Faculty Performance Appraisal

Preeti Jain[1], Dr. Umesh kumar Pandey[2]
[1]Research Scholar, Dept. Computes Science, MATS University, Raipur (C.G.) India.
[2]Associate Professor, MATS University, Raipur (C.G.) India.

ABSTRACT
Appraisal as a lively process produces data, which acts as a performance indicator for an individual and subsequently impacts on the decision making of the stakeholder's as well as the individual. The idea proposed in this paper is to perform an analysis considering number of parameter s for the derivation of performance prediction indicator's needed for faculty performance appraisal, monitoring and evaluation. The aim is to predict the quality, productivity and potential of faculty across various disciplines which will enable higher level authorities to take decisions and understand certain patterns of faculty motivation, satisfaction, growth and decline. The analysis depends on many factors, encompassing student's feedback, organizational feedback, institutional support in terms of finance, administration, research activity etc. The data mining methodology used for extracting useful patterns from the institutional database is able to extract certain unidentified trends in faculty performance when assessed across several parameters.

***Keywords*-**Data-Mining, Performance, Analysis

I INTRODUCTION

The applications of Data Mining in the field of higher education can truly be supported with the findings that typical type of data mining questions used in the business world has counterpart questions relevant to higher education [2]. The need in higher education is to mine faculty and students data from various stakeholders' perspective [7]. The methodology adapted to design the system comprises of Phase-I - Finding the key parameters needed for the assessment and evaluation of the faculties [10]. Phase-II – Finding the most appropriate data mining techniques needed to evaluate the performances with substantial accuracy and to derive the indicators, which help in revising the policies of the institute and the intellectual stature of the faculties.

II PHASE I - PARAMETER IDENTIFICATION

The proposed model as shown in Figure – 1 portrays the framework for faculty performance evaluation system. Figure 2 lists the model depicting seventy seven parameters which have been identified for assessing faculty performance. A database consisting of [50 (faculties) * 77(parameters)] was subjected to data mining algorithms for analysis. The faculties were from Information Technology stream from one Institute. Figure – 1 FPMES - Framework

III TRADITIONALAPPROACH

The Faculty Performance if done using the traditional approach as shown in Figure 3B does not identify the hidden patterns in their performances and is not of much use to the management as no clear differentiation emerges in the analysis. The traditional approach uses cumulative values of all parameters taken into consideration. This necessitates using data mining concepts for the performance evaluation so that hidden trends and patterns in faculty performance can be unearthed and can be a benefactor for the management in restoring potential faculties, encouraging faculty growth, honoring and awarding faculties.

