach
47	Mobile neseted transaction	Luis A. Gama Moreno	2004	For the nomadic teams
48	Linguistic representataion	Ildar Z. Batyrshin	2004	Qualitative dependencies.
49	Financial Prediction and training	Se Hak Chun	2004	Appln to single and multiple markets
50	Ecommerece order selection	Ren Jie Kuo	2004	Fuzzy Neural Network
51	E business	JonnKoh	2004	Knowledge sharing in virtual communities
52	Qa system	Yonggang	2004	Cbr approach
53	Information retrieval	Omar nouali	2004	Semantic web based and the feature based approach
54	Customer segmentation	Hyunseok Hwang	2004	Ltv model for the wireless telecommunication industry
55	Gesture recognition	Tapio Frantti	2004	ES in the user interface terminals
56	E business Architecture	Jaegyong Chang	2004	Organizational Memory for facilitating the knowledge
57	Job Matching	Athanasios	2004	ES for the unemployed
58	Project Allocation	Yeung Cheung	2004	Distributed ES for the dynamic project allocation
59	E commerce	Yoon ho cho	2004	Web usage mining and product taxonomy to collaborative recommendations

60	Process Optimization	Leo Chau Kuang Liau	2004	Using Neural Network
61	Architecture	George Xirogiannis	2004	A fuzzy cognitive map for the urban design
62	Data Categorization	Casper J Fall	2004	Categorization of the german language a patent documents
63	Architecture and planning	So young Sohn	2004	Decision Tree based on data envelopment analysis.
64	DM Knowldege extraction	Rafael Valencia Garcia	2004	An incremental approach to discover the medical knowledge from the text.
65	DM Knowldege Transfer	Minxin Shen	2004	Role relevant process views for disseminating process knowledge.
66	Learning System	Chien Hsing Wu	2004	Building Knowledge structures via knowledge elements interrelations
67	Air Pollutiion Control	Qian Zhou	2004	Intelligent DSS for air pollution control for the coal fired power plant
68	Medicine	Inan Guler	2004	Classification of the aorta doppler signals using variable coded hierarchical genetic fuzzy system
69	Medicine	Fernanado Casas	2004	Fuzzy pulmonary cardio rotary bypass blood pump controller
70	Scoring system for the telecom	Hyungwon Shin	2004	Multi attribute scoring method
71	Fault Diagnosis	Bo sulk yang	2004	Kohonean NN based and CBR
72	Recommender System	Khaled F. Shallaan	2004	ES for the best weight distribution on the ferryboats.
73	E Commerce	Ana Garcia Serranno	2004	Support advanced interaction capabilities in a virtual assistant
74	Recommender system	Yi Fan Wang	2004	Personalized recommender system for the cosmetic industries.
75	Predicting systems	Chi Hsu	2004	CBR for the prediction of the

				outsourcing success
76	Design and construction	Chaochang Chiu	2004	Adapted covering algo for modeling airplanes landing gravities.
77	Tutoring System	Loannis hatzilygeroudis	2004	Hybrid rule based system for the knowledge acquisition and update capabilities
78	Recommender system	Sung sung weng	2004	Feature based recommendation for he one to one marketing
79	Feature selection	Wouter bucknix	2004	Customer adapted coupon targeting
80	Text classification	Sung shun weng	2004	For answering mails various text classification and multiple concepts
81	Relationship management	Inwon kang	2004	Fuzzy cognitive map
82	Medicine	Xue wei wang	2004	Self learning ES for diagnosis
83	Loan management	Yoon seong kim	2004	Misclassification patterns of credit scoring model
84	Information extraction	Nahk hyun sung	2004	Semi structured web pages
85	Warning systems	Tae yoon kim	2004	Ann for the economic crisis warning
86	Selection process (hr)	So young sohn	2004	Classification models for the Sequential flight test results
87	Information system	Chun lang chang	2004	Cbr for the car inf system
88	Equipment selection	Daniel J. Fonseca	2004	KB for the conveyor selection
89	Diagnostic system	Khaleed F. Shaalan	2004	Multiagent approach for ES via internet
90	Assessment system	Feng hsu wang	2004	Fuzzy neural network for item sequencing
91	Stock exchange app	Hyungwon shin	2004	Segmentation of the customers
92	Diagnostic system	Dirk Vna den Poel	2004	Direct and indirect effects of the retails promotions on sales and profits assessments
93	Environmental Emergency Management	Kevin F. R. Liu	2004	Agent based resource discovery architecture

