

Work Load Allocation and Cumulative Analysis in Training and Assessment Department Based on Balanced Load Approach

Akshatha Prabhu¹, Pavitra.M²

¹Lecturer, Department of Computer Science, Amrita Vishwa Vidyapeetham, Mysore Campus, Mysore, India

²MCA, Department Of Computer Science, Amrita Vishwa Vidyapeetham, Mysore Campus, Mysore, India

Abstract: *Efficiency of an organization increases when the systems are automated. Assigning tasks to the team, setting a time frame for team members to complete the task is one of the key factors that aid in the growth of the individual employee and the organization. These activities when handled manually leads to data inconsistency, room for errors and miscopying of information. There is a need to automate the allocation of resources such as managers to team members, assigning tasks to each team and individual team members, evaluate the performance of the individual employee based on the successful completion of the task assigned within time boundary. The application enables the managers to set goals for the team members, send notifications regarding the goals that are communicated through the electronic mails. The system has auto evaluation system for the individual team members based on the several parameters like feedback, target reached.*

Keywords: Work load indicator, Cumulative efficiency, load balance, efficiency factor.

1. Introduction

The application developed is to automate the process of allocating resources in Education Training and Assessment department of an organisation. Human resource management is a complex process. Work load evaluation which is an integral part of HRM depends on several criteria such as work assigned, work for each employee, performance evaluation based on completed task, number of tasks assigned and duration of completion of the task. Each company has different scenarios and approaches to calculate, assign work and performance assessment. There is always a need for a novel approach to solve this crisis.

To develop an efficient approach, we require in detail knowledge of Human Resource Assessment Company policy [1], time set for a task, grade level of an employee, team count under each manager. Bringing together all these variables is herculean task as the organization expands itself. Reports generated supplement for the employees work load and performance evaluation [4]. Performance reports provide performance of team members and top performers in a team.

2. Existing system

In existing world, human resource management is fully or partially manual intervened, one where each authority of an organization takes their own criteria; even managers in a company differ in their functionality of assigning workload and evaluations of employee performance. The scale of evaluation is completely based on predetermined assumptions asserted on the basis of Company policies. It does not have functionality of auto allocating manager to the newly joining team members, and auto evaluation system for the team members and there are no statistical reports generated automatically for any of the users for viewing the

performances of an employee [2]. There are no automatic prediction that enables the users to have a clear idea to track status and their performance.

3. Proposed system

In this paper, we have proposed a novel method for work load allocation and cumulative assessment based on balanced load approach. For generalizing an performance evaluation scheme independent of the company or the manager, we have taken into account several attributes that ease the calculation of employee assessment [9]. A systematic approach to avoid inconsistent load is dealt by allocating an employee automatically under the manger supervision based on the work load of the manager which is the core functionality of the proposed system. After this the tasks are assigned for each employee along with the target details within the time limit. These details encompasses target finished and target reached. After the expiration of the set time, the details of each task is taken into account by the system and efficiency factor for each task is calculated [3]. A cumulative efficiency of the employee is evaluated from the mathematical figures obtained by the efficiency factor variable.

4. Architecture

The first level of the architecture is the manager and the second level is the subordinate. The fig 1 depicts the flow of activities that needs to be followed for allocating a manager for a subordinate. Two predefined storage files manger file and subordinate file are considered. List of managers are listed through manager id fetched from manager file. Count of subordinates under each manager id is generated. These counts are arranged in the ascending order through sort process. The minimum number of teams under each manager is taken into account[5]. The manger id with the

least number of teams is generated and the subordinate is assigned to the respective manager. The subordinate file and the manager file are updated accordingly

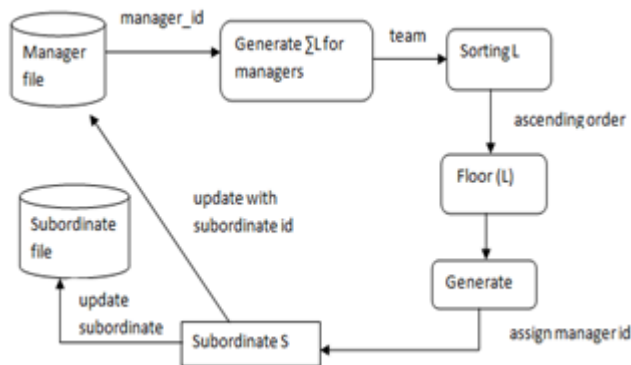


Figure 1: data flow diagram for Work Load

The data flow diagram for Cumulative efficiency factor (fig 2) demonstrates the grant of assigning tasks to a particular subordinate under a respective manager. Their id numbers are fetched from the manager file and subordinate file. The work load indicator is a variable that assigns tasks to each subordinate. Each task contains the target to be finished criteria within the set time frame. On the termination of the set time boundary, the target reached values are collected [6]. With these two variables, the efficiency factor is calculated for each task. This factor provides the information on the count of remaining target that was not reached for a particular task. The total target reached is affixed to the credit gained by the subordinate. With the efficiency factor as the input, the cumulative efficiency factor is thus evaluated that delivers the value on the target that was not achieved by the subordinate for the given number of tasks [7].

