On Auctions as the Negotiation Paradigm of Electronic Markets
Success Factors, Limitations and Research Directions

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Abstract

Until recently, electronic markets were dominated by the combination of static offer schemes and fixed pricing. Static offer schemes such as online catalogues apparently bear the risk of not matching the requirements of all potential buyers. But fixing a price also imposes another risk to the seller - the price might not always reflect the current market balance of supply and demand and the specific valuation of a single buyer. Whereas static offer schemes today are still prevalent, electronic auctions address the risk related to fixed pricing with an easy way of price discovery and differentiation by soliciting a wide range of bids from multiple parties.

In this paper reasons for the recent success of the auction paradigm in electronic markets are identified. But we will also illustrate one fundamental limitation: the price-based bidding of today’s auctions supports only distributive negotiations and does not provide a model for integrative negotiations where differences in the valuations of consumers and providers are exploited in order to achieve joint gains. Several solutions have been suggested to address this issue. We review critically these approaches and outline directions for future research.

1. Introduction

Negotiations are bargaining processes that not necessarily have to, but can be part of the coordination effort in markets. In this paper we identify market conditions that favour the use of negotiations. These negotiations can be executed with various protocols, but our observation is that only one class of protocols has gained widespread usage in electronic markets - auctions. This implies that the virtualisation of markets has caused a shift from more traditional protocols such as bilateral synchronous negotiations towards the auction paradigm. We will explain why auction protocols especially benefit from information technology, but also identify limitations of their use that have to be considered and are currently the subject of further research. This analysis of auctions is based on fundamental concepts of negotiation theory, which we will introduce first.

2. Negotiation fundamentals

Business transactions consist of a finite number of interaction processes among business parties, which can be classified in the following four phases (Schmid 1998):

- Knowledge (gathering information concerning products, partners etc.)
- Intention (specifying supply and demand)
- Agreement (discussing the terms and conditions of the transaction)
- Settlement (executing the agreed-upon contract)

One issue the agreement phase typically determines is the price for the execution of the transaction. Two situations are possible after the intention phase - the provider offers a fixed price or the price is variable. The other issue, which can be subject to agreement, is the configuration of the transaction. The object of a transaction can be goods, services or combinations of both. Again two situations are possible, a fixed configuration (e.g. products ‘off the shelf”) or a variable configuration based on components (presented for example in a catalogue).

To fix either price or configuration constitutes a risk for the provider organisation. It has to be sure about the current balance of supply and demand (the efficiency of the price) as well as the attractiveness of the configuration.

The alternative of leaving the discovery of price and configuration subject to agreement has the main advantage of an automatic adaptation to the current market situation, but requires a discovery mechanism. Negotiations provide such a mechanism.

2.1. Processes in the intention and agreement phase

A definition of negotiations has to respect interfacing processes in the intention and agreement phase. Our analysis identifies several processes with relevance to negotiations:
In the preparation process each party determines a reservation price. For a provider this is the minimum price it will accept to perform the transaction. A consumer will normally enter the agreement phase with a price offer that is lower than its reservation price. If the provider accepts this price then the consumer realises an advantage. Each party can also define its reservation configuration. The reservation configuration represents the set of issues (attributes and attribute values of the transaction) that are targeted to be part of the agreement. One issue could be for example the attribute 'return policy' with a desired attribute value of '75% price return'. Whereas reservation parameters usually remain secret, the offer configuration is communicated to another party. In a typical scenario, the consumer could offer a configuration defining '100% price return', which leaves room for future concessions. If these reservation parameters are determined, the offer is advertised (specifying for instance a date of expiration), and the intention phase is completed.

Matching is the first process in the agreement phase with the goal of identifying either offers with comparable offer prices and configurations, or offers that suit certain search constraints. In the scoring process this set of candidate offers for an agreement is evaluated and ranked to determine the best offer. Accepting the best offer and signing a contract completes the agreement phase.