94	Medicine	Seung Hee Ho	2004	Analysis on the risk factors for the cervical cancer using induction technique.
95	Construction Procurement	Ren Jye Dzeng	2004	Intelligent Agent for supporting the negotiation process.
96	Medicine	Michael Glykas	2004	Technological innovations in asthma patient monitoring and care
97	Medicine	Shieu Ming Chou	2004	Mining the breast cancer pattern using ANN and multi variant adaptive regression
98	Strategic Planning	Nam Hong Yim	2003	KB decision making
99	Recommender System	Jedid Jah Jonker	2003	Optimization of customer segmentation and marketing policy to maximize the profitability
100	Recommender System	Jose Mira	2003	Knowledge modeling for the motion detection task
101	Marketing	Shu Hsien Liao	2003	Electronic Catalogue Monitoring
102	Banks	Nan chen hsieh	2003	Data mining and behavioral scoring model
103	Highway design	Lawrence mandow	2003	Assistance for highway design
104	Mining approach	Hsin chang yang	2003	Mining approach on automatic generation of web directories and hierarchies
105	Decision making in marketing	Wei Po Lee	2003	Agent Based decision making in the electronic market place
106	CRM	Zengyou He	2003	Mining class outliers
107	Geographical System	Loannis V.Fillis	2003	In integrated geographical ES
108	Advisory System	K. Nadia Papamichail	2003	Natural language selection
109	Irrigation and Agriculture	Ahmed A. Rafea	2003	Automatic knowledge acquisition tool for irrigation and

				fertilizers system
110	Health care Management system	Ranjit Bose	2003	Knowledge management enabled
111	Cost Estimation	Kyong jae Kim	2003	Hybrid GA and NN approach in activity based costing
112	Solid waste composting	L.C Jayawardhana	2003	ES for Sri Lankan solid waste composting
113	Tutoring System	Richardo Tucho Navarro	2003	ES for teaching mechanical engineering
114	Performance Assessment	Kwai Sang Chin	2003	KB self assessment system for measuring Organizational performance
115	Fault Diagnosis System	Qian Yu Xiuxi	2003	ES for the chemical process
116	Customer service management	C.F. Cheung	2003	Multi perspective KB system
117	Decision Support	Yishai a. Feldman	2003	KB approach for index selection in RDBMS
118	Scheduling System	Yen WEn Wang	2003	Genetic Algorithm method to solve course scheduling problems
119	Performance assessment system	Pei lun hsu	2003	Hybrid of association rule algorithm and genetic algorithm for tree induction for the student course performance
120	Supplier relationship management system	K.L. Choy	2003	CBR , integration of the supplier rating and the product coding
121	Behavior Analysis	Seewon Ryu	2003	Knowledge sharing behavior of physicians
122	Budget Allocation	Chien Hsing Wu	2003	Data mining applied to material acquisition budget allocation for libraries
123	Performance support and the Training System	John W Coffey	2003	Knowledge Modeling and creation of EI tech for the electronic technicians
124	Detailing Planning	John C Yi	2003	ES for the physician

				detailing planning
125	Forest Management system	Amparo Alonso Betznzos	2003	Prediction of the forest fire risk and the fire fighting management
126	Law	Giles Oatley	2003	Crime analysis software using clustering and Bayes net prediction
127	Waste water treatment plant management	Eugenio Fernandez Carrasco	2002	Rule Based Diagnosis and supervision of the plant using fuzzy logic techniques
128	Conflict Management	Oh Byung Kwon	2002	Multi agent coordination co rdination engine to resolve conflict among the functional units of the organization
129	Knowledge Sharing and Knowledge management	Hai Zhuge	2002	A knowledge flow model for peer to peer team knowledge sharing and management.
130	Fish disease Diagnosis	Daoliang Li	2002	Web based ES for the diagnosis of the fish diseases
131	Architectures	Marco A.F. Dsouza	2002	Designing reusable rule based architectures with design pattern
132	Software Development support	Kim Mens	2001	Supporting Software Development through declarative codified programming patterns
133	Knowledge Management	Yogesh Malhotra	2001	ES for the KM
134	Intellectual Capital Management	Brendan Kitts	2001	Transformation form the intangible assets to fitness landscapes

