

Implementation of Analytical Hierarchical Process to support decisions in Employee Performance Appraisal

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Abstract — The management appraisal of the employee's performance irrespective of any industry lacks industry standards, is not transparent involving excessive variability. Appraisal is ad-hoc and does not have a scientific method for the rating of the employees. A decision support tool if developed will assist software services organization in standardizing and making the appraisal procedure transparent.

Keywords-component; Decision Support System, Performance Appraisal, AHP, DSS

I. INTRODUCTION

Decision support system (DSS) is an interactive computer-based system that acts as an auxiliary system providing support for decision making activities and helping decision makers to identify the problems and solve them and helps in making informed decisions [2]. A well structured decision support system is built focusing on managers who gather and analyses raw data and documents them to create business models and identify areas of defect and takes necessary measures to eradicate the same.

Decision support systems are classified into the following different types:

- Knowledge oriented system capable of analyzing the employee data and allow managers to track the performance of the employees.
- Data and Document driven systems which help in gathering and archiving past performance related information of the employees.
- Communications driven systems which help in the coordination and communication among employees working at distant location but similar projects.

The four different criteria for a good decision support system are defined as follows:

- simplicity
- ease of control

- robustness
- Completion of required details

The three primary components of a decision support system are:

- Language system that focuses on all the relevant messages of a decision support system
- Presentation system for all messages a DSS can use or emit.
- Problem processing system that is used in identification and processing/solving of problems

Decision support system is a highly dynamic system and can be implemented in any environment emphasizing on agile processes. It can be used in multiple segments of the management level for taking decisions related to strategic planning, operational control, management control and operational performance. Generally, DSS is commonly classified as routine or recurring and non routine or infrequent. There should be minimum investment of time to arrive at a generic or routine decision by analyzing the process in detail and programming the observed data using latest technology aids [2].

II. EMPLOYEE PERFORMANCE APPRAISAL

Performance appraisal system is basically a formal interaction between an employee and the supervisor or management conducted periodically to identify the areas of strength and weakness of the employee. The objective is to be consistent about the strengths and work on the weak areas to improve performance of the individual and thus achieve optimum process quality [5].

Employee appraisal is a process which involves personnel from the entire employee hierarchy and highlights and maps

job expectations from both the ends of an organization and then reports results to take decisions [4].

In other words, Employee performance appraisal is an organized and structured process of determining the performance of the employees in an organization and then takes necessary decisions regarding employee appraisal at the end of the financial year. Therefore, it is highly desired that the system is unbiased, transparent and fair.

The objectives for performance appraisal are judged in terms of the following benefits [4]:

- Increase motivation to further improve performance
- Increase self respect and ambition
- Understand the inner feelings of the staff and supervisors
- Enable communication among the participants
- Encourage value added development
- Distribution of the appraisal or rewards transparently
- Justify the organizational goals

Most of the companies do not use computer-based employee appraisal systems. In traditional appraisal system, paper-based appraisal system involves huge amount of manual work, time, which is prone to human errors, not secured, and lacks flexibility. The present appraisal system for the employee's also lack industry standards and is not consistent. Therefore a scientific method is required to analyze the performance and take decisions to make the system transparent and thus keep employees motivated. [3].

III. APPLICATION OVERVIEW

The appraisal system is based on different criteria that will determine the final ranking of the employee and in turn the annual increase in compensation. The various criteria which have been discussed in the paper are broadly classified into two categories namely:

- Technical Skills
- Soft Skills

The technical skills are assessed based on the performance of the employee in four categories namely:

- Domain Knowledge
- Software Knowledge
- Process Knowledge
- Project Specific Technical Knowledge

Soft skills are assessed based on the performance of the employee in two categories namely:

- Interpersonal Skills
- Personal and Hygiene

A. Domain Knowledge

The domain knowledge consists of skills which determine the knowledge of the employee about the domain in which the software company is presently working on. The domain can be anything from finance, banking, supply chain etc. A number of options are listed under this skill to judge the domain knowledge like the number of domain trainings attended, number of domain trainings delivered, number of internal and external domain certifications and finally the number of domain related documents the employee has prepared.

