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# COSTA: Contribution Optimizing Sales Territory Alignment

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## Abstract

The alignment of sales territories has a considerable impact on profit and represents a major problem in salesforce management. Practitioners usually apply the balancing approach. This approach balances territories as well as possible with respect to one or more attributes such as potential or workload. Unfortunately, this approach does not necessarily guarantee maximizing profit contribution. Thus, it does not provide an evaluation of the profit implications of an alignment proposal in comparison with the existing one. In consequence, several authors proposed nonlinear integer optimization models in the 1970s. These models attempted to maximize profit directly by considering the problems of allocating selling time (calling plus travel time) across accounts as well as of assigning accounts to territories simultaneously. However, these models turned out to be too complex to be solvable. Therefore, the authors have either approximated the problem or proposed the application of heuristic solution procedures on the basis of the suboptimal principle of equating marginal profit of selling time across territories.

To overcome these limitations, we propose a new approach, COSTA, an acronym for "contribution optimizing sales territory alignment." In contrast to previously suggested profit maximizing approaches, COSTA operates with sales response functions of any given concave form at the level of sales coverage units (SCUs) that cover a group of geographically demarcated individual accounts. Thus, COSTA works with sales response functions at a more aggregated level that requires less data than other profit maximization approaches. COSTA models sales as a function of selling time, which includes calling time as well as travel time, assuming a constant ratio of travel to calling time. In addition, the formulation of the model shows that an optimal solution requires only equal marginal profits of selling time across sales coverage units per territory, but not across SCUs of different territories.

Basically, COSTA consists of an allocation model and an assignment model, both of which are considered simultaneously. The allocation model optimally allocates the available selling time of a salesperson across the SCUs of his or

her territory, whereas the assignment model assigns the SCUs to territories. Thus, COSTA predicts the corresponding profit contribution of every possible alignment solution, which enables one to perform "what-if"-analyses. The applicability of the model is supported by the development of a powerful heuristic solution procedure. A simulation study showed that COSTA provided solutions that are on average as close as 0.195% to an upper bound on the optimal solution. The proposed heuristic solution procedure enables one to solve large territory alignment problems because the computing time increases only quadratically with the number of SCUs and proportionally to the square root of the number of salespersons. In principle, we also show how COSTA might be expanded to solve the salesforce sizing as well as the salespersons' location problem.

The usefulness of COSTA is illustrated by an application. The results of this application indicated substantial profit improvements and also outlined the weaknesses of almost balanced territories. It is quite apparent that balancing is only possible at the expense of profit improvements and also does not lead to equal income opportunities for the salespersons. This aspect should be dealt with separately from territory considerations by using territory-specific quotas and linking variable payment to the achievement of these quotas. Furthermore, the superiority of COSTA turned out to be stable in a simulation study on the effect of misspecified sales response functions.

COSTA is of interest to researchers as well as practitioners in the salesforce area. It aims to revive the stream of research in the 1970s that already proposed sales territory alignment models aimed at maximizing profit. Such profit maximizing models are theoretically more appealing than approaches that strive to balance one or several attributes, such as potential or workload. COSTA's main advantage over previous profit maximizing approaches is that it is less complex. Consequently, COSTA demands less data so that even large problems can be solved close to optimality within reasonable computing times.

*(Salesforce Research; Industrial Marketing; Forecasting)*