4 Implementation of the Expert System

An expert system shell is selected for this research to develop the prototype. Expert system shells contain such components as inference engine programs, programmed control mechanisms for managing the knowledge base, facilities for explaining how and why conclusion was reached, and capabilities for storing and editing knowledge bases. For these reasons, expert system shells can be easier and quicker to use than programming language. The example of expert system shells are ESIE, VP-Expert and LEVEL5 OBJECT. The expert system shell chosen for this research is Guru Expert

System Shell. Guru ES is selected because it is suitable to use in limited time and has substantial object capabilities. Generally, the knowledge representations in Guru ES involve rule based, frame based and object oriented.

5 Result and Discussion

The expert system in this research is called Competence Management Advisor (CMA) which emphasized on troubleshooting and problem solving in competence management of the educational institution. The system architecture of CMA can be expressed as shown in Figure 1. It is consisted of several interacting subsystems (modules) that can be executed in parallel processing. The knowledge base of CMA consists of two subsystems competence assessment and performance management.

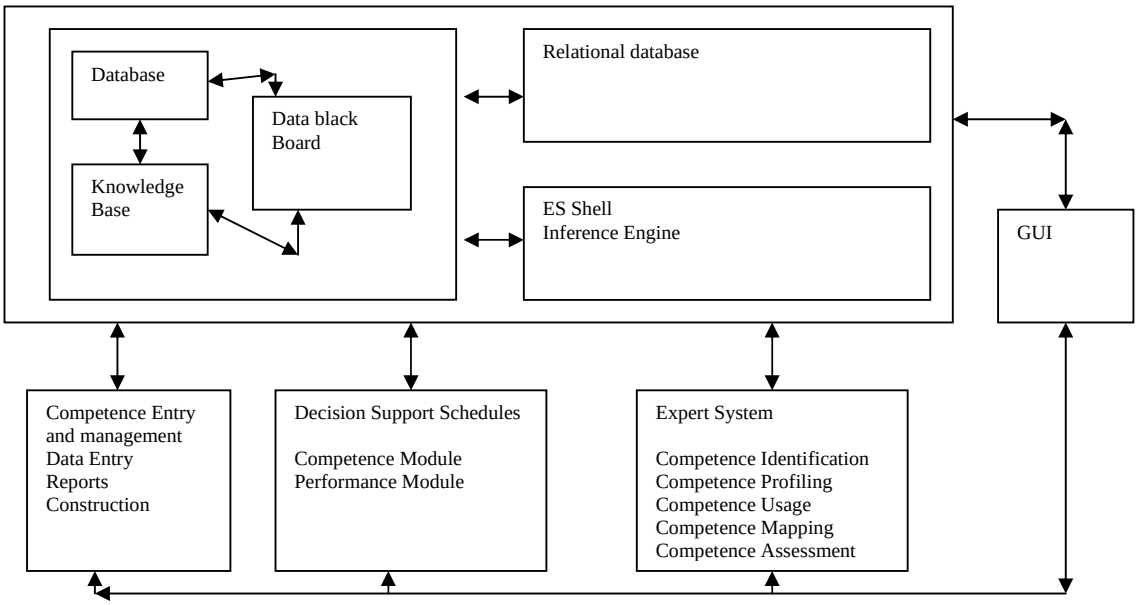
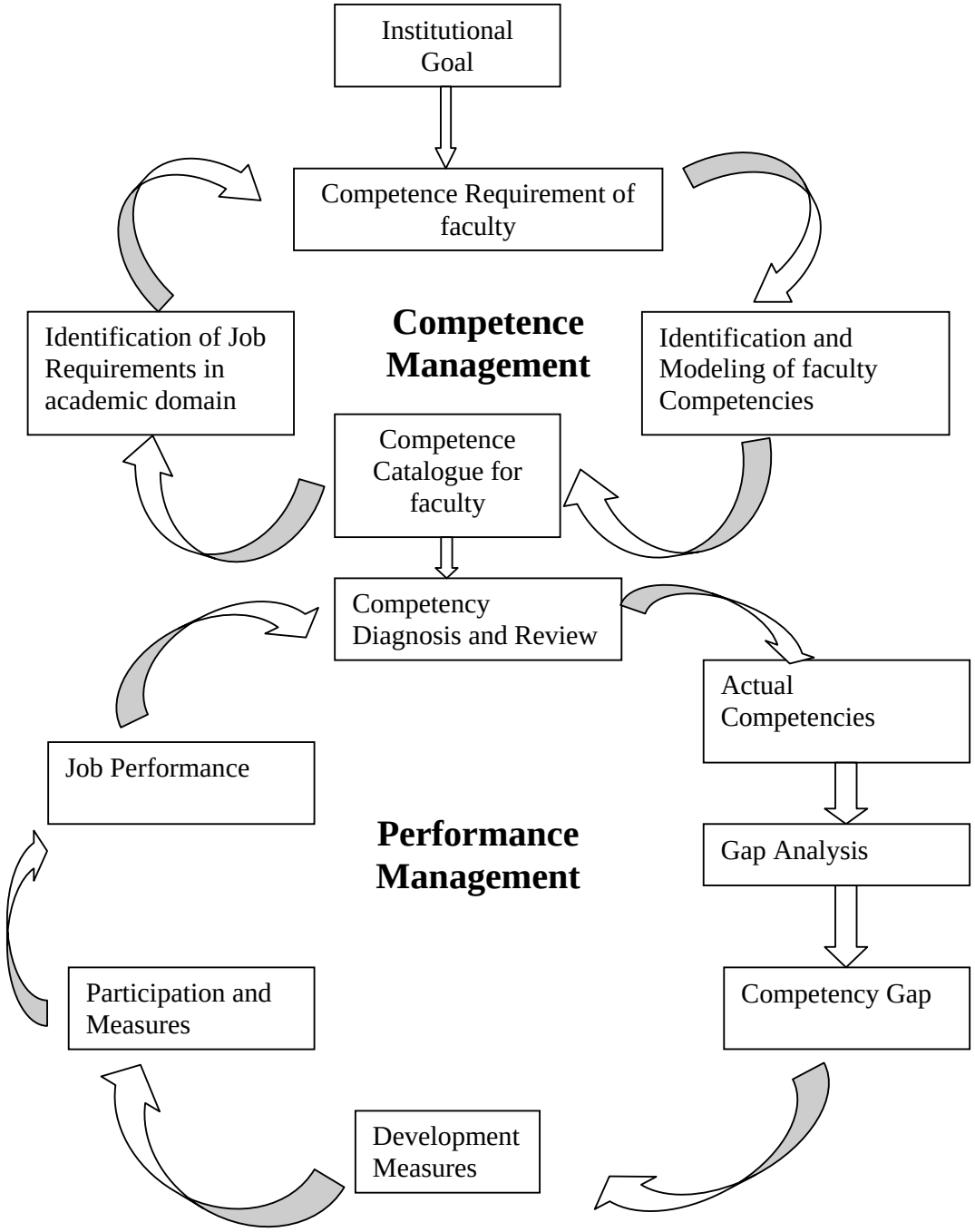


Figure 1 System Architecture

The consultation process with CMA begins when the users interact with main interface of CMA. From the interface, users choose the consultation on competence management module or performance management module. During the consultation, users are required to fill in the data in input data form in certain interfaces regarding their competencies and the task performed by them. The inference engine in the system will search and activate appropriate rules to come out with solutions or recommendations for the competency mapping. This will help them to develop a model for the different roles performed in the academic institution. The consultation process is considered complete when users get required solutions, suggestions and recommendations.



