

# An Analysis of Design Problems in Combinatorial Procurement Auctions

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## The Authors

**Prof. Dr. Martin Bichler**  
**Dr. Alexander Pikovsky**  
**Dr. Thomas Setzer**

TU München  
Department of Informatics (I18),  
Internet-based Informations Systems  
Boltzmannstr. 3  
85748 Garching/Munich  
Germany  
martin.bichler@in.tum.de

## Abstract

Traditional auction mechanisms support price negotiations on a single item. The Internet allows for the exchange of much more complex offers in real-time. This is one of the reasons for much research on multidimensional auction mechanisms allowing negotiations on multiple items, multiple units, or multiple attributes of an item, as they can be regularly found in procurement. Combinatorial auctions, for example, enable suppliers to submit bids on bundles of items. A number of laboratory experiments has shown high allocative efficiency in markets with economies of scope. For suppliers it is easier to express cost savings due to bundling (e. g., decreased transportation or production costs). This can lead to significant savings in total cost of the procurement manager. Procurement negotiations exhibit a number of particularities:

- It is often necessary to consider qualitative attributes or volume discounts in bundle bids. These complex bid types have not been sufficiently analyzed.
- The winner determination problem requires the consideration of a number of additional business constraints, such as limits on the spend on a particular supplier or the number of suppliers.
- Iterative combinatorial auctions have a number of advantages in practical applications, but they also lead to new problems in the determination of ask prices. In this paper, we will discuss fundamental problems in the design of combinatorial auctions and the particularities of procurement applications.

## Keywords

Combinatorial auction – Multidimensional auction – Industrial procurement – Combinatorial optimization

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