

A FRAMEWORK FOR BUILDING A WEB-BASED DECISION SUPPORT SYSTEM FOR JOB ASSIGNMENT

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Abstract: In order to achieve the concept of “Putting the right man on the right job”, the job director has to clearly understand job’s requirements, related job’s skills, and, especially, employee who is possible to be assigned to do the given jobs. The fulfillment of these concerned issues could be done by one of the information systems called “Decision Support System” (DSS), which provides capabilities of identifying possible alternatives (that is, the appropriate employees), supporting the alternative-comparison process, and making-choice process. The DSS’s capabilities in supporting job assignment process increase not only the job director’s satisfaction in assigning job, but also the employee’s satisfaction in doing the assigned job. Moreover, the “Flexibility” is another factor required by the job directors in performing job assignment, and communicating with their employees. Therefore, this research proposes a framework for building a Web-based DSS for job assignment.

1 INTRODUCTION

The Information System (IS) and its applications are the empirical factors for success of business operations in all levels of organizational structure. By serving across the enterprise, the ISs must completely support the varied business operations done by various groups of users, provide the appropriate user interfaces, and provide the information relevant to the users’ requirements. Though the IS’s efficiency in generating the “User-Required Information” is important for the success of business operation, the completeness and correctness of the information provided is important as well. Therefore, this research focuses on building an efficient and effective Web-based DSS that provides appropriate and necessary information for supporting job assignment process through the web. This system can be called the “*Web-based Job Assignment’s Decision support system*” (or WJADSS).

Based on the basic architecture of DSS (Dong and Loo, 2001; Sauter, 1997; Sprague, 1980; Turban et al., 2005), the WJADSS consists of 4 components, which are “Dialog Component”, “Model Component”, “Data Component”, and “Mail

Component”. These components fulfill the decision making process of various job directors while doing the job assignment. Though many DSSs were developed to support job scheduling or job assignment (Chauvet et al., 2000; Ferland and Fleurent, 1994; Gopalakrishnan et al., 1993; Schniederjans and Carpenter, 1996), these DSS emphasize mostly on “*Increasing Processing Speed*”, “*Reducing Cost*” of the given process, and “*Assigning Job Under Pre-defined Conditions*”. Therefore, this research attempt to propose the framework for building the DSS that supports job assignment process in general business units of any organization. The proposed system provides not only the models supporting quantitative analysis (done by the system), but also the related information necessary for heuristic analysis (done by job directors).

The WJADSS provides necessary information of both concerned jobs and employees to job directors during job assignment process. Moreover, the appropriate models would be activated to analyze the related data under specific circumstances and criteria. And, finally, the outcomes of alternatives (or employees) comparison and evaluation may be represented in form of text and graph. Because the

WJADSS focuses on the concept of “*Putting the right man on the right job*” and the “*Fairness*” of job assignment process, this system increase not only job director’s satisfaction in assigning job, but also increase the employee’s satisfaction in doing assigned job.

2 CONCERNED FACTORS FOR JOB ASSIGNMENT PROCESS

During job assignment, the job directors have to identify the job skills necessary for doing concerned jobs, and clearly understand the capabilities of employees who may be assigned to do the given jobs (Cascio, 2003; Department of Human Services, 2006; Ivancevich, 2004; Jackson and Schuler, 2003). Moreover, “reasonableness of being assigned the new job”, which is determined by amounts of job being done by specific employee, must be taken into account. Therefore, the concerned factors of job assignment process are divided into 2 groups:

A. “*Job-related Factors*” refers to the characteristics of job or the criteria in doing concerned job. When the new job occurs in the business unit, these factors must be identified.

❑ *Job Requirements (or Job Skill)*: After determining the new job, job skills required for doing concerned job are listed. The given skills are necessary for determining the employee, and, then, pointing out the appropriate employee who is possible to be assigned to do job. It is exactly clear that the employee who is assigned to do a particular job must match the job requirements (Kaixuan, 1994; Schneier et al., 1995).

❑ *Job’s Working Duration*: The working duration of specific job is useful for identifying job’s submission deadline. That is, it is calculated by determining the job’s started date and the job’s working duration. After submitting job, the job’s submitted date is compared to the job’s submission deadline in order to evaluate the work efficiency (or performance) of employee. The outcome of the given evaluation is taken into account for the next job assignment (Cascio, 2003).

B. “*Employee-related Factors*” refers to the characteristics of the employee that would be determined during job assignment process. The necessary factors are shown below.

