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Increasing the Effectiveness of Performance Appraisal Systems using Integrated Timesheets

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Abstract—Evaluation of the quality of an individual's performance in an organization is modeled using a formal management system known as Performance. Performance Appraisal is based on quantitative as well as qualitative parameters. Adherence to performance evaluation parameters such as a specific work schedule, interpersonal skills and innovation, communication skills and team collaboration that is ability to coordinate well with other associates or employees could be some of the factors or performance measures that govern the performance appraisal result. Evaluating some of the factors involve vagueness, uncertainty and imprecision as they are based on judgment making ability of the reviewer. A timesheet can be termed as a process or method for recording the amount of a time utilized by the employee on each job. If multiple such timesheet are integrated, we could calculate some of the evaluation parameters using soft computing techniques and which help in decision making from available data and experience to provide unbiased decision in performance appraisal. This paper proposes a technique of reducing the vagueness, uncertainty and imprecision by collecting the precise data through the integration of timesheet for an individual. The paper describes the performance evaluation using the proposed system for an individual of an IT organization, considering the vertical as AMS (Application Management Service).

Keywords-Performance, Appraisal, KRA, Timesheet, Performance Measures, KRA rules set, Weighted Rating.

I. INTRODUCTION

From an organizational point of view, there can be identified concepts of ”measurement”, ”analysis”, ”assessment ”, considering the idea that the performance can be defined as a state of competitiveness of the company, that can be reached by a level of efficiency and productivity that ensure a sustainable presence market” [1]. Employee evaluation is used to identify industrious employees and encourage meritocracy by promoting a system of compensation that is commensurate with performance [2]. Human resources with knowledge and competencies are the key assets in assisting firms and/or countries to sustain their competitive advantage. Globally competitive organizations will depend on the uniqueness of their human resources and the systems for managing human resources effectively to gain competitive advantages [3]. Generally employee evaluation includes measuring the things that make the most difference. The problem is that many of the things that make the most difference are not easily quantifiable [4]. The sort of parameters that can be considered includes attendance and punctuality, initiative, dependability, attitude, communication, productivity, interpersonal relationships, organizational and time management, knowledge sharing, safety, etc [5]. Employee evaluation should be fair and unbiased, since employee compensation is based on the results of performance appraisal [2].

II. PROPOSED SYSTEM

We propose a system to reduce the imperfection and vagueness of few of the above performance

measures. We will term the performance measures as KRA- Key Performance Area. Our proposed system is based on the reliability of the timesheet filled by the individual to account his/her daily activities [6].

2.1. Timesheet

A timesheet is a method for recording the amount of a time spent on each job. Customization of timesheet is required to gather the details for the performance measures. A timesheet can be used to store the micro details for the task which could then be used to get the integrated information for the particular task. A few of the micro details could include accounting the total hours allotted for the task/job, the type of task/job, number of appreciations/escalations over the job, Expected delivery of the job, Actual completion time of the job, number of defects raised over the job and individual involved in the job [6]. All timesheet data will be stored using 3NF to avoid redundancy of data, and improve the performance of the proposed system.

2.2. Evaluation Parameters- KRAs

We identify a set of KRAs which are currently being evaluated vaguely to form a vague weighted matrix for performance evaluation. Below are few KRAs that we will evaluate using the proposed system.

2.2.1. Quality of Work: Quality of Work could be calculated by the number of defects obtained in the job. The more number of defects specifies the less quality of work. For multiple tasks, it is less efficient to comment on the quality of work parameter since some tasks could involve zero defects while some less defects.

2.2.2. Timely Delivery: Timely delivery for the task involves the task to be completed and delivered out within the expected time.

2.2.3. Team Collaboration: It involves participation in the team events and activities by an individual.

2.2.4. Attendance: It represents the presence of an individual over duration. The punctuality for an individual could also be accounted in this KRA.

2.2.5. Self Improvement or Trainings: It involves the continual improvement program for an individual. The advancement of technology requires the individuals to upgrade themselves to the latest techniques and be updated with the current knowledge.

2.2.6. Customer Satisfaction and Escalations: The number of escalation and the number of appreciations may be accounted for the customer review for the work.

2.3. Ratings, Associated Scores and Rule set

We consider 5 different ratings- Outstanding, Above Expectations, Meets Expectations, Below Expectations and Poor hat can be assigned to the KRA's. We assign scores on a range 1-5 for the above ratings. The rules for selection of ratings needs to be defined which will help system to identify rating and associated score for the individual [6].

The Outstanding ratings gains the highest score and goes decreasing till the last rating specified. The data for the decision making for the ratings is obtained through the timesheet. We define the rules, in such a way that there would be distribution of the individual performances amongst all the ratings, and not concentrated to a specific rating. Also we define them so that the most challenging rule gets the highest rating and the lease challenging is assigned the lowest rating score [6].