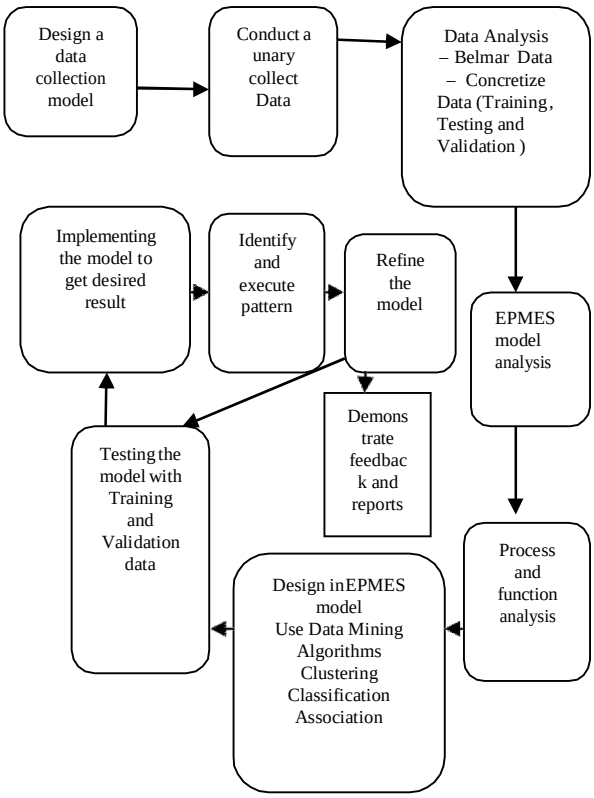

Fig. 1 FPMES – Framework

Evaluation by Management Parameters	Faculty Profile	Educational qualification Industry Experience	
	Teaching	Content Knowledge of the subject Technical Know – how Programming skills	
		Course Design	Appropriate Syllabus Formulation
			Continuous course content improvement
		Instructional Delivery	Syllabus Specific Instructional Delivery
			Continuous improvement in instructional delivery with improvement in course content Follow case based approach
		Instructional Relationships	Support of departmental instructional efforts
			Support from students
		Course Management	
		Class control	
		Guidance to students	Class Advisor
			Living Advisor
			Club Advising
			Summer and Winter coaching
			Student exchange program
			One to one monitoring
		Course organization	
		Years of teaching	
		Thesis advising work	
		Teaching workload	
		Student achievement based on performance exams and projects Project supervision of graduate and postgraduate level	
	Professional Development	Commitment to Pupils and Pupil Learning	The teacher demonstrate commitment to the well-being and development of all pupils The teacher is dedicated in his or her effort to teach and support pupil learning and achievement The teacher trends all pupil equality and with respect The teacher provide an environment for learning that encourage pupils to be problem solving , decision makers , lifelong learners and contributing members of a changing society
		Organizing Professional Learning	The teacher engage in organizing professional learning and applies it to improve his or her teaching practices
			Seeks input from colleagues , consultants or other appropriate support staff and effectively applies it to enhance teaching practices
			Identifies areas for professional growth , attend workshops, appropriate seminar to respond to change in education/policies and practices effectively applies information to enhance teaching practices
			Participates willingly and effectively in professional learning , study groups and in service program to enhance skill development or broaden knowledge

Fig.-2Snap-shot of Performance Parameters

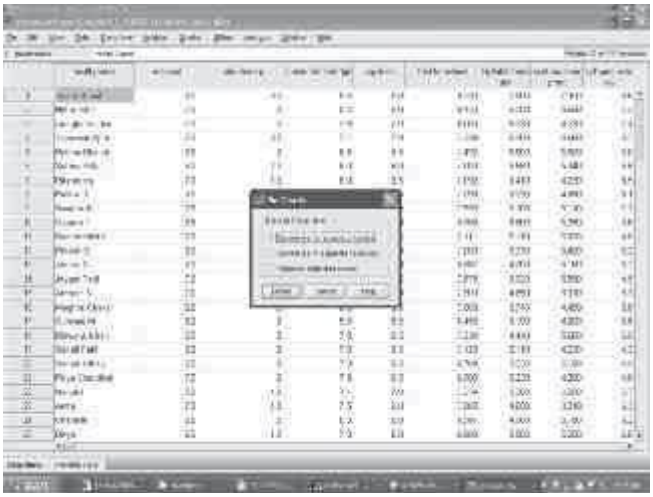

Fig. 3A-Statistics for Pie Chart

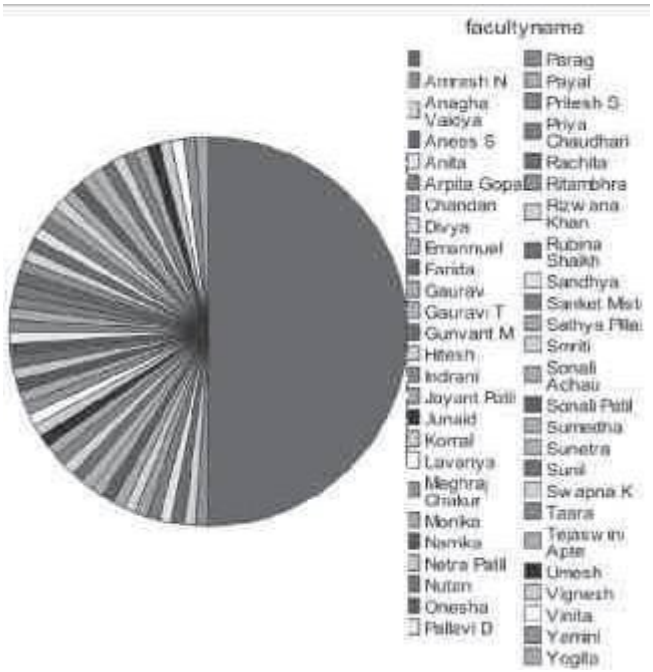

Fig. 3B Traditional Approach

IV PHASE II -OUR APPROACH

To evaluate Faculty Performance using Data Mining Techniques we used PASW Statistics 17.0 to classify the data [12]. The statistical file was subjected to classification using K means algorithm to generate the clusters and the number of cases identified in both the clusters is shown by the results in Table 1.