Negotiating takes place when, based on the offers from the intention phase, an agreement cannot be reached among the parties intending to carry out the transaction (or there is a potential for optimisation) and the parties are willing to discuss their offers. From the perspective of one party, negotiating is characterised by the modification of its own offer or the efforts to change the other party’s offer in order to reach an agreement.

If the parties can not or do not want to negotiate, there are several options. The transaction is accepted as specified by the other party, the agreement phase is cancelled, or the matching process is restarted with different offer parameters or even different reservation parameters.

2.2. Classification

The most common classification of negotiations distinguishes between two types (e.g. Raiffa 1982): distributive and integrative negotiations. In distributive negotiations one issue is subject to negotiation and the parties involved have opposing interests. One party tries to minimise (to give as little as possible) and the other party tries to maximise (to receive as much as possible). Distributive negotiations are also characterised as 'win-lose negotiations'. The more one party gets, the less the other party gets.

In integrative negotiations multiple issues are negotiated and the parties involved do have different preferences towards these issues. Two parties want for example to buy a company, but one is interested primarily in the human capital whereas the other is interested primarily in the patent portfolio. These variant valuations can be exploited to find an agreement with joint gains for all parties. If their preferences are the same across multiple issues, the negotiation remains distributive until opposing interests are identified. In such a case, both parties can get more and thus another name for this class of negotiations is 'win-win negotiations'. This fundamental advantage compared to distributive negotiations is also illustrated in Table 1. In this simplified negotiation scenario four issues are subject to discussion. The buyer and the seller have different valuations, indicated in the scenario as importance ratings ranging from 0 to 100. As the example illustrates, a win-win solution is for instance achievable with the following trade-off: the seller accepts a higher value for the return policy (which is most important to the buyer) but the buyer in turn pays a higher price (which is most important to the seller). This trade-off is advantageous to both parties, if the loss suffered by conceding one point is lower than the additional value achieved through the concession of the other party.
### Issue Potential value range

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### Table 1: A scenario for integrative negotiations

In general, this classification based on the number of issues cannot be assigned once to a negotiation. During the process of agreement an integrative negotiation could be reduced to a distributive negotiation if only one issue becomes subject of the discussion and all other issues are temporarily fixed. On the other hand a distributive negotiation could be extended to an integrative negotiation by adding issues to the discussion.

Another classification addresses the number of negotiating parties. Negotiation can take place between one provider and one consumer, among many providers and one consumer (or vice versa) and among many providers and many consumers.

### 3. Sufficient and necessary conditions for negotiations

Why do we need negotiations in electronic markets? In general, there is never a rigid condition that implies negotiation. Negotiations happen voluntarily. If a party does not want to negotiate, it can always accept what the other side is offering. Negotiations are dependent on a combination of sufficient and necessary conditions. If the necessary conditions are true and at least one of the sufficient conditions applies, then a party has the option and a reason to negotiate.

#### 3.1. Necessary conditions

One necessary condition for negotiations is mutual dependency (Lewicki, Saunders and Minton 1997). If one party is totally dependent on the other party, it can only react to the other party’s moves. If the company decides to lay an employee off because it is no longer dependent on his work, then negotiations will not take place. This might change if the union decides to fight for the employee’s job because the company is still dependent on the union.

An additional condition is necessary for integrative negotiations. In order to discover potentials for joint gains there has to be an exchange of preference information between the negotiating parties. In the example of the company acquisition, a win-win solution is impossible if the potential buyers do not know that one party is interested primarily in patents and the other in human capital.