5.1 Competence Management Subsystem

The Competency-Based Management System is a research-supported system based on the primary goal of defining the critical competencies (behaviors) needed for effective and superior individual and institutional performance. A competency catalogue is a set of related behaviors that (1) impact job performance; (2) can be measured against established standards; and (3) can be improved through training and development. Competencies are always described as observable, measurable behaviors, but they are not simply concrete actions that are easily imitated. Instead, competencies can be manifestations of some underlying intent — driven by a person's basic personality, ability, knowledge and skills. It is an enduring characteristic of a person that predicts behavior across many workplace situations in the institutions. For instance, a conscientious faculty is organized, keeps commitments and promises; an achievement-oriented faculty sets challenging goals and takes

calculated risks; a self-confident faculty is able to make sound decisions despite uncertainties. The competency catalogue for a particular position in the institution may be flexible, innovative, and have the ability to lead change the competencies needed for institutional success. We can also define competencies at the functional level. We can argue that the ability to manage conflict, being customer-focused, and interpersonally effective are all necessary job competencies — but whether for particular position in the institution or particular function performed by the faculty member? This would be appropriate for the faculty in the institution but probably the proficiency may vary depending on the position of the faculty in the institution. Such as Assistant Professor may have different requirements to meet the expectations as compare to the lecturers and the Senior Lecturers. This is the key — alignment — that makes the Competency-Based Model most effective i.e. aligned with the business strategy of the institution. The Competency-Based Management system can be used for the successful operations of the institution.

The Competency model maintains a comprehensive list of competencies, which have been proven to be frequent predictors of successful job performance across different types of roles in the institution. Its primary purposes are to bring more detailed definition to the behaviors that are important for institution to achieve its strategic goals and to create a common, objective language for talking about behavioral skills. This is the building block for where your customized competency model that is aligned with your institution business strategy is created.

5.2 Performance Assessment System

Using a Performance Assessment system, links institutions strategy to a set of critical competencies. It becomes a blueprint against all institutional practices. Thus it assures the selection, set and track goals, assesses performance, develop the faculty as per the requirements, and identify institution's future leaders i.e helps in succession planning aligned with overall institution's vision and strategy.

Here are examples of the processes that can be competency-based and strategically aligned if you use this approach:

- Structured interview to improve selection and placement decisions for both internal and external candidates.
- Assessment surveys for identifying candidates with higher likelihood of success in your organization.
- Succession planning by assessing competencies to identify and develop future leaders.
- Talent mapping to assess the current workforce for gaps in critical competencies needed for organizational (and individual) success.
- Training and development program investments targeted on addressing the strategic gaps.
- Team development and performance processes.
- Performance management processes including performance appraisal and performance feedback and coaching.
- Multi-source (360-degree) assessment for development planning.

The limitation to this model is that there may be certain competencies at the functional level that may not be shared at the organizational level — e.g., sales can have critical competencies— interpersonal effectiveness, customer engagement — that may not be evident in the overall organization's business strategy or vision. The way to address this limitation is to use the organization level competency model as the base requirement, then fine-tune competency models for each major function as warranted. This retains the strategic alignment and shared vision of what good performance looks like while allowing the different functional disciplines to add the richness they need to make effective decisions. While using single-job competency models will get you the best fit between competencies and job requirements, the time and resources needed to develop these highly-customized models for a wide-range of jobs can be quite excessive and cannot help but undermine the alignment with the strategy and vision of the organization as a whole.

Developing a Competency Based Management System and the Performance Assessment System in the institution supports the integration of various faculty performance management activities — selection, training, performance management, career development — because all are derived from a common competency model. It serves two complementary objectives: it is directed to the accomplishment of the institution's goals; and to the individual's development. Implementing this strategically driven initiative helps institutions reach their goals by getting the right people in the right jobs that possess the right competencies; and creates a more committed faculty by providing developmental opportunities aligned with these goals. To highlight the major benefits using practical terms. The Competency-Based Model and the Performance Assessment Model have (1) selection benefits — by defining one candidate as more effective and superior than another thus creating a better fit; (2) provides performance benefits — by clarifying and raising the bar on what is expected; and (3) provides developmental benefits — by setting individual goals that employees can strive to reach that are aligned with the business strategy.