- ❑ *Employee’s Capability*: This factor refers to the job skills occupied by the employee. The given job skills (or employee’s capabilities in doing job) must be matched the job skills required for doing concerned job. This matching basically guarantees the concept of “*putting the right man on the right job*”.
- ❑ *Amounts of Responsible Job*: The job directors have to take the amounts of job in responsibility of any appropriate employee into account, while doing job assignment. Since the efficiency (or performance) and effectiveness in performing job/task may be reduced if the employees have to responsible for many jobs/tasks at any given time (Cascio, 2003).
- ❑ *Work Performance*: Amounts of on-time complete job could be used as work performance indicators of employees. They show how well the employees perform their jobs. Therefore, after doing job, the job submitted date is compared to the job’s submission deadline in order to indicate the work performance of employee who handles that job. If the employees completely and correctly finish their jobs on time (or in time), it can be inferred that they perform jobs/tasks effectively. Moreover, the job directors have to concern not only the amounts of on-time complete jobs, but the amounts of overdue jobs as well.
- ❑ *Work Experience*: In some situations and some work areas, the work experience is necessary for performing jobs/tasks. We found that the experienced workers can handle difficult questions and high-pressure situations better than the novice workers. Therefore, the information about the employee’s work experience should be provided to the job directors during job assignment.

3 THE FRAMEWORK FOR A WEB-BASED JOB ASSIGNMENT’S DECISION SUPPORT SYSTEM (WJADSS)

After pointing out the important factors necessary for determining both job and employee during job assignment, the pointed out factors are applied to the appropriate components of the WJADSS. That is, in

order to fulfill the DSS capabilities in supporting job assignment's decision making process, the structures and capabilities of WJADSS's components are:

A. Dialog Component: Since the target users of WJADSS are divided into 2 groups, job directors and employees, the system provides 2 interface modules. The first module facilitates job directors to manipulate job's profile, to create the employee records, to assign job, and to check the progress of assigned job. The last module facilitates employees to edit their profiles (especially, the job skills that could be changed over time), and to report job's progress back to the job director.

To answer the question "what are the appropriate user interfaces for the WJADSS?", the system developers must clearly understand and properly identify levels of user's technical skill, levels of user's operational management, and format of the output required by the users (Sauter, 1997). The examples of action languages appropriate for WJADSS can be "Input-Output Format" (for employee's data entry), "Menu Driven Format" (for commands selection), and so on.

Moreover, during job assignment, the system should represent the outcome of decision making process in terms of text and graph. These 2 forms of representation enable the job directors to see both details and overall picture of the alternatives' comparison outcome.

B. Model Component: One of the important components which provides analysis capabilities for WJADSS is the model component. The given component deals with all models (shown in Figure 1) necessary for analyzing job's and employee's data during job assignment process. These models provide the analysis capabilities to WJADSS in order to perform the following issues:

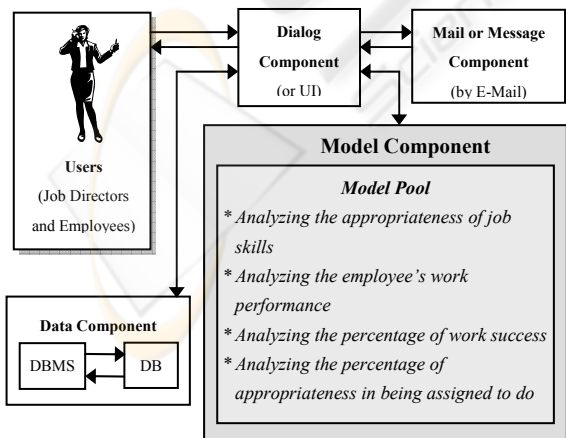


Figure 1: Models Performing Analysis Capability in WJADSS.

- Analyzing the appropriateness of job skills by determining ratio of job's requirements to the job skills occupied by specific employee. When P is the percentage of appropriateness of job skill. This can be calculated by the below formula:

$$P = \left(\frac{A}{B}\right) \times 100 \quad (1)$$

Where;

A : Amount of job skills which are occupied by the employee and are matched to the job skills required by the concerned job ($A = 1, 2, 3, \dots$)

B : Amount of job skills required by any job ($B = 1, 2, 3, \dots$)

- Analyzing the work performance of any concerned employee. When W is the work performance of any concerned employee.

$$W = \frac{\sum_{i=1}^N SC_i}{\sum_{j=1}^M SA_j} \quad (2)$$

Where;

SC : Score of on-time complete jobs

SA : Score of both on-time complete and delayed jobs

N : Amount of on-time complete job.

I : 1, 2, 3, ..., N

M : Amount of both on-time complete and delayed job.

J : 1, 2, 3, ..., N

- Identifying the percentage of work success. When S is the percentage of work success. This can be calculated by the below formula:

$$S = \left(\frac{N}{M}\right) \times 100 \quad (3)$$

Where;

N : Amount of on-time complete job.