B. Software Knowledge

The software knowledge consists of skills which determine the knowledge about the software platform employees are working on. The software can be anything from mainframes, Java, C++, VB etc. A number of options are listed in this category to judge the knowledge or skills namely the number of software trainings attended, number of software trainings delivered, the number of technical documents the employee has prepared related to the software or the innovation shown by the employee and finally the number of technical symposiums attended by the employee.

C. Process Knowledge

The process knowledge consists of skills which determine the knowledge of the employee about the process as a whole. The process knowledge category includes level of coding skills of the employee at the same time adhering to the standards followed by the firm. Also, special credit is given for the use of new coding techniques. The number of process trainings and audits attended is also one of the major criteria to assess employee performance.

D. Project Specific Work

The project specific work consists of all the activities performed by the employee related to the project work. This includes criteria like the number of project the employee has worked on, the duration and the team size of each of the project. Also the total number of lines coded (KLOC or SLOC); number of defects found and fixed, number of client appreciation mails received, awards and recognition and finally value additions provided to the clients are considered as important aspects of the performance appraisal process.

E. Interpersonal

Interpersonal skill emphasizes on team work and communication skills. The inclination of the employee towards team work is determined by the participation shown by the employee in group activities and the level of co-operation shown by the employee in team related activities. The communication skills of the employee is determined by the presentations given by the employee which includes both internal and external presentations, the efficiency in writing mails to the clients or to peers and also includes the interviewing skills.

F. Personal and Hygiene

Employees are assessed based on criteria like punctuality, personal hygiene, respect for people and the number of leaves exceeded as per the company standards and policy.

IV. ANALYTICAL HIERARCHICAL PROCESS

AHP was developed by Thomas Saaty. This approach includes several hierarchies of criteria which resemble a Decision Tree [1] Pair wise comparison of attributes is done first and the weights for each attribute are obtained. The scores given by the manager for each employee for each attribute is used to prioritize the employees against each attribute [6] [7]. Then the overall priority weight (score) for each employee is calculated. The case study of an Employee Appraisal System in a Software company is used to illustrate the AHP calculation as shown in Figure (1).

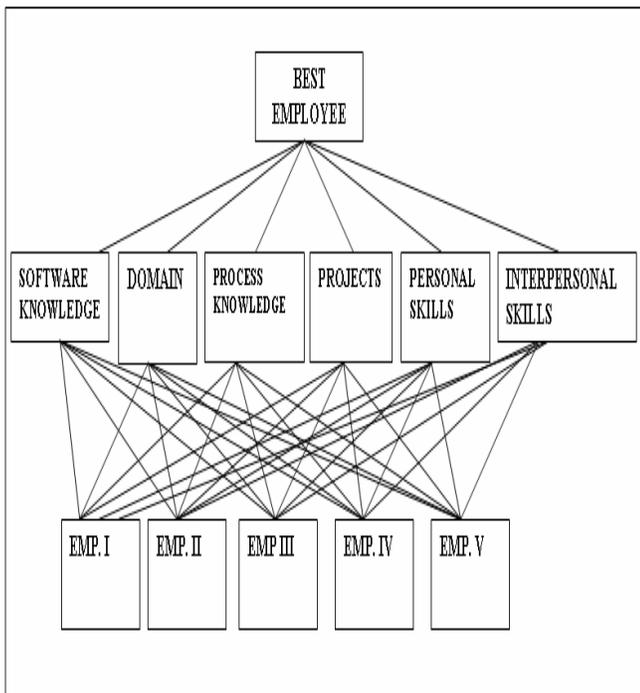


Figure 1. Decision tree of an Employee Appraisal System

A. Determining the relative importance of attributes

Saaty’s suggested numbers to express degrees of preference between two elements are used the same for pair wise comparison of attributes [7]. For example since technical is strongly more important than personal, a score of 5 is given for technical Vs personal. The reciprocal score of 1/5 is given for personal Vs technical as shown in TABLE I.

TABLE I. TABLE REPRESENTING RELATIVE IMPORTANCE OF PERFORMANCE APPRAISAL ATTRIBUTES

	Technical	Domain	Process	Personal	Interpersonal	Project Specific
Technical	1	3	4	5	5	1
Domain	1/3	1	2	3	3	1/3
Process	1/4	1/2	1	3	3	1/5
Personal	1/5	1/3	1/3	1	1	1/5
Interpersonal	1/5	1/3	1/3	1	1	1/5
Project Specific	1	3	5	5	5	1
	$\sum = 2.98$	$\sum = 8.17$	$\sum = 12.67$	$\sum = 18$	$\sum = 18$	$\sum = 2.93$

B. Normalized matrix of paired comparison of attributes

Each cell is divided by the sum of that particular column in the previous table to obtain the normalized table. As shown in TABLE II., the average of each row is calculated to calculate the weight or relative importance of each attribute.

