

# Study on feasibility of Uniform Appraisal System

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**Abstract**—An appraisal system is an integral part of any organization having salaried employees like banks, IT companies, educational institutes, etc. Due to change in industrial pattern, creating and forging a ground rule for evaluation process of an organization is important. The main focus is to study the changing pattern, observe it and accordingly predict the quality & performance aspect, this will help to analyze the employee's specification or parameters like growth rate, interest area etc. It ensures and maintain quality of workforce in an organization. The three paramount aspects of the evaluation process are work capacity, moral ethics and knowledge interest. These aspects can be evaluated through supervised or unsupervised data mining algorithms depending upon the case. These algorithms require considerable amount of processing power and time which increases as the data increases. The main focus of this project is to create a common platform of evaluation for all the domains mentioned above. This will also extend the facility of appraising the employees of the domain. We intend to provide multiple methods for all domains so that specific domain can use particular method for their appraisal system.

**Keywords**—Appraisal, evaluation, data mining, employee, domain, organization.

## I. INTRODUCTION

Employee is influential as well as a vital part of any organization. Performance Appraisal is a step where the management finds out how effective it is whether to hire employees or not. It is a process of evaluating the performance and qualifications of the employee in terms of the requirements of the job for which he/she has applied, for purposes of administration including student's placement, selection for promotion, providing any other rewards and any

other growth aspect. Since performance appraisal is a crucial and a time consuming process, our proposed system is an efficient time-saving system to provide better functioning of the organization based on the requirement of the organization.

For the performance evaluation every organization has different approval aspects but the common aspects remain the same according to domains and job types. We have basic three aspects or index that we took into consideration for underlying level.

- A. **Work Capacity Index:** Work capacity index includes four aspects: work quantity (amount of work completed in a unit time), work quality (the level or grade at which a given task/project is performed), work efficiency (how productive is the output of the task performed in a unit time), work method (different adaptive and effective method adapted to improve the project outcome)
- B. **Moral index:** Moral index includes four aspects: collective honor sense (enthusiasm for collective interest), learning spirit (eagerness and consciousness to gain information about political, technical and professional knowledge), work responsibility sense (the sense of responsibility to complete the given work target), other factors (the level of cooperativeness and level of motivation)
- C. **Knowledge index:** Knowledge index includes three aspects: professional knowledge (the amount of knowledge the employee has in its domain), general knowledge (some primary knowledge as well as

some general knowledge in every domain) degree of application of knowledge (the depth and level at which the knowledge can be applied at professional level.)

Our proposed system has proposed cardinal evaluation process for banks, hotels, educational institutes and IT companies based in above mentioned indexes.

## II. LITERATURE SURVEY

In literature[2], the author describes the implementation of an Employee Appraisal system in a Virtual Organization. Virtual Organizations are those organizations having a team of freelancers or employees geographically apart. A combination of 360 degrees feedback and Online Tests using K means clustering algorithm is used for performance evaluation in this case. A 360 degree feedback is a feedback collected from all people with whom the employee interacts with during working hours. It evaluates skills as well as behavior of the employees and helps to identify development opportunities among them. But highlighting only negative aspects or a collective low peer review might escalate the misunderstandings between employees and may adversely affect the work culture, therefore affecting the effective productivity of the organization.

In literature[3], the author tries to overcome some of the shortcomings of 360 degree feedback by using 360 degree feedback twice, also known as 720 degree feedback. It works in two phases: Pre-Appraisal and Post Appraisal. In Pre-Appraisal phase, the first 360 degree feedback is conducted. In Post-Appraisal phase, the results are analyzed and the employee is made aware of his/her positives and shortcomings. A second 360 degree feedback is conducted after a predefined time duration. The results of both the 360 degree appraisals are compared for the final appraisal score. Although more favourable for employees, it is time consuming, expensive and requires active participation from the management as well as senior employees.

In literature[4] describes a system based on data mining classification with two types of appraisal forms: Self-appraisal and Supervisor-appraisal form. In Self-appraisal, the employee has to rate himself/herself on a scale of 1 to 5, with 5 being the highest, on various parameters predefined by the organization. For Supervisor appraisal, only the immediate seniors or supervisors are considered. Immediate supervisors are in a much better position to give an accurate rating on the employee. But along with the above parameters, another parameter called Supervisor reliability is considered. Like a junior employee, even a supervisor may be rated by his/her seniors. A higher supervisor rating may indicate more reliability compared to a lower rating. This is an attempt to reduce bias as the supervisor with low rating won't be considered reliable so the supervisor rating won't be given

more weightage in such cases as opposed to the reliability of supervisors with high ratings.

