Combinatorial Reverse Auctions in Construction Procurement

Motivation / Background
- Volume of construction is forecasted to grow by 85% to $15.5 trillion by 2030.
- An allocation mechanism is needed to source based on “who wants it the most?” and “who can do it best?”
- Procurement is often misaligned with companies’ strategic goals.
- Combinatorial reverse auctions are used in the transportation sector.
- Perform well compared to single item auctions.
- Side constraints can easily be added to models to reflect business rules.

“Do you believe that good procurement is always synonymous with a successful project?”

Yes: 87%
No: 12%
I Don’t Know: 1%

Key Question / Hypothesis
- Can combinatorial reverse auctions be used to minimize procurement costs and improve project performance?
- Does adding bid adjustment and side constraints to models reflecting business rules well?
- Can the models handle uncertainty well?

Methodology
Historical data will be used to generate package bids. Bids will be adjusted to include indirect costs. 4 optimization models will be run to find optimal allocations and compared to traditional allocations.

Results and Insights
Allocation changed from exclusively using Supplier 2 to using Suppliers 1 & 3 lowering costs by 4.8%

Expected Contribution
- Recommend a framework for construction procurement.
- Show that models can take into account factors other than cost using bid adjustments and side constraints.
- Propose a method for handling uncertainty.

Results and insights from this project may be applied to other industries that deal with the project based procurement.

Initial Results
Before
After

Supplier 2
Supplier 1
Supplier 3

Item Costs
5 Million
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0

Fixed Cost

Supplier Comparison Statement (Raw Data)
Adjust Bids
Applying Models 1-4
Sensitivity Analysis
Does Bid Distribution Favor CRAs?
Results Report

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