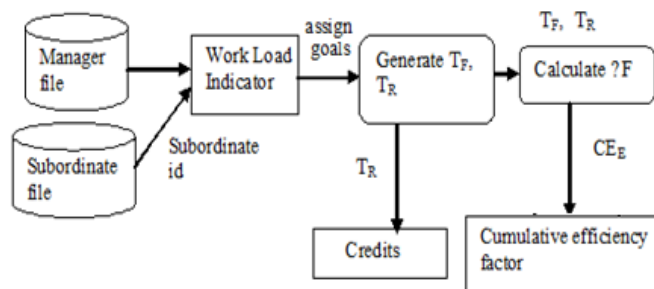


Figure 2: data flow diagram for Cumulative Efficiency Factor

5. Implementation Detail

The following algorithm is proposed for work load scheduling and to determine the cumulative efficiency factor.

A function $\sum L = F(M, L, E, C)$ is outlined with the following variables,

M is a Manager id generated with respect to the Company policy.

L is a dependent variable based on the number of team members working under the manager M.

S is a Subordinate id generated with respect to the Company policy.

C is the count of distinct managers for an employee.

With the given function $\sum L$, the algorithm for work load scheduling with a balanced load is elucidated.

Algorithm for work load scheduling with a Balanced Load Scenario

1. Begin
2. If subordinate S exist, then check for M where M -> S.
3. Arrange M in ascending order.
4. Check L for M such that L= floor (L) (lower bound)
5. Take M generated from step 4.
6. If M is a unique value generated from $\sum L$.
7. Assign S->M.
8. Stop.

A specific subordinate id is fetched through the subordinate file and manager ids are fetched from the manager files where a pre determined condition exists such that a manager exists for every subordinate and every manager has at least one subordinate [8].

Floor (L) in step 4 provides a list of manager/s with least number of members in each team.

Lower bound of floor (L) provides either a unique or non unique manager ids.

If a unique manager id is generated from the previous step, the emphasised subordinate is assigned under that manager id.

A function $\sum F(M, N, S, T_F, T_R, C, F, CE_E)$ is described with following attributes, with the given function $\sum F$, the algorithm for Cumulative Efficiency Analysis for Employees is detailed below.

M is a Manager id generated with respect to the Company policy.

WL_T is the Work Load Indicator that gives count of tasks allocated for each employee.

S is a Subordinate id generated with respect to the Company policy.

T_F is the target to be finished.

T_R is the target reached

F is the efficiency factor.

C is the credit assigned to each employee,

CE_E is the cumulative efficiency of the employee.

Algorithm for Cumulative Efficiency Analysis for Employees

1. Begin
2. Choose M such that S->M
3. For each WL_T
4. Assign T_F such that S-> T_F
5. Calculate T_R for S.
6. $\Delta F = \frac{T_F \cdot T_R}{T_F}$
7. Assign C=T_R

$$CE_E = \sum_{i=1}^n \Delta F$$

- 8.
9. End for.
10. Select next subordinate S.
11. Repeat steps from 2 to 8.
12. Stop.

For each subordinate, tasks are assigned where task count is stored in the variable WL_T . The number of target to be finished is highlighted for each task through the variable T_F . ΔF is determined by the ratio of difference of T_R and T_F to the value of T_F .

Credits are assigned to the subordinate depending on the targets reached.

6. Case Study

Sample data have been collected. The table is constructed with sample values that have been obtained by applying the algorithm for cumulative efficiency analysis for employees.

The table built is shown below.

WL_T	T_F	T_R	ΔF
1	6	4	0.33
2	10	2	0.8
3	5	4	0.2
4	18	12	0.33
5	20	16	0.2
6	10	10	0

Test cases are provided with a subordinate who is assigned with 6 tasks as indicated by WL_{T1} through WL_{T6} . Each task is assigned T_F and T_R is obtained after the finish of each task. ΔF is calculated automatically with the values of T_F and T_R which is procured through Cumulative Efficiency factor is given by the formula,

$$\Delta F = \frac{T_F - T_R}{T_F}$$

Hence for WL_{T1} , $T_F = 6$ and $T_R = 4$

$$\Delta F = \frac{6-4}{6}$$

= 0.33

The above operation holds for all the WL_{TS} . Cumulative efficiency is formulated through

$$CE_E = \sum_{i=1}^n \Delta F$$

ΔF gives the ratio of targets to be reached for each work load.

$\sum \Delta F$ is the sum of ΔF to the work load indicator assigned to each subordinate

$$\sum \Delta F = 1.86$$

Number of tasks assigned is 6 from the samples then

$$CE_E = 1.86/6 = 0.31$$

The value of CE_E indicates that 31% of the targets were not achieved by the subordinate under the set of n tasks provided. The cumulative efficiency factor in this scenario states the negative annotation on the set of samples provided.

The samples run successfully for 70 data sets.