The pattern recognized was that cluster 1 contains all unique values of faculty performance and cluster 2 contains performance values which are common or occur more than once in the faculty performance database. In Table 2 the distance between the two clusters is moderate as observed from the result and the pattern which is identified indicates that for segment of faculties, performance differs significantly if assessed across 77 parameters which is not the case if few performance parameters are taken into consideration. The statistical file was then subjected to rigorous analysis using Classification and Regression Tree Algorithm (C&R Tree Figure 4) which is a tree based classification and prediction method that uses recursive partitioning to split the training records into segments with similar output field values. Figure 5 shows the interactive tree formation after the C&R tree algorithm was executed on that data set. The interactive tree helps classify tuples as per the parameters taken into consideration. .The Tree Growing Process of C&R tree is as follows: The basic idea of tree growing is to choose a split among all the possible splits at each node so that the resulting child nodes are the "purest"[1]. In this algorithm, only univariate splits are considered. That is, each split depends on the value of only one predictor variable. All possible splits consist of possible splits of each predictor. If X is a nominal categorical variable of I categories, there are 2I-1

possible splits for this predictor. If X is an ordinal categorical or continuous variable with K different values, there are K - 1 different split on X. A tree is grown starting from the root node by repeatedly using the following steps on each node.

(a) Step–1: Find each predictor's best split. For each continuous and ordinal predictor, sort its values from the smallest to the largest. For the sorted predictor, go through each value from top to examine each candidate split point (call it v, if x ?v, the case goes to the left child node, otherwise, goes to the right.) to determine the best. The best split point is the one that maximize the splitting criterion the most when the node is split according to it. For each nominal predictor, examine each possible subset of categories (call it A, if xє?A, the case goes to the left child node, otherwise, goes to the right.) to find the best split.

(b) Step-2: Find the node's best split. Among the best splits found in step 1, choose the one that maximizes the splitting criterion.

(c) Step-3: Split the node using its best split found in step 2 if the stopping rules are not satisfied. The tree has been generated using the expert model with specific stopping criterion. The Gains chart in Figure 6 and 7 shows the performance chart which categorizes the performance depending on the flag associated with the variable faculty performance.

