Summary

Technological advances over the past decades have greatly improved the efficiency of transactions of goods and services. They have also created significant challenges to market designers and operators. On the one hand, the increased penetration of ICT has given rise to a never-ending arms race for speed in both traditional and emerging markets. On the other hand, market participants, due to cognitive limitations, cannot adequately process all the available information to make informed decisions, which would harm the performance of a market. Our research endeavors to develop novel IT artifacts that facilitate fast-paced decision-making in information-rich and time-critical B2B auction markets. To ensure the relevance of our research to business practices, we have developed a close collaboration with the world's largest flower wholesale market, the Dutch Flower Auctions (DFA), see Figure 1 for an Illustration of the information flow and decision-making process.

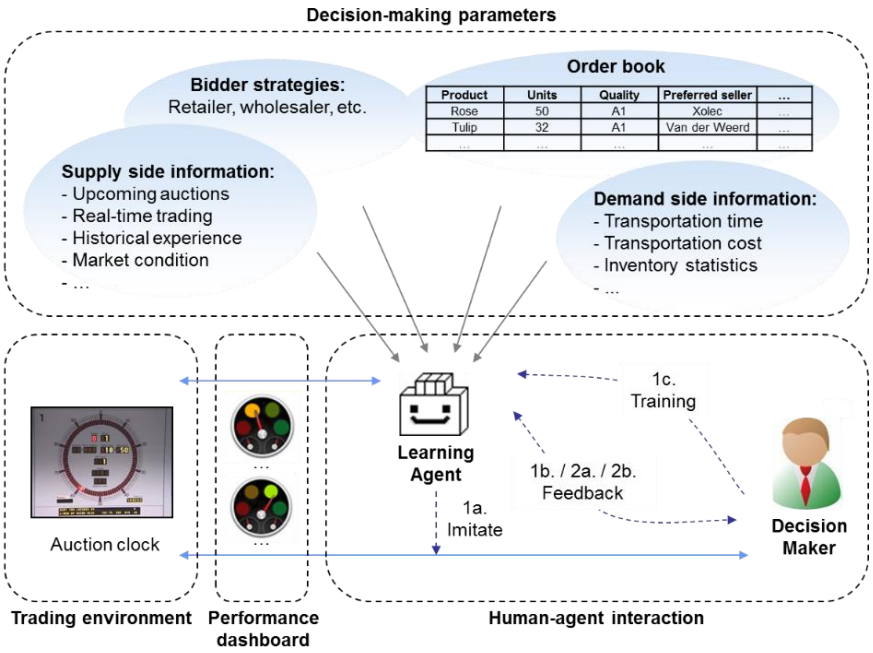
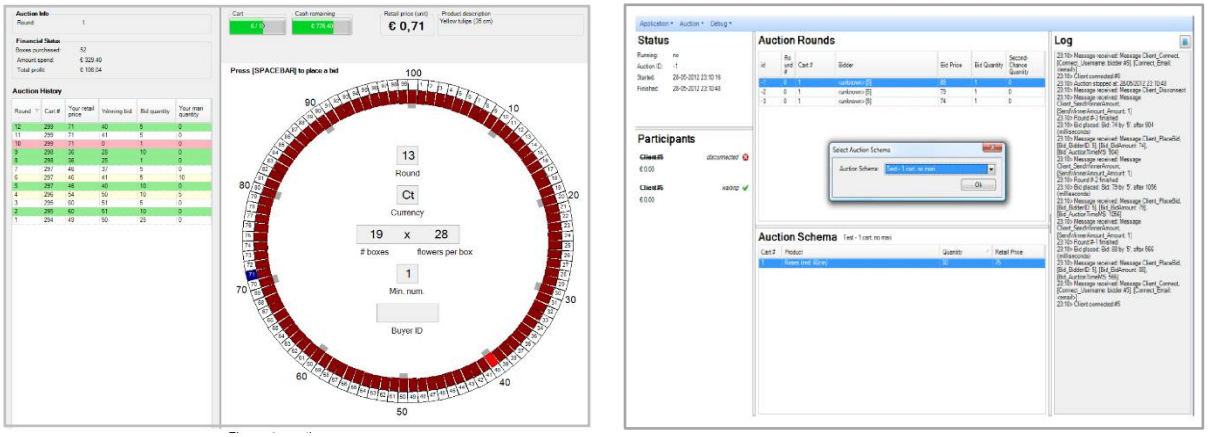