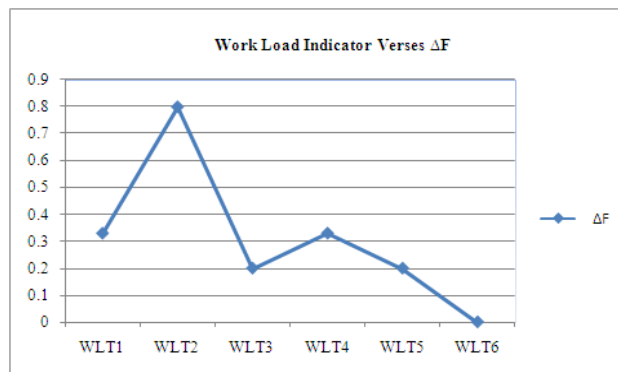


Figure 3: Graph analysis for Cumulative Analysis Factor

The graph analysis (fig 3) communicate clearly the factor of non achievable targets in a task assigned based on the samples assembled. For WL_{T2} , 80% of the targets have not been achieved. Evidently, for WL_{T6} all the targets allotted have been achieved and hence ΔF is 0.

7. Conclusion and Future Development

A balanced load is always a better approach to solve human resource management crisis. Complexity increases when a manager is unable to handle too many subordinates. Each manager is assigned equal number of subordinates through the balanced load method. Each subordinate is allotted an assignment with specific number of targets to be reached. The efficiency factor is provided to both the employees (manager and subordinate) with the figures that were non achievable, hence promoting the subordinate to fill those remaining targets and to improve the efficiency. The cumulative efficiency factor gives an overall impression of the performance assessment that requires to be accomplished for the given assignments.

The mechanism illustrated can be amplified further on the basis of;

1. Relative performance assessment to increase efficiency factor.
2. A balanced load method considering the skill set or domain knowledge of a subordinate.
3. Team performance can be increased by multi sharing the tasks such that it can be achieved quickly and number of targets reached will be increased.

8. Acknowledgement

We thank the almighty for His blessings. We thank all the authors and co-authors of different journal papers which has been a motivation to this paper. Our sincere thanks to our parents for their support. Our thanks and appreciations also go to our colleagues and friends in developing the paper and people who have willingly helped us out with their abilities.

References

[1] Balachandran, K. R. and R. E. Steuer, "An Interactive Model for the CPA Firm Audit Staff Planning Problem with Multiple Objectives." The Accounting Review LVII (1), 125-140, (1982).

- [2] J. Wglarz, J. Jo´zefowska, M. Mika, and G. Waligo´ra, “Project Scheduling with Finite or Infinite Number of Activity Processing Modes—A Survey,” *European J. Operational Research*, vol. 208, pp. 177-205, 2011.
- [3] O. Bellenguez and E. Ne´ron, “Methods for the Multi-Skill Project Scheduling Problem,” *Proc. Ninth Int’l Workshop Project Management and Scheduling*, pp. 66-69, 2004.
- Workload Capacity Measures for Use in Allied Health Workforce Planning. Human Capital Alliance, Department of Human Services Victoria; 2006. Available http://www.health.vic.gov.au/_data/assets/pdf_file/0007/306196/hca_workmeasures.pdf [verified 5 May 2011].
- [5] L.Ozdamar, “A Genetic Algorithm Approach to a General Category Project Scheduling Problem,” *IEEE Trans. Systems, Man, and Cybernetics-Part C: Applications and Rev.*, vol. 29, no. 1, pp. 44-59, Feb. 1999.
- [6] T. Stutzle and H. Hoos, “Max-Min Ant System,” *Future Generation Computer Systems*, vol. 16, no. 8, pp. 889-914, 2000.
- [7] Bauer, B. Bullnheimer, R.F. Hartl, and C. Strauss, “Minimizing Total Tardiness on a Single Machine Using Ant Colony Optimization,” *Central European J. Operations Research and Economics*, vol. 8, no. 2, pp. 125-141, 2000.
- [8] M. Dorigo and L.M. Gambardella, “Ant Colony System: A Cooperative Learning Approach to TSP,” *IEEE Trans. Evolutionary Computation*, vol. 1, no. 1, pp. 53-66, Apr. 1997.
- [9] D. Merkle, M. Middendorf, and H. Schmeck, “Ant Colony Optimization for Resource-Constrained Project Scheduling,” *IEEE Trans. Evolutionary Computation*, vol. 6, no. 4, pp. 333-346, Aug. 2002.

Author Profile



Akshatha Prabhu is working as Lecturer in Department of Computer Science, Amrita Vishwa Vidyapeetham, Mysore Campus completed her MS in Computer Science, University of Mysore has an excellent teaching profile and guiding students towards research oriented projects. Area of specialization includes ERP solutions, Network Security and Cryptography.

Pavitra. M. is Final Year MCA student has a good academic profile and pursued her internship and final year project in Infosys, Mysore. She has excellent reasoning and programming skills. Area of interest is application development and ERP solutions.