2.4. Mathematical Model Using Set Theory

Consider a system S, which can be defined as,

S -"Calculating the performance score based on performance parameters."

Here, the system calculates score for each performance parameter based on the weight, rating and integrated timesheet data for respective parameter, and generates the total performance score based on the sum of individual scores for the parameter.

For this system S, consider sets as,

K -"Set of all performance parameters, expressed as KRAs."
W-"Set of performance score for each KRA."
R -"Set of Ratings for the KRAs."
So, initially system can be described as,
K - k1,k2,..,kn
W - w1,w2,.,wn
R - r1,r2,.,rn
K', W', R' – NULL
Suppose, now the system initiates for the evaluation process. The system will first try to identify the first KRA and then obtain a rating based on rule set and integrated timesheet data. It will then calculate the KRA score based on the rating and weight for the KRA. Hence after the identification in first iteration the sets will be as follows:
K - k2,k3,.,kn
W - w2,w3,.,wn
R - r2,r3,..rn K' - k1
R' - r1 W' - w1
Similarly we can reach the final state when K, W, R contains NULL and K', W', R' contains initial values of K, W, R respectively.
The equation for evaluation value for an associate can be defined as-
$E_i = \sum_{k=1}^{n} W^k R^k / R^m$
Where, Ei is the evaluation score for associate i.
K represents the number of KRA,
W^k Represents the Weight for KRA k.
R^k Represents the rating obtained by associate for KRA k.
R^m Represents the maximum rating score.

2.5. System Architecture

The system architecture is divided into three layers.
The first layer consists of two modules- Timesheet portal and the Performance Appraisal Portal.

2.5.1. Timesheet portal: It will consist of User Login to authenticate the user. Upon successful login, the users can create tasks, fill and submit the timesheets.

2.5.2. Performance Appraisal Portal: It will consist of User Login to authenticate the user. Upon successful login the users can configure the KRAs and generate the appraisal report.

The second layer consists of three services-Timesheet service, Authentication Service and Appraisal Service.

2.5.3. Timesheet service: The timesheet service will contain the service methods to create tasks, save the time sheet, and integrate the timesheet data.

2.5.4. Authentication Service: The authentication service will authenticate the user during login.

2.5.5. Appraisal Service: The appraisal service will contain service methods to save the configuration of the KRAs and generate appraisal report.

The last layer consists of the database, which will store the task, timesheet, user and appraisal data. The data access layer will contain the LINQ to SQL.

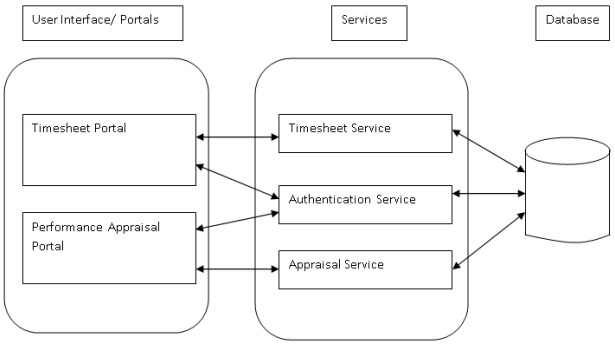

Figure 1. System Architecture

2.6. Algorithm

Inputs-

E- Matrix of Employee Details, K- Matrix of KRA Details, R-Ratings and Rules Matrix, T[i][t]- Matrix of Timesheet.

Output-

E[i][v]- Matrix of evaluation scores for associates.

Step 1: Once the system components are set, we define a date range period 't_1-t_2' based on which we need to perform the performance evaluation of the individual.

Step 2: The System integrates the data filled by an individual for the specified time period to generate the report for tasks.

i.e. for t= t1 to t2, Generate T'[i][t'] using T[i][t]

Step 3: For each KRA, the system collects the data from the report required to set the rating for the KRA.

i.e. for each k, Normalize data to calculate R^k.

Step 4: Based on the rules for the KRA, the system decides the rating to be assigned and the system calculates the KRA weight as follows-

Actual Weight= Weight of KRA*Rating Score/Highest Rating Score

i.e. for k=1 to n Calculate W^kR^k/R^m.

Step 5: Once the Actual Weights are obtained for all the KRAs, the sum of Actual Weights gives the Total Actual Weight.

i.e Calculate E_i using defined equation.

Step 6: The Total Actual Weight is then used to decide the appraisal for the individual as per the organization regulations.