#### 3.2. Sufficient conditions

If a provider or consumer organisation does not want to fix the price and/or configuration of its offers, it can rely on negotiations as price and configuration discovery mechanism. With negotiations, offers can be tailored to individual needs. They leave the determination of the value to the marketplace where resources are allocated to those who value them most (Guttman and Maes 1998). A provider does not want to take the risk of fixing a price and/or configuration if for instance one of the following conditions applies:

- non-repetitive, non-standard transactions (paintings)
- demand unknown (new products)
- supply unknown (differentiated markets)
- perishable transactions (airline tickets)
- consumer requirements heterogeneous (product mix)
- consumer value perceptions unknown (fashion goods)
- dynamic markets (electrical power)
- availability of price based comparison mechanisms (shopping agents)
- focus on long-term relationships with the consumer (special offers)

To provide a typical scenario in electronic markets where some of these conditions are present, we will illustrate the pattern of electronic price wars. Search costs are generally low in electronic markets (Wigand and Benjamin 1995). If provider comparisons (for instance with shopping agents) are cheap for consumers the profit margins shrink for providers and the market shows characteristics of perfect competition (no regional, personal or product-specific preferences and high transparency). Perfect competition implies that there is only one efficient price on the market, which leads to price wars and typically to the market exit of several providers. Alternatively providers drop fixed pricing or choose differentiation strategies (value-added services, branding, frequent buyer programs) to make searching more complex and to avoid comparisons based only on price. With an increase in differentiation, electronic markets become less transparent, which again obstructs fixed pricing.

### 4. Auctions

Based on the perspective of negotiation theory introduced above, the role of auctions as negotiation protocols in electronic markets will now be investigated. This discussion covers a classification, success factors and the identification of limitations.
4.1. Classification of auctions

Auctions in electronic markets define a protocol for the interaction of providers and consumers to determine the price for transactions. The reservation price, which is identified in the preparation process of the agreement phase, represents the minimum bid in an auction. Through a public announcement and opening of the auction, the offer is advertised. Matching implicitly happens if bidders decide to participate in the auction. The negotiation then takes place through a sequence of bids until the auction is terminated and the winning bid is identified.

As price is the only attribute subject to negotiation, auctions support distributive negotiations. Depending on the auction protocol (e.g. Kumar and Feldman 1998) one-to-many negotiations (single-sided auctions) as well as many-to-many negotiations (double-sided auctions) are possible.

4.2. Success Factors

Interactions in distributive negotiations are limited to the communication of asks and bids with one attribute, the price. Coordination is therefore easy and inexpensive to automate compared to the more complex exchange and analysis of information, which is required for integrative negotiations. Furthermore the competition inherent to the bidding process of auctions forces bidders to unveil their true valuation. Overall this leads to more efficient prices than bilateral negotiations, where a party can always try to demand a bigger share in the hope the other party will back down because it is not aware of alternative agreements. An additional advantage of auctions is that they are public and can be delegated to independent third parties (Milgrom 1989), which reduces the opportunity for “behind the scenes agreements” and creates an image of fairness.

The dominance of auctions as negotiation protocols in electronic markets is also based on two other factors:

- Auctions are virtual exchanges with low setup and transaction costs, which allows providers to keep their reservation prices relatively high because unsold products/services do not incur return costs (Lee 1998).

- Auctions exploit network externalities: an increased benefit for sellers with increased number of buyers and vice versa (Bakos 1991). This effect is based on the ubiquitous and cheap connectivity of the Internet.

4.3. Limitations

The efficiency of auctions is endangered by several factors (e.g. Guttman and Maes 1998):

- Rings and shills – bidders can form rings to acquire the good at relatively low cost and then distribute the gain among themselves. Sellers themselves can bid to push the price higher. With after-sales evaluations and ratings, this risk can be reduced.

- Winner’s curse - the winning bid is always higher than the market valuation (a problem addressed by the Vickrey auction).

- Lot size and frequency – although sellers leave the determination of the price to the market, the right choice of the frequency and size of auction lots for production goods that are in principle unlimited resources (e.g. digital music) is not trivial.

