A DATA ENVELOPMENT ANALYSIS APPROACH TO NEGOTIATIONS

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The economic analysis can easily evaluate profit-making companies. But it is sometimes necessary to compare decision making units (DMUs) although their inputs and outputs cannot be evaluated in means of market prices. Data Envelopment Analysis (DEA) is a linear programming based technique for measuring the relative performance of organizational units where the presence of multiple inputs and outputs makes comparisons difficult. The aim of this paper is to present not only the way to evaluate the best practice (as it is normally done by Data Envelopment Analysis), but also the worst practice and to show, how efficiently it can be used in preparation for negotiations.

We assume that there is an organization where market prices cannot be used and there is no system for evaluation of DMUs yet. Moreover, the organization wants to finally create a system for measuring efficiency of its departments or employees and is willing to negotiate the conditions with employees. We also assume that information about all inputs and outputs of all DMUs are known to each DMU and that they do not change significantly in time. We expect that every DMU wants to maximize its efficiency. Although we suggest DEA to be used in non-profit organizations for evaluation of performance, we assume that top management would prefer multicriteria decision analysis. This is the reason for suggestions we give to potential negotiators. Each DMU knows this way what is the best possible outcome (the relative efficiency score) and what are its best weights for inputs and outputs before going to negotiations, so it can try to negotiate these weights to be used for the whole organization.

The units, which are efficient when maximizing an inefficient unit, are its reference units. The negotiator from an inefficient DMU should try to convince the negotiator from its reference units to support the weights, which his DMU has the highest relative efficiency score with. And vice versa, the negotiator from efficient unit has to decide which weights he should suggest in order to win most support from DMUs for which his unit is the reference one. This may turn out harder than it looks. The best position has a DMU (if there is one) which dominates all other units because it will be efficient if any weights are selected. But this situation is really rare.

There may be a task to find out which DMUs are least efficient. In order to identify the worst DMUs, we can run reverse DEA. The least efficient units will have scores equal to 1. The score of a target unit can be obtained as a solution of a reverse DEA model, calculated as a DEA model where inputs are exchanged with outputs and vice versa. This way a negotiator knows beforehand whether it is possible that his DMU can be considered as the worst one when the weights are applied, which

are the worst from his point of view. If so, he must invest all the effort into negotiating the best weights. If not, he does not have to be that much cautious about the negotiations.

Outliers are relatively efficient DMUs which use the fewest amount in at least one input component (input-oriented model) or produce the highest amount in at least one output component (output-oriented model). All DMUs, which are in the best and the worst practice groups, are outliers. There may be also other outliers, which cannot be identified this way, but they are not of our interest now.

The negotiators of the units, which are outliers, have absolutely stressful position in negotiations. If they are successful, they may be later considered to be efficient. If they have bad luck, they may end up being the least efficient.

References

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