III. RESULT ANALYSIS

3.1. Experimental Analysis

We define the following test criteria for the KRAs as shown in Table I, The ratings and the rule set for each rating for a KRA. The system will integrate the daily timesheet filled in by the user to obtain the report data in the desired format. For results analysis we define a Test Integrated format to the system for an Employee in the Table II.

Table I. Test KRA Data

KRA	Rating 1 (Excellent)	Rating 2 (Average)	Rating 3 (Poor)
CSAT	More than 4	Between 2 and 4	Less than 2
Escalations	0	Upto 2	
Timely Delivery Percentage	100	Above 75	Less than 75

Number Of Defects	0	Upto 2 per task	More than 2 per task
Technical Training	2	1	0
Behavioral Training	2	1	0
Value Add	2	1	0

Table II. Test Integrated Timesheet Data

Parameter	Value
EmployeeID	Emp001
CSAT Rating	4.2
Number Of Escalations	0
Number Of Defects Per Task	1
Number Of Technical Training	2
Number Of Behavioral Training	1
Timely Delivery Percentage	80
Number Of Value Add	0

Table III. System Calculated Results

KRA	Rating Obtained
EmployeeID	Emp001
CSAT	Excellent
Escalations	Excellent
Number Of Defects	Average
Technical Training	Excellent
Behavioral Training	Average
Timely Delivery	Average
Value Add	Poor

Based on the test data in Table II, we now test the proposed system to obtain the KRA ratings for the employee referring to our KRA rule set. The ratings determined by the system can be represented as shown in Table III. The ratings obtained in Table III can then be used in the given algorithm to determine the performance score for the employee. Thus the performance score is based on the soft computing techniques instead of the manual verification as in existing systems.

3.2. Comparison of Existing and Proposed System

Since the performance appraisal for an individual is based on his work in the past duration of time, there are multiple tasks undertaken by the individual. Out of the numerous tasks, some tasks may be well performed while some may not. The decision to weight for these tasks in the existing system solely depends on the reviewer. Moreover sometimes, there might be a situation where in different sections in the organizations have a different view to assign the weights. Thus the existing system has the probability of imperfection while deciding the weights for the performance measures or the KRAs.

The proposed system has a centralized track of the organizations performance appraisal system. It has the ability to track the individual's performance for the task even after a long period of time. It has the ability to solely decide the weight for the KRA and does not change on account of any influences of the reviewer.

We can represent the summary of theoretical context comparison in the Table IV.

Table IV. Conceptual Comparison

Parameter	Existing System	Proposed System
Accuracy	Less	More
Transparency	Less	More
Overhead	More	Less
Cost	Less	More
Dependencies	More	Less

Table V. Accuracy Comparison

Time Interval (Days)	Existing System (%)	Proposed System (%)	Accuracy Enhancement (%)
7	99	99	0
30	95	97	2
90	80	93	13
180	72	90	18
365	55	85	30

The accuracy and effectiveness of the proposed system over the existing system can be proved by the accuracy percentages obtained in the experimental analysis. For the Worst case scenario, considering all the data entered is incorrect, both the system show to same accuracy percentages (around 1%), and same is the case for best case scenario, in which we assume that all data entered is correct where the accuracy percentages for both the systems is 100%. Considering the practical scenario of an incorrect data of 10% passed to the proposed system the accuracy percentages vary with the time

interval selected. For lower time intervals the existing and the proposed system show a small difference in accuracy percentages, but for higher intervals, the proposed system outperforms the existing system.
We can show the following accuracy percentages over the graph as shown below-

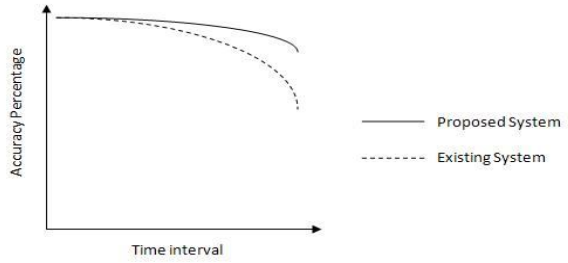

Figure 2.Graphical Representation of Accuracy Performances

CONCLUSION

After analysis of the existing systems for performance evaluation, we find that there are some performance measures that are being calculated with vagueness and imperfection. To overcome this, we propose a system that identifies few of the performance parameters, which could be tracked through the daily filled timesheet data. We propose to integrate the daily timesheet data to provide the required data for performance appraisal of identified performance measures or the KRAs.
After experimental analysis, we now look forward to implement the proposed system in IT organization and compare the feedback results in comparison to the existing system at more precise level. We also look forward to identify commonalities in the performance measures in various organizations to build a common performance evaluation system capable of making unbiased and precise decisions in performance appraisal.

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