M : Amount of both on-time complete and delayed job

- Analyzing the percentage of appropriateness in being assigned to do job. Based on a set of criteria identified by the job director, Q is the appropriateness of being assigned job. This can be calculated by the below formula:

$$Q = \sum_{i=1}^N (W_i \times C_i) \quad (4)$$

Where;

W : Weight or percentage of the certain

criterion identified by the job director.

C : Score of any concerned criterion given by job director

i : Order of criteria used to evaluate the alternatives (or employees)

N : Amount of criteria that the job director selects to evaluate the employee

Notes:

The criteria used to evaluate a group of concerned employees can be, employee's work performance, amount of jobs in responsibility, years employed (or work experience), and etc.

Therefore, the total percentage of appropriateness in being assigned to do job (*T*) is determined by:

$$T = Q + P \quad (5)$$

Where;

P : Percentage of appropriateness of job skill

C. Data Component: To achieve the decision making process for job assignment, the data stored in the system's data repository (shown in Figure 2) can be divided into 4 categories:

- ❑ *The job's profile:* The first data category describes characteristics of any job in specific business unit, such as, job skills required by any job, job's working duration, job's started date, job's submitted date, job's status, and so on.
- ❑ *The employee's profile:* The second data category describes characteristics and capabilities of any employee in specific business unit, such as, job skills occupied by any employee, job position, work-starting date, and so on.
- ❑ *The jobs in responsibility:* The third data category plays the important role in identifying jobs undertaken by specific employee at any given time. This data represent the relationship between job and employee. Moreover, the given data are necessary for the job assignment process, since the job director must take them into account when assign job.
- ❑ *The job's progress report:* The last data category describes on-going job's status, job's progress, and procedures of any job. While the employees are doing assigned

jobs, they can report these data back to the job director. Therefore, the job director can check the progress of any job, and keep tracks of events occurred during job's working duration.

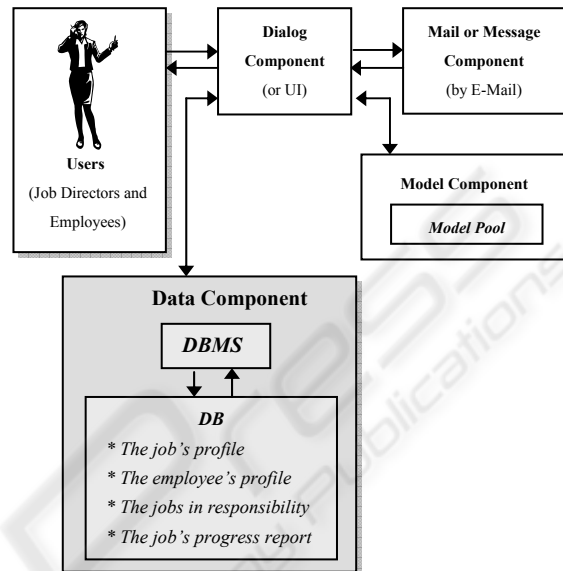


Figure 2: Data Categories in WJADSS.

D. Mail Component: In any business unit, the mail component enables communication between job director and employee. The E-Mail could be sent back and forth among these people. That is, after decision making process, the result of job assignment could be sent from job director to the specific employee. Moreover, while the employees are doing assigned jobs, they may need the communication's capability in order to communicate with the job director or the related employees.

4 THE DECISION MAKING STEPS IN WEB-BASED JOB ASSIGNMENT'S DECISION SUPPORT SYSTEM

To enable job directors in doing job assignment, the WJADSS provides both useful information and system's capabilities for supporting decision making process during job assignment. The model shown in Figure 3 represents "How does WJADSS work?".

Based on the work flow represented in Figure 3, the job directors firstly create the job's profiles for the new jobs entering in any business unit, while the employees create their work profiles. The first

profile describes characteristics and requirements of the concerned jobs, while the last one describes job skills and personal data of the concerned employees. During job assignment, these two profiles are determined in order to guarantee the concept of “putting the right man on the right job”. It ensures that the employee is properly selected to do job. In other word, the job skills of selected employee correspond to or meet the job requirements. Moreover, the information relate to the jobs handled by selected employees must be concerned. Since the work performance and work quality may decrease, if the employees handle too many jobs at the same time. Therefore, amount of workload is another important factor that the job directors have to take into account.

After first-step screening which determines only employee’s job skills and job’s requirement matching, the WJADSS lists all employees who are possible to be assigned to do job. The WJADSS, then, enables job directors to identify the criteria necessary for alternatives (or employees) comparison, such as, amounts of job in responsibility, employee’s work performance, job position, work experience, etc. Based on these criteria, the related models in model base are selected to provide analysis capabilities. The job director, moreover, has to identify the weight or the percentage of importance for each criterion. Since the given weight set for any criterion influence the alternatives (or employees) comparison process. That is, the higher weight is set to any criterion, the higher score is calculated from it.