In literature[5], the author describes an appraisal system for an Educational institute. It uses a combination of self-appraisal and students' feedback. In Self-appraisal, the employee has to rate himself/herself on a scale of 1 to 5, with 5 being the highest, on various parameters predefined by the organization. Students are important stakeholders for any educational institute as success of the institute is dependent on the current students' academic performance. Classification algorithms such as Naive Bayes, Decision Tree Classifier are used on the above parameters. An unbiased students' feedback will help the teacher to rectify mistakes and explore development opportunities which in turn may have a positive impact on the results as well as overall development of the students. A feedback based on favoritism or grudges on the faculties might lead to incorrect scores which in turn may reduce the importance of the system in the eyes of both faculties as well as students.

In literature[6] focuses on Students, Peer and Seniors review. Students are important stakeholders for any educational institutes. Peer review is important mainly for behavioral analysis of the faculty. Seniors review form may be filled by an experienced faculty or the Head of Department. Multiple data mining algorithms including K star, Random Tree, KNN are used. The parameters used for student feedback mostly deal with the teaching quality, punctuality, behavior and other aspects related to classroom lectures. An unbiased feedback from students and peers will help the teacher to rectify mistakes and explore development opportunities which in turn may have a positive impact on the results as well as overall development of the students. Seniors review may be more inclined towards completion of goals. But as in the earlier case[4], student feedback may be based on favoritism or grudges against the faculties. Also, a negative peer review might result in a negative work environment.

## III. PROBLEM STATEMENT

Many of the literatures dealing with Human Resource Management and its issues recognize the importance of performance appraisal system for all types of organization. Organizations need an intact and assured way to channel the behaviors of the employee to optimize the work method adapted. Performance appraisal is one of the important tools involved in this process [6].

The continuous evolution of organization has lead to an impedes growth of any organization, therefore the organizations depends upon the capacity of employees, their performance and their role in the organization and whether they are justified in their work whether it be a profitable or non-profitable organization employees are a vital resource in organization. Various strategies and methods are used to

increase the sustainability of the organization. However a little specific and strategic approach attention should be given in enhancing the appraisal system.

In our proposed system we tend to identify the parameters of each and every specific domain and bring it on a common platform to evaluate the performance. A common platform for appraisal for various domains will not only save costs of conducting the appraisal process but also will take away the burden of maintenance of the system from the client organization. The hierarchy of the type of organization is very important in deciding the parameters, algorithm and overall appraisal process of the domain.

1. Educational Institute: Any educational institutes consist of two levels that includes operational level which include faculties and HOD while the management level includes Dean and Principal. For Work Index the growth and development, work quality, work quantity and work method of operational level is taken into consideration first Moral index of both the level is taken into consideration. Here knowledge index is of utmost importance for both the levels because this is the index which halfway defines the graph of an institute

2. Hotels:

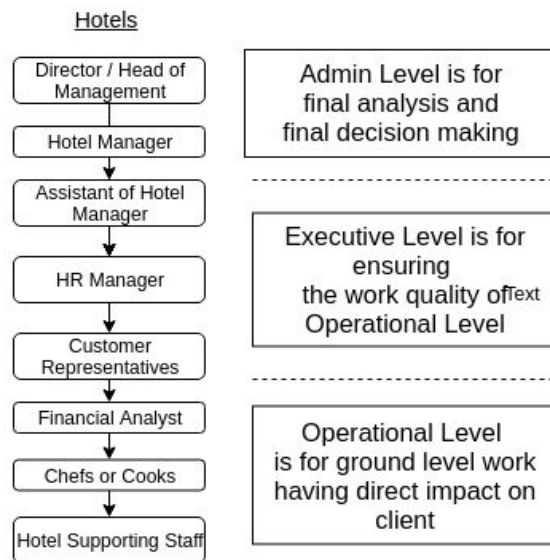


Fig 3.1: Hotel Employees Hierarchy

Any hotel has a basic organization level. So from most of the observed basis our proposed paper has three cardinal levels namely operational level, executive level, and administrative level. The

work index of waiters to the executives will be taken into consideration, considering their work quality as well as work efficiency. The moral index of waiter as well as executive will be considered to sense the work responsibility at any instance of a situation with the guest. Knowledge Index mostly deals with the executives wherein it is important to have the sense as well as the awareness and consciousness to handle a situation from the guest side.

3. Bank: A bank works on two main levels that is operational and management level. Wherein the management level comprises frontdesk employees, bank accountant and financial analyst while the operational level consists of branch manager, director and CEO. Here the work index and moral index will be considered at operational as well as management level. Primarily knowledge index at operational level will be more important than the management level because at the operational level the sense of responsibility as well as professional response sense is more important.