Figure 1: Overview of the Research Setup

Our research has generated five major design artifacts.

- **A Stable Taxonomy of Bidding Strategies**: Using a rich dataset from real-world transactions, we identified five distinctive bidding strategies. Theoretically, such finding challenges the conventional view that bidders' strategies would converge as they gain more experience and highlights the fundamental differences between B2B and B2C markets; Practically, the taxonomy of bidding strategies allows market operators to adapt and optimize the key auction parameters in real-time [1].

- **A Flexible Decision Support Framework**: Two key elements of this framework are: a prediction model that leverages structural properties that characterizes bidders' valuations of auctioned goods, and an optimization model that optimizes market outcomes for any given targets and/or constraints. The results from extensive simulations benchmarked with real-world auction data shows this novel framework can help auctioneers make better tradeoffs between revenue and throughput (i.e., market clearing speed) under different market conditions [2].
- **A New Auction and Bidding Interface**: Using a large-scale field experiment, we demonstrated that the new design can significantly increase the total revenue and price stability. The new design has been adopted and implemented at all the auction sites of the DFA. The effectiveness of the new design also sheds light on the on-going debate over information transparency [3].
- **A Hybrid Auction Mechanism that Mitigates Market Congestion**: Combining game-theoretical analysis, numerical simulations, and a large scale field experiment, we demonstrate our proposed hybrid mechanism can significantly speed up market clearing process without affecting expected revenue, and thus effectively mitigate the congestion problem. This is the first study that explores the potential of hybrid mechanism in addressing critical challenges faced by real-world markets [4].
- **An Auction Simulation System (see Figure 2)**: The simulation system allows researchers to study various design aspects of auctions in a highly realistic setting while maintaining control. It can also be used for training purposes for practitioners.



(a) Client[1] (b) Server

Figure 2: Illustration of the Auction Simulation System

Verification Statement

This project is initiated and conducted by university-based Information Systems scholars for R&D purposes.

[1] See https://youtu.be/0AjVJ0L5Cak for the demo of the simulation system's Client Software.

References

[1] Lu, Y., Gupta, A., Ketter, W., and van Heck, E. 2016. "Exploring Bidder Heterogeneity in B2B Auctions: Evidence from the Dutch Flower Auctions," *MIS Quarterly*, 40(3), 645-662.

- Best Paper Award (Runner-up) at Conference on Information Systems and Technology 2012

[2] Lu, Y., Gupta, A., Ketter, W., and van Heck, E. 2019. "Dynamic Decision-Making in B2B Sequential Auctions: A Structural Econometric Approach," *Management Science*, 65(8), 3853-3876.

- Best Paper Award (Runner-up) at Conference on Information Systems and Technology 2013

[3] Lu, Y., Gupta, A., Ketter, W., and van Heck, E. 2019. "Information Transparency in B2B Auction Markets: Theory and Evidence from a Field Experiment," *Management Science*, 65(9), 4261-4279.

- Best Video Presentation (Runner-up) at Conference on Information Systems and Technology 2014
- Findings implemented by *Royal FloraHolland* in the Dutch Flower Auction market in 2015

[4] Lu, Y., Gupta, A., Ketter, W., and van Heck, E. 2021. "Designing Hybrid Mechanisms to Overcome Congestion in Sequential Dutch Auctions," *MIS Quarterly*, Forthcoming.