When the comparison criteria and their weight of importance are identified, the employee comparison process begins. At this point, the job director has to make sure that all concerned employees are evaluated, and are scored based on the same set of criteria.

After employee comparison process, the WJADSS calculates score for all concerned employees by summarizing the scores they get from all criteria. The given outcome represents not only evaluation score for each employee, but also pinpoints the appropriateness for each employee in being assigned to do job. That is, the highest percentage means the most appropriate in doing job. However, the job directors can make their own final decision in assigning job to the most appropriate employee. The WJADSS, then, send an E-Mail to the assigned employee, when final decision is done.

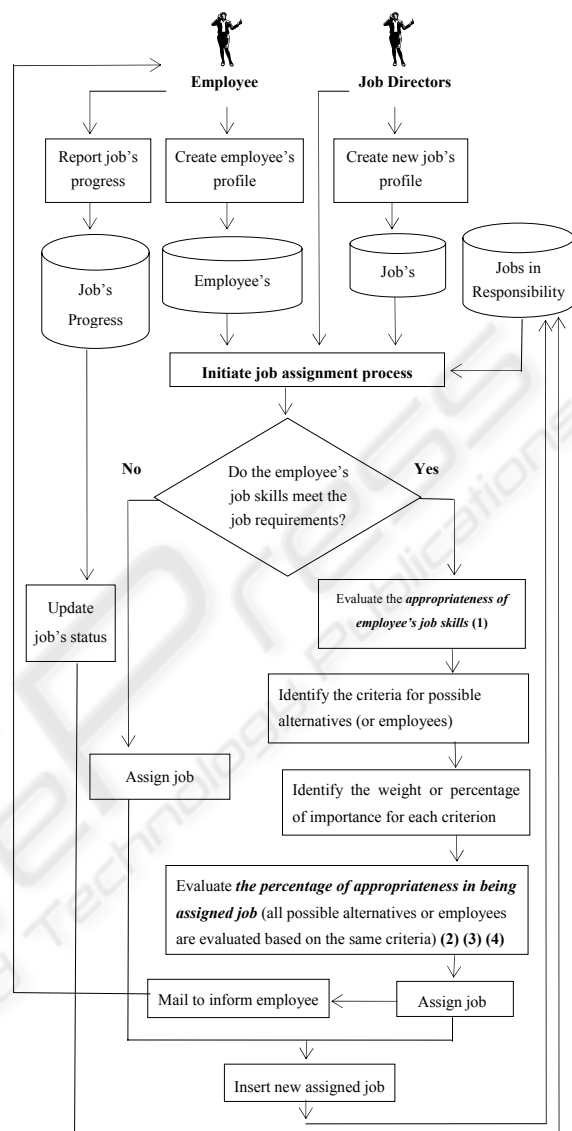


Figure 3: The Work Flow of WJADSS.

The E-Mailing feature enables job directors and employees to communicate with each other anywhere, anytime. The job directors send job’s directions, orders, or questions about concerned job to the employees along with E-Mails. While, the employees can send job’s progress report, questions, or problems about the assigned job back to the job directors as well. This information is very useful for the job evaluation, and the next round of job assignment’s decision making process.

5 CONCLUSION

To create a Web-based Job assignment's DSS (WJADSS), 4 components of the given system must be determined and designed carefully. Firstly, the DSS developers must clearly understand both system's target users and job assignment process. This understanding helps system developers to design system's interfaces which are proper to system's target users and consistent to the job assignment's work flow. Moreover, understanding of job assignment process is an empirical factor for designing the rest components. It points out not only the data necessary for making decision during job assignment process, but also the analyzing methods (or models) supporting the given process.

In order to boost up the web-based capability, the WJADSS must be developed as the web-based system which is browsed through the web browser. This capability enables the job directors to do job assignment anywhere anytime, and enables the employees to perceive the job's assignment from the outside as well. After job assignment, two groups of system's target user: job directors and employees, may communicate with each other through E-Mailing system. The information get along an E-Mail can be additional job's direction, job's progress report, or problems occurred while doing job. The given information is useful for both job's and employee's evaluation. Moreover, it is useful for the next round of job assignment process as well.

6 CURRENT STATUS AND FUTURE WORK

Based on the proposed framework, the WJADSS is currently implemented. The important modules supporting job assignment process and job progress report are firstly tested and debugged. After implementation, the system would be launched and be evaluated the efficiency and effectiveness. The system evaluation must be determined in 3 aspects, "Input of Decision Making Process", "Output of Decision Making Process", and "Efficiency and Effectiveness of Decision Making Process".

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