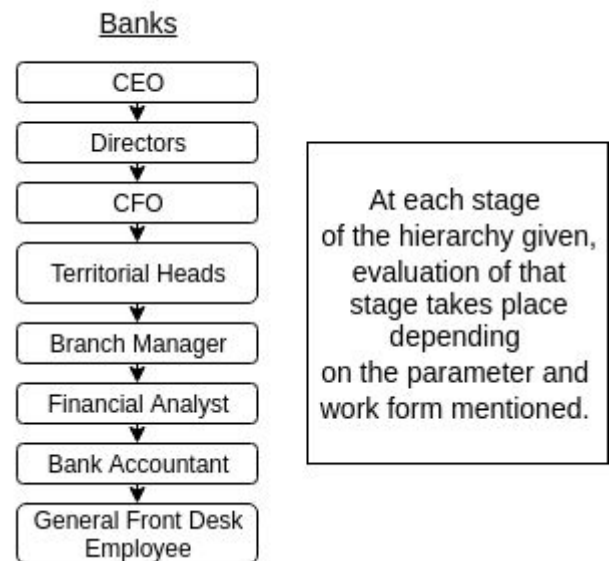


Fig 3.2: Bank Employees Hierarchy

4. IT Companies: The IT companies' hierarchy has also been segregated into two levels i.e operational level which consist of junior s/w engineer to project manager while the management level consists of senior project manager, director and the ceo. For work index, work quantity as well as work method of operational level will be considered at utmost importance. Here also, moral index such as learning

index, work responsibility sense of operational level will be of more importance than the managerial level. For the Knowledge Index, depending upon the circumstances the consideration will be considered accordingly. Otherwise knowledge index of both the levels are considered equally.

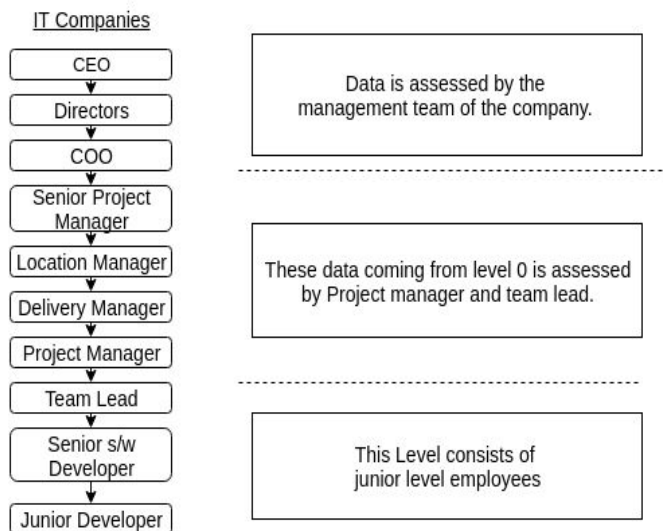


Fig 3.3: IT Company Employees Hierarchy

#### IV. DATA MINING AND ALGORITHMS

Data mining is the process of sorting through elements in large dataset, analyzing frequent patterns, and establishing relations between them using data analysis tools as mentioned in [7]. In simple terms data mining is collecting useful information from any kind of large datasets. These large datasets are referred from warehouses where large amounts of raw databases are present. We store that useful data in a separate database and analyze data patterns in large batch files which is done with the help of data analysis tools. An algorithm is a mathematical procedure for solving a specific kind of problem, similarly a data mining algorithm is a set of heuristics and calculations that create a model from data. This model is created by identifying specific types of patterns or trends [8].

##### A. Top data mining algorithms

There are a number of algorithms that is used in industries now and then. Some of the top data mining algorithms are as mentioned below.

##### 1) K-means:

It's also referred to as nearest centroid classifier or the rocchio algorithm which is the method of vector quantization. K-means is one of the most popular algorithms used for clustering analysis in data mining. The motive is to define a centroid which goes per group and it is better to keep them as far as possible. The next stride is to take each point belonging to a particular cluster and then associate it with centroid. When no point is pending, the first step is completed and an early age group is done. At this point we recalculate the k new centroid and repeat the steps again.

Applications: Areas where k-means is widely used like financial data analysis, retail industry telecommunications, industry biological data Analysis, scientific applications, intrusion detection system.

##### 2) Support Vector Machine:

Support vector machines are also known as support vector network when it comes to machine learning and it is basically supervised learning models that come with associated learning algorithms which then analyzes data and are used for the analysis of regression and classification. An SVM model is created as a representation of examples points mapped in space. It is further mapped so that data are separated into categories, are then divided by a clear gap that is ought to be as wide as possible. Depending upon the dataset SVM can be more accurate and can give precise output at a given stage for a dataset as compared to K-means clustering. Separating hyperplanes is another concept that is used in SVM. In simple terms it can be assumed as lines separating two or more specific featured points from each other [9].