Although these problems can generally be solved, there are more fundamental limitations. Auctions typically have a fixed time frame, which tends to be long in order to capture a critical mass of bidders. This makes no sense in one-to-one negotiations. Moreover electronic auctions are currently limited to distributive negotiations with one attribute, namely price. Distributive negotiations are of win-lose nature and consequently not as economically efficient and desirable as integrative negotiations.

5. Towards integrative negotiations in electronic markets

If participants in an electronic market prefer to reduce the scope of negotiation to one attribute, price, then auctions are an efficient way to perform price discovery. However this restriction will not apply to differentiated markets with complex products and services, where neither consumers should compare nor providers want to be compared based on just one attribute. As electronic markets are expanding from commodities like books and CDs to more complex areas of business, the availability of support for integrative negotiations will be a critical success factor. Several efforts are currently in progress to address this issue.

5.1. Research overview

Multi-attribute auctions have been envisioned to extend the scope of auctions beyond price discovery. In one projected scenario (Bichler 1999) the consumer specifies a request for bids including requirements and preferences. Providers try to configure bids that maximise the satisfaction of the buyer. The bids are then collected and the winning bid(s) are computed according to the consumer’s preferences. In another approach (Teich, Wallenius and Wallenius 1998) multiple-attribute auction algorithms are introduced that match providers and consumers.

Autonomous market agents support multiple bilateral negotiations with a high level of automation (Chavet and Maes 1996, Beam and Segev 1997). In order to reduce human intervention, the negotiator specifies requirements, preferences and a bidding strategy (e.g. starting price,
lowest/highest-accepted price, and risk attitude), which is then used by an agent to negotiate an agreement with other agents on behalf of the owner. This approach is not limited to the negotiation of one attribute. MIT’s T@T project is developing an integrative negotiation protocol based on argumentation theory and distributed constraint satisfaction, which will support multi-attribute negotiation (Maes, Gutman and Moukas 1999).

Negotiation Support Systems (Jelassi and Foroughi 1989; Kersten 1998) originate from decision theory and are not tailored to a specific scenario like electronic Commerce. The focus is on the preparation and mediation of the negotiation process (e.g. with preference elicitation) and the support for efficient outcomes (e.g. by suggesting pareto-optimal solutions in the post-settlement phase).

5.2. Discussion

The solutions presented here require a complete and consistent specification of the preferences of a decision-maker in order to implement automated offer comparison, agreement suggestion or clearing procedures. To extract these preferences, techniques such as multi-attribute-utility theory or conjoint analysis have been suggested (Kersten and Noronha 1997). However these methods impose severe restrictions (such as the independence of issues) and require a clear structure of the decision problem (the number of issues is known and all options for the issues are in an expected range). These are conditions, that most real world negotiation problems will not fulfil (Rangaswamy and Shell 1997). In the area of financial services, it is for instance increasingly common to bundle and customise products (life insurance, pension plan, funds management etc.) to the specific needs of the consumer. In this scenario offers with interdependent issues, unexpected options and incomparable structure are very likely. Furthermore it can not be assumed that preferences are constant in a negotiation. Pressures (e.g. time constraints) or new knowledge can alter these preferences at any time (Kersten and Szapiro 1986).

Our goal is to avoid the current restrictions of preference specification with a more dynamic and incremental approach of information exchange based on the principles of the staged dialogue, which has been developed in the ViMP project (Field and Hoffner 1998). This effort contributes to our general research question: how can the benefits of competitive bidding and the network externalities, which have been successfully exploited in electronic auctions, be used to support integrative negotiations in a virtual marketplace?

6. Summary

After a phase of fixed price menus, negotiations were introduced to electronic markets with the rise of online auctions. This is a positive development because under many market conditions, negotiated agreements are advantageous for both providers as well as consumers. But it is incorrect to assume that current auction protocols can cover the entire range of negotiation processes that will be required for complex electronic commerce scenarios. Their current restrictions and limited scope will lead to the emergence of other new electronic negotiation paradigms, which also benefit from the exploitation of the advanced information and communication technologies available in electronic markets.
References List