Table 1
Number of cases in each cluster

Cluster	1	3.000
	2	47.000
Valid		50.000
Missing		0.000

Table 2
Distances between Final Cluster Centers

Cluster	1	2
1		22.232
2	22.232	

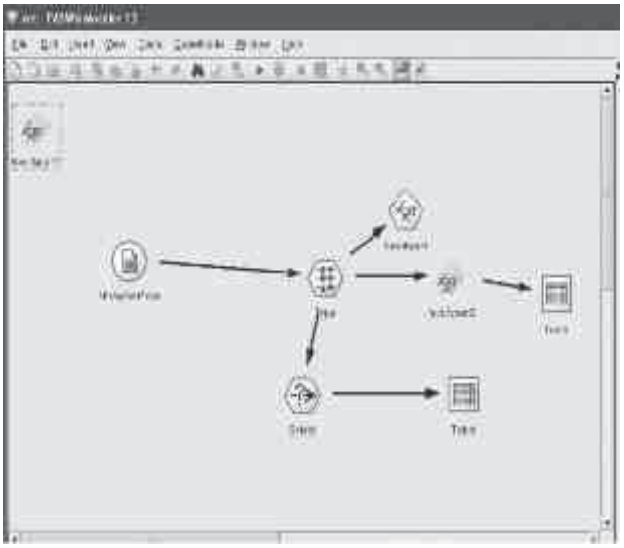

Fig. 4 C & R Tree-Model

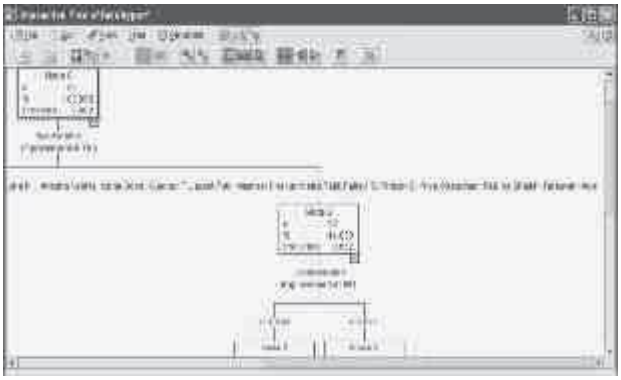

Fig. 5 Interactive Tree

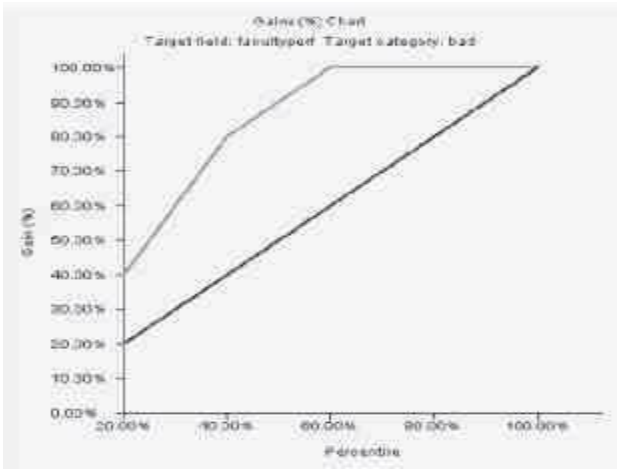

Fig.6 Target Category –Bad

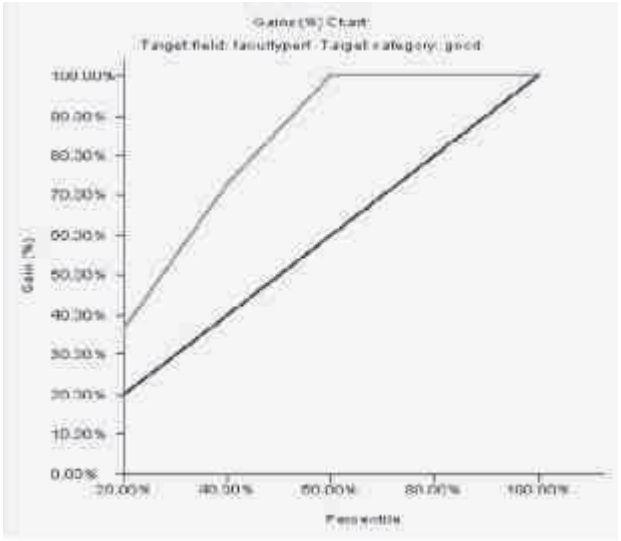

Fig.7 Target Category-Good

Figure 8 shows the Gains chart depicting mean faculty performance measured against the target field faculty performance. Using this classification model it was easy to analyze the known outcomes like a faculty with experience performed better than a novice though while assessing individual cases like faculty acceptance to changes in education policies it was found that newly joined faculties easily accepted the changes while the experienced faculties resisted to the same. Other data mining models like the Segmentation model can also predict the unknown outcomes and patterns of faculty performance.

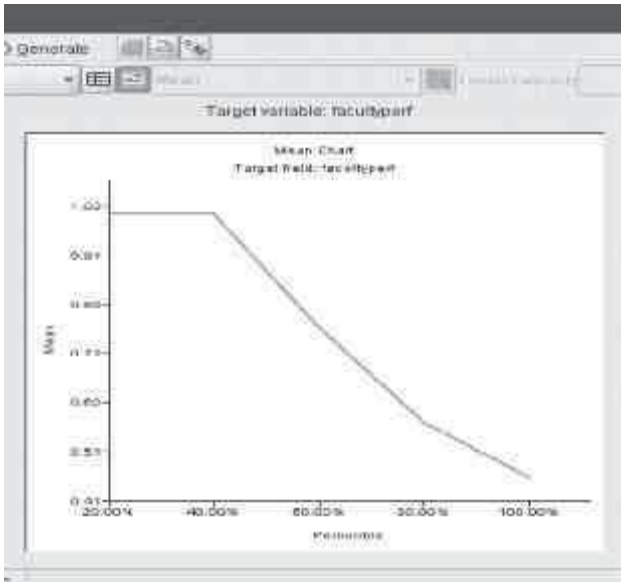

Fig. 8 Mean Chart

V CONCLUSION AND FUTURE WORK

The proposed technique justifies the use of Data Mining to provide effective monitoring tools for faculty performance with considerable accuracy using derived variables which are fine tuned to improve prediction quality. In future we can take into consideration varied segments of faculties across various disciplines and try to find unidentified pattern in their performances using Data Mining models which can help predict unknown outcomes. The reports which will be generated in future will serve mainly to compare changes over time in performances as may be affected by the different predictors that are available plus other well chosen variables.

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