

CORNELL HR REVIEW

THE POTENTIAL OF DATA ENVELOPMENT ANALYSIS (DEA) IN LABOR ADJUSTMENT POLICY

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Through labor-management policy, the management is responsible for establishing mutually beneficial relations between workers and employers. Establishing proper relations from the perspective of the worker refers to protecting workers' rights by guaranteeing their quality of life.¹ Areas of labor-management policy set by management include those that appropriate wages and labor conditions; stipulate and settle collective relations between management and workers; and establish industrial safety and workers' compensation. Management also sets employment policies related to labor welfare, vocational training, employment security, maintenance of employment agencies, and other policies that push forward human resource development.²

When setting these policies, management seeks to find a solution that is mutually beneficial for workers and employers. However, in the case of downsizing, there are not sufficient guidelines specific or objective enough for both workers and employers to agree on. Therefore, it is difficult to resolve differences when it comes to labor settlements. The following case study hypothetically illustrates ways in which the management could resolve labor settlements that are jointly accepted by workers and employers.

Case Study

The management of Automobile Company has decided to conduct layoffs due to recent financial difficulties and weak profits. After meeting at headquarters, management has determined to conduct layoffs in customer service, factory production, and sales. Management decided to downsize these particular areas because two hours of labor per day was considered sufficient for the performance of actual operational duties. This would reduce unnecessary idle time. In order to fully understand the actual workload of those subject to cuts, management representatives went undercover as new employees in customer service, production, and dealer support. Through this investigation, it was concluded that employees' workloads were much larger than expected, often exceeding normal labor hours. There were also served complaints about workers not receiving timely support from headquarters.

It is often workers in the field office who sense crisis the most during times of downsizing. From the perspective of those in management, the labor of production workers is often not considered high-level autonomous labor, but rather task and quantity-based labor that can be easily adjusted based on production output demand. However, in the aforementioned case study where there is a difference in perception between the field office workers and management, field office workers are likely to express their grievances if management proceeds with downsizing. Consequently, this would raise issues that could lead to a strike.

Therefore, when making labor adjustments, there needs to be an agreed-upon foundation that both management and field office employee can accept, rather than solely reflecting management's point of view. In other words, management should not single out field workers as the first target for cuts simply because they did not yield results. Personnel reductions must be made based on labor inefficiencies. However, it is difficult to objectively judge what labor is inefficient, so it becomes important to clearly define what this means.

Although job surveys are performed to get a better grasp of inefficient labor, subjective factors should not be ruled out. To that end, Data Envelopment Analysis (DEA) is a method that workers and employers could agree on as the basis for labor adjustment method that also measures labor efficiency more objectively. In other words, through the DEA method one can judge labor efficiency by rank or job function, determine which positions operate relatively inefficiently, and perform in-depth job surveys on such positions, potentially reducing current labor-management conflicts related to labor adjustments.

DEA for Human Resource Efficiency Measurement

Regression analysis has been the traditional method in measuring human resource efficiency. By measuring strength of any correlation between sales and relevant labor, the influence that such labor has on a company's sales can be analyzed, and once that influence is shown to be positive, companies typically refrain from cutting such labor. However, with regression analysis it is difficult to make relative comparisons among job positions or ranks. Also, in cases where there are a variety of input and output variables, complications such as a multicollinearity problem between variables can exist.³

The DEA method can resolve such issues. DEA is method of analysis that measures the relative efficiency of each decision making unit equally for multiple input and output variables.⁴ It can be easily used to draw out efficiency changes between the decision making units.⁵ When an efficiency value of a decision making unit is close or equal to one, it is considered efficient, whereas if the value is measured significantly less than one, it considered inefficient compared to other decision making units.⁶

When applying DEA to human capital, output variables can include employee satisfaction levels, turnover rates, key personnel secure rates, training hours, personnel evaluation scores, employee grievances, etc. Input variables can include number of employees, paid-in capital, budget amount, base material input funds, equipment and number of machines, and labor costs such as salary and employee benefits. When estimating input and output variables, adjustments can be made based on business characteristics. Also, because this does not require a complex statistics package, it can be used easily and inexpensively using spreadsheet software.

Expected Effects of Introducing DEA to Labor Adjustment policy

Known as both a nonparametric method and a multi-criteria decision making method, DEA has been generally used in financial organizations for credit risk evaluations to predict bankruptcy. By applying DEA's strengths to human resource management, factors such as turnover rate increases and job satisfaction level decreases can be evaluated to objectively

and quickly understand which labor is inefficient.⁷ Because this would be effective for labor adjustment and labor improvements⁸, DEA would also be useful for the governmental human resource development policies.

In conclusion, prior to performing job analyses in a situation where labor adjustments need to be made, the DEA method provides a unique and effective way to approach labor adjustments. Presenting employees with outcomes from an objective efficiency analysis first and then performing job analyses would increase employee understanding and minimize resistance. This compares to current practices where management performs regression-based job analyses on their employees which, as described above, is inappropriate in many situations and can produce misleading data. In other words, if management informs workers that job analyses and required labor adjustment will be determined by objectively measuring inefficient outcomes from quantitative analysis using the DEA method, there would be greater employee understanding and fewer grievances. Therefore, it is essential that a process be put in place that thoroughly explains to employees how efficiency was measured in the first place.

Once inefficient job functions are determined through DEA analysis, in-depth investigations need to be conducted for the identified positions. It would be unreasonable to make cuts solely based on DEA results to minimize workers' grievances. For example, if a particular employee had performed his or her duties consistently and a downsizing effort were suddenly announced without making improvements for work efficiency, it could be difficult for the employee to accept such cuts. Therefore, if a job function or position requiring improvement is discovered through job analyses with inefficient DEA results, a business needs to provide the relevant worker with an effective work process or present objective feedback as to why changes need to be made. ✕

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¹ Nevarez, L. (2011). 'Pursuing quality of life: From the affluent society to the consumer society.' Routledge.

² International Labor Office. (2012). 'EFFECTIVE PROTECTION FOR DOMESTIC WORKERS: A GUIDE TO DESIGNING LABOR LAWS.'

³ Guajardo, S. A. (2015) Assessing Organizational Efficiency and Workforce Diversity An Application of Data Envelopment Analysis to New York City Agencies. *Public Personnel Management*, 0091026015575179.

⁴ Zhongming, O. (2011). The Research on Human Resource Management Evaluation based on Data Envelopment Analysis. *International Journal of Digital Content Technology & its Applications*, 5(12).

⁵ Lynde, C., & Richmond, J. (1999) Productivity and efficiency in the UK: a time series application of DEA. *Economic Modelling* 16(1), 105-122.

⁶ Kirjavainen, T., and Loikkanen, H. A. (1998) Efficiency differences of Finnish senior secondary schools: an application of DEA and Tobit analysis. *Economics of Education Review*, 17(4), 377-394.

7 Zbranek, P. (2013). DATA ENVELOPMENT ANALYSIS AS A TOOL FOR EVALUATION OF EMPLOYEES' PERFORMANCE. *Acta Oeconomica et Informatica*, 16(1).

8 Zhu, X., & Yu, X. (2014, January). Analysis on the Utilization Efficiency of Human Resources in Guangxi Based on Data Envelopment Analysis Method. In *2014 International Conference on Global Economy, Commerce and Service Science (GECSS-14)*. Atlantis Press.