6 Design Methodology

IF-THEN Rules taking into account the inputs and the possible diagnosis result, a structure of knowledge-based rules was built up. Each rule is a linguistic expression of the knowledge of the human expert and relates determined values of the input variable that lead to a diagnosis input. There were several of rules designed for the competence management of the educational institutions. The rules are written in IF-THEN rule. Basically, a rule begins with the keyword IF followed by the conditions evaluated. A series of conditions can be linked by the logical operators AND and OR. AND means that conditions on both sides of the AND must be true in order for the rule to pass while OR means that one or both conditions must be true.

6.1 Samples of the rules

Rule 1
IF
AND
THEN
Rule 2
IF
AND
THEN

From the sample of rules above we can see that rules for competence based management generally deal with competence identification, competence profiling , competence usage, and competence assessment.

7. Case Study

The most challenging part of building an expert system is testing. The basic motivation behind testing is to control performance, efficiency and quality of the knowledge base. The goal is compliance with user expectations and system functioning. Validation of an expert system means to make certain that the advice given by the system will be valid in all of its applications. In short, CMA must act like human expert.

In order to validate and verify the CMA, a secondary data has been taken from an Educational Institution, The Sample Technical School (STS); India is rated among the top 10 Technical schools in India. It is widely recognized as a centre of excellence in management, having moulded itself according to the fast changing business and social environment over the last 25 years. STS, boasts one of the best infrastructures in the country which is evident from its consistent high ranking on infrastructure parameters. Its strength lies in its eminent faculty and the quality of its courses that have in many cases, been trendsetters. STS, graduates equipped with energy and drive, a take this same

team spirit and individual skill base to the workplace, demonstrating a passion for excellence and characteristics STS, brand of commitment and go- getter attitude.

A validation has been carried out using those data and the final conclusion of the system was expected and consistent with the predictions of the domain expert.

8. End users

The end users targets of CMA would include heads of the department /deans of the colleges and the faculties of the institutions. Thus, the CMA expectantly can help them to make a quick solution of the problems encountered during the competence management. CMA is user-friendly because users can use CMA at anytime to gather information about competence management. The user-friendly characteristic of system enables the end users to use the system without any knowledge in computer programmed.

9. Conclusion

In order to control competence management process in educational institution, CMA is developed for the diagnosis of competence management process. The objective of the research is to develop an expert system for competence based management process and hopefully can overcome most of the problems encountered in typically competence management and the performance management. The knowledge acquisitions in developing the system involved interviews with the domain expert and literature review from several books. A secondary data has been taken from the Sample Technical School, in order to validate the system and the final conclusion of the system was expected and consistent with the predictions of the domain expert. Thus, the CMA is verified, can be implemented and applied in educational institutions

References

[1] AICTE report. (2008) Retrieved 18 April 2008 from http://www.aicte.ernet.in

[2] Canen A.G and Canen A. (2002) Innovation management education for multicultural organisations: challenges and a role for logistics, European Journal of Innovation Management, Volume 5, Number 2, pp. 73-85(13), Emerald Group Publishing Limited

[3] E A Feigenbaum, “Thae Art of Artificial Intelligence: Themes and Case Studies of Knowledge Engineering (1977), Proceedings of the Fifth International Joint Conference on Artificial Intelligence.

[4] Gonzalez, A.J. and Dankel, D.D. 1993. The engineering of knowledge-based systems: theory and practice, Alan Apt, New Jersey.

[5] Mallach Efrem G. (2002) Decision Support and Data Warehouse System, Tata McGrawHill, pp 424-456.

[6] Mockler, J. and Dologite, D.G. 1992. Knowledge-based system: an introduction to expert systems. Mcmillan, New York.

[7] Peter Jackson. (2000) Introduction of Expert System, Addison Wesley, pp 5-9.

[8] Retrieved from http://wotan.liu.edu/docis/ on 20th December 2008.

[9] Tripathi P, Ranjan J, (2007). “Decision Supporting System for the Competence Management”. Procoeedings of the First International Conference on Information System Technology and Management, 2007.

[10] Tripathi,P., Ranjan J,(2008). “Measuring Competencies using Expert System: Educational Perspective” Journal of Theoretical and Applied Information Technology, 2008.