A simple reciprocal service cost allocation model and a generalization - for manufacturing firms

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A simple reciprocal service cost allocation model is a prime requirement of all manufacturing firms as cost accountants find it difficult to understand most existing models. This research is aimed at addressing this limitation. Initially, an easily understandable reciprocal service cost allocation model using a system of linear difference equations is introduced. This is a new model, and is solved using the theory of linear difference equations. Then this model is converted into the existing linear algebra model, which is solved using general matrix theory. It is assumed throughout that all service departments serve at least one production department, which is a meaningful assumption for real life problems. Any set of allocation ratios chosen for the service departments satisfying this general assumption will lead to a matrix of the form $\begin{pmatrix} 0 & B \\ 0 & A \end{pmatrix}$, where the matrix $A = (\mu_{ij})_{n\times n}$ represents the proportions of the reciprocal cost allocation between service departments, where n is the number of service departments and μ_{ij} denotes the proportion of service department j's overheads assigned to service department i, at each allocation. The matrix $B = (\eta_{ij})_{m\times n}$ represents the proportions of service costs allocated to the production departments, where m is the number of production departments and η_{ij} denotes the proportion of service department j's overheads assigned to production department i, at each allocation. A special property of A is that it is a non-negative square matrix with all column sums less than one. This property is used to establish unique solutions for both models. Two simple problems are solved using these models and a sensitivity analysis is done for the entries of A in one problem. Finally, complete solving techniques using both models are explained for reciprocal allocation problems with dual cost allocation ratios, one for variable cost and another for fixed cost, for the service departments' costs. This technique can be easily extended to any number of cost classifications within the service departments. Furthermore, for each model, an R-programming script is written, which provides readily usable formats for users.

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