Applications: Some of the real time application of SVM are as followed like face detection, text and hypertext categorization, classification of images, bioinformatics, handwriting recognition, generalized predictive control (GPC)

##### 3) Apriori:

Apriori is an algorithm used for frequent itemset and association rule learning overall transactional databases. This algorithm is preceded by first identifying all the individual items that are frequent in the database and then extending them to larger itemset as long as sufficient those item sets appear often enough in the database. These frequent itemset that are determined by Apriori can be used for the determination of association rules which then highlight general trends. Labeled data is not required as it is unsupervised; as a result, you can use it in many different situations because unlabeled data is often more accessible. Three significant components comprise the apriori algorithm. They are Support, Confidence, and lift. This can be better explained by an example, assume having a supermarket with



1000 customer transactions. We have to find support, confidence, and lift. It is because these are frequently bundle these two items together. Out of 1000 transactions, 200 contain screen protection whereas 300 contain phone. These 300 transactions include a 100 that includes phone as well as screen protection. Using this data we shall find out the support, confidence, and lift [10].

i) Support:

Support is the default popularity of any item. It defines selling of a particular product with respect to the total number of transactions in case of this example. Support is calculated as a quotient of the division of the number of transactions containing that item by the total number of transactions. Hence, in our example,

Support (screen protection) = (Transactions involving screen protection) / (Total Transactions) = 200/1000 = 20%.

ii) Confidence:

Confidence tells us about the likelihood that the customer bought both the phone and screen protection. It can be calculated by dividing the number of transactions that include both phone and screen protection by the total number of transactions considering the example mentioned above. It shows whether the customer will buy a product Y if product X bought. Confidence = (transactions involving both phone and screen protection) / (Total Transactions involving screen protection) = 100 / 200 = 50%. It implies that 50% of customers who bought screen protection and bought phone as well as per the given example.

iii) Lift:

According to our example, lift is the increase in the ratio of the sale of phone when you sell screen protection. The mathematical formula of the lift is as follows. Lift = (Confidence (screen protection -- phone)) / (Support (screen protection)) = 50 / 20 = 2.5. It says that the likelihood of a customer buying both screen protection and phone together is 2.5 times more than the chance of purchasing screen protection alone. If we come across the value of lift less than one, it entails that the customers are unlikely to buy both items together. Greater the value, the better is the combination.

### B. Choosing right data mining algorithm

Choosing the best algorithm suited for a specific analytical task can be a challenging part. Various data mining algorithms can be implemented for the same task, each algorithm produces a different result and some algorithms can produce more than one type of result. For example we can use decision

tree algorithm not only for prediction, but also for reducing the number of columns in a dataset, because the decision tree can identify columns that do not affect the final mining model [5]. Data mining comprises of following types as mentioned below.

- 1) **Classification Algorithms** helps in predicting one or more discrete variables, based on the other attributes in the dataset.
- 2) **Regression algorithm** is an algorithm where numerical variables are predicted continuously, such as profit or loss, based on other attributes in the dataset.
- 3) **Segmentation Algorithms** separates data into groups, or clusters, of items having similar properties.
- 4) **Association algorithms** helps in finding relation between attributes in a dataset. The most common application of the above algorithm is for creating association rules, which can be used in a market basket analysis.
- 5) **Sequential analysis algorithms** summarizes of frequent specific part or an element in data, such as a series of clicks in a web site, or a series of log events preceding machine maintenance.

## V. METHODOLOGY

This application will help merge different domains into one platform when it comes to appraisal and evaluation system. The proposed system is to create domain specific parameters and provide in under one roof. That is, for a particular domain we tend to find the important and common parameter and list it down for that particular domain. For example considering engineering colleges, hotels, banks, IT companies our application will make it possible for having four different evaluation processes one for each domain. Also, customisation of appraisal process to meet the client's demand is one of the goals of a uniform appraisal system. A web based uniform appraisal system which can be accessed from any device having browsing capabilities will work similar as shown in Fig. 5.1. There can be various criteria which can be either pre-defined or customizable according to the type of organization. In [11], the authors have mentioned both traditional methods like grading system, ranking system and modern methods of appraisal like 360 degree feedback and Management by Objectives for educational institutes along with data visualization which will help the faculty as well as higher authorities analyse the performance better. In [12], a research on various parameters for appraisal in Software/IT industry has been carried out which will enable to figure out pre-defined and customisable criteria for uniform appraisal system.