TABLE II. NORMALIZED STRUCTURE OF PAIRED COMPARISON OF ATTRIBUTES

	Technical	Domain	Process	Personal	Interpersonal	Project Specific	Average
Technical	0.34	0.37	0.32	0.28	0.28	0.34	0.32
Domain	0.11	0.12	0.16	0.17	0.17	0.11	0.14
Process	0.08	0.06	0.08	0.17	0.17	0.07	0.10
Personal	0.07	0.04	0.03	0.06	0.06	0.07	0.05
Interpersonal	0.07	0.04	0.03	0.06	0.06	0.07	0.05
Project Specific	0.34	0.37	0.39	0.28	0.28	0.34	0.33

C. Scores of each employee

As shown in TABLE III, the total scores are calculated by adding the individual scores for five employees against each attribute usually done by the management.

TABLE III. SCORES OF INDIVIDUAL EMPLOYEEES

	Technical	Domain	Process	Personal	Interpersonal	Project Specific
Employee1	90	40	70	60	50	80
Employee2	70	70	60	90	80	70
Employee3	50	70	50	40	40	60
Employee4	60	30	70	90	90	70
Employee5	40	40	30	50	40	40
	$\sum = 310$	$\sum = 250$	$\sum = 280$	$\sum = 330$	$\sum = 300$	$\sum = 320$

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D. Determine the overall priority weights of the employees

For each employee, the overall weight calculation is done using the following formula:

$$\text{Overall Weight} = [\text{Normalized Average of a "specific skill"} * (\text{Score of "an employee" in the "specific skill"}) / (\text{Total score of all the employees in the specific Skill})]$$

Similarly the overall weight is calculated for all employees and the employees are ranked accordingly.

V. SYSTEM DESIGN

The prototype application is developed in Visual basic 6.0 and it is mapped with Access 97 and Excel 2003 databases. The detailed software architecture is shown in Figure (2).The calculations of individual score, overall score and AHP are done using Microsoft Excel. The ratings for each skill given to the employee are stored in the Microsoft Access database. The manager fills the respective forms and updates the data in the Visual Basic front end application which is mapped with the access database and further with Excel. Finally after calculations the score is displayed in the VB front end.

VI. CONCLUSION

A unique method of the adaptation of Analytical Hierarchy Process (AHP) for employee appraisal in software services companies is presented and a fully functional prototype has also been implemented. Accurate and fair evaluation of employees with different skill sets can be achieved with the use of AHP. More empirical models need to be developed and tested for adapting this concept for appraisal in various other organizations.

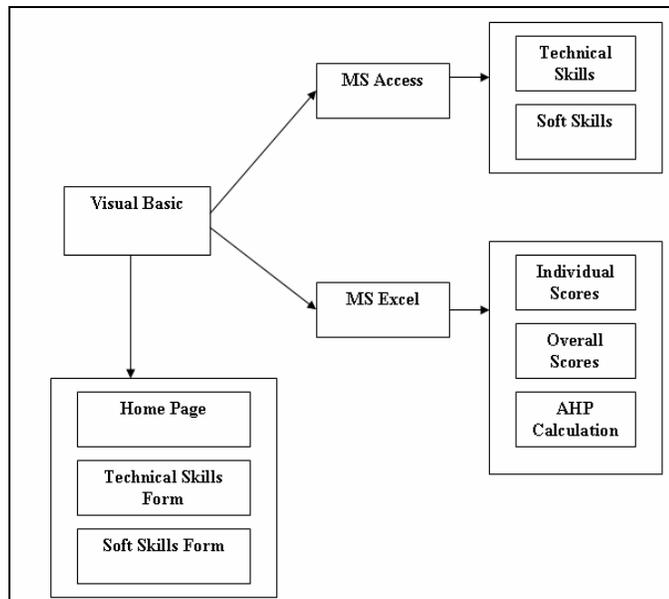


Figure2. Software Architecture Model of the Appraisal System

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