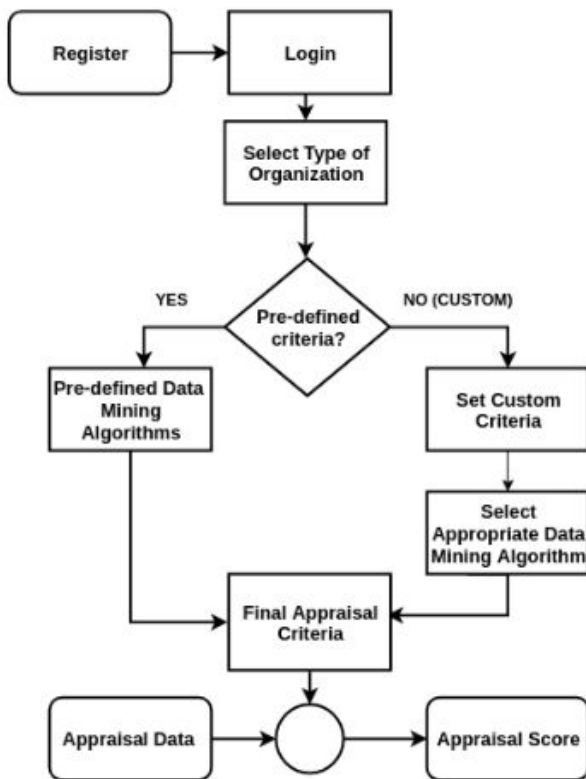


Fig 5.1: Workflow of Web-based Uniform Appraisal system

Considering domain specific example of Engineering colleges, this shall be understood in a better way. In engineering colleges, we have professors HoD, Dean and principal including the management team. Teaching staff will fill the form provided to them with necessary information(parameters) asked leave records, certification, extra curricular activities, etc. These details after filled will then be displayed to the next preceding higher authority. In this case it will be HoD. HoD can check the details and verify it, mentioned by staff. HoD can change details if required in acknowledgment with that particular staff. This data is then proceeded to Dean and Principal. The management team then continuous approving and updating the appraisal as assigned to each staff member. Coming to analysis part, graph and clusters are created according to the form filled by the staff members. These points are plotted in graph and the growth of particular employee is seen through that.

Through graphical representation we can also understand the interest area of particular professor. Coming to analysis part, graph and clusters are created according to the form filled by the staff members. These points are plotted in graph and the

growth of particular employee is seen through that. Through graphical representation we can also understand the interest area of particular professor.

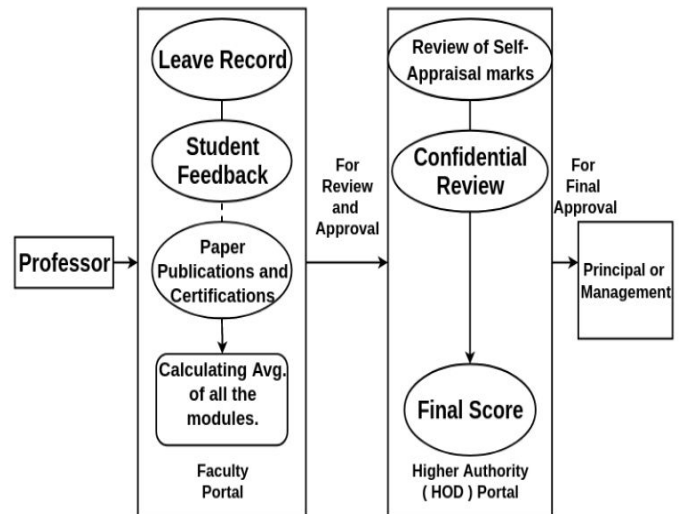


Fig 5.2 Workflow (Engineering Colleges Appraisal system)

## VI CONCLUSION

The main motive behind our work is to study the feasibility of a uniform appraisal system in real world scenarios in multiple domains. Appraisal system is vital in ensuring high productivity in any organization. While organizations are transitioning from the traditional pen-paper based systems to computerised system for appraisal, the lack of a uniform appraisal system results in organizations spending a considerable amount of time and money for developing and maintaining an intra organizational appraisal system. Although an intra organizational appraisal system meets the specific demands of the organization, a uniform appraisal system can enable the organization to try and experiment with multiple ways of appraisal without consuming additional time or money. Multiple algorithms can be used according to the domain, company specific goals and other parameters while considering the most accurate result. A domain specific approach in the uniform appraisal system enables ease of compatibility with appraisal process of multiple domains, thereby covering a large number of organizations.

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