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Effects of Electronic Markets on Negotiation Processes

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Abstract- Negotiation can be regarded as playing a game with certain rules. If the rules change, the game has to be played differently. Compared to traditional markets, electronic markets can have fundamentally different characteristics such as cost structure or the level of transparency. These differences have already stimulated the tremendous success of one breed of electronic market negotiations: auctions. But auctions offer only limited support for the negotiations that will be necessary in more differentiated markets for complex goods and services. This paper relates the implications of specific electronic market characteristics to the effectiveness of major types of negotiations. The analysis reveals why bidding protocols currently dominate bargaining protocols and suggests that future negotiation support beyond auctions should be based on integrative multilateral protocols.

I. INTRODUCTION

Negotiations have been identified as critical coordination mechanisms for the interaction of providers and consumers in future electronic markets that transcend the selling of uniform goods [1]. This has inspired research with origins in the area of negotiation science [2],[3], autonomous agents [4],[5], and auctions [6]. However the primary focus of these research efforts is on the automation or extension of existing negotiation protocols. More fundamental questions have been neglected so far.

A broad variety of negotiation protocols has evolved in traditional markets. What are the reasons that some types of protocols have not been implemented in electronic markets? Are all traditional negotiation protocols promising candidates for electronic markets or are there protocol types that are more efficient due to certain characteristics of electronic markets?

A study of the interdependencies between economical characteristics of electronic markets and features of negotiation processes can provide insight into this issue and outline future research. It turns out, that first, one can expect the number of negotiated agreements to increase in electronic markets. Second, protocols with multilateral character seem to be suited especially to benefit from electronic market characteristics. Third, missing formalisations of the integrative negotiation process currently prevent fully automated implementations and will probably continue to do so in the future.

To present these conclusions, this paper is organised in the following way: Section II briefly introduces negotiations as part of the agreement phase of business transactions and provides a basic classification of negotiation protocols. Section III analyses major characteristics of electronic

markets. These characteristics are then used in Section IV to specify a need for negotiations in electronic markets and in Section V to examine the implications for processes in the agreement phase. In Section VI we review our findings based on negotiation support that is currently available in electronic markets. Finally, Section VII discusses conclusions of this assessment and our future direction of research.

Throughout this paper we will postulate hypotheses to summarise our findings.

II. AGREEMENT PHASE

Four phases of interaction can be identified in business transactions [7]:

- *Knowledge* (gathering information concerning products, market participants etc.)
- *Intention* (specifying supply and demand with offers to buy etc.)
- *Agreement* (identifying the terms and conditions of the transaction and signing a contract)
- *Settlement* (execution of the agreed-upon contract, payment, post-sales support etc.)

Each phase consists of several interaction processes. The interface between the intention and the agreement phase is an offer. If at least one party submits an offer, the agreement phase is initiated. In the simplest case another party merely has to accept this offer in order to reach an agreement. In case of an agreement the transition to the settlement phase is marked by a signed contract.

In the following sections, processes in the agreement phase are examined in more detail. For one of these processes – negotiation – a classification is provided.

A. Processes in the agreement phase

We identify the following high-level processes to be part of the agreement phase. *Matching* is the initial process that identifies candidate offers for an agreement. Input to the matching process is either a set of requirements (constraints and preferences identified in the information phase) paired with a number of offers or a set of offers-to-buy and offers-to-sell. Correspondingly the output is either a set of offers that fulfil the constraints or matching offers with high agreement potential. Hence matchmaking provides data sets for the next step: scoring.

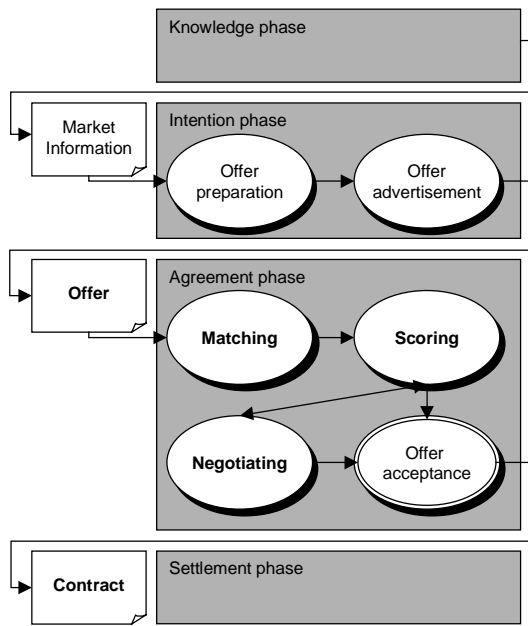


Figure 1: Processes in the agreement phase [8]

In the *scoring* process the set of matching offers is evaluated and ranked to determine the best offer. The ranking can be a result of comparing single attributes such as price or of more complex evaluations based, for instance, on multi-attribute utility theory [9]. If a party is satisfied with the best offer, signing a contract by *accepting* the offer completes the agreement phase.

Negotiating takes place when, based on the offers made in the intention phase, an agreement cannot be reached or the agreement has potential for optimisation and the parties intending to carry out the transaction want to discuss their offers. From the perspective of one party, negotiating is characterised by the modification of one's own offer or the efforts to change another party's offer. After the negotiation process, scoring can be initiated again to compare the negotiated agreement with other potential agreements.

If after scoring or after the negotiating process an agreement has still not been reached, the entire agreement phase can be restarted, for instance, by preparing new offers in the intention phase or reviewing the initial requirements in the knowledge phase.

B. Classification of negotiations

Many attributes can be used to classify negotiations [10]. For the purpose of this paper the following attributes are of primary interest:

- *Distributive versus 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 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 in the patent portfolio. These variant valuations can be exploited to find an agreement with joint gains for both 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 realise gains; thus another name for this class of negotiations is 'win-win' negotiations [11].

- *Bilateral versus multilateral negotiations.* This characterisation of negotiations refers to the numbers of parties participating in the negotiation. Only two parties participate in bilateral negotiations, whereas in multilateral negotiations either the one-to-many or many-to-many negotiation situation applies. In addition, parties involved in multilateral negotiations can typically inspect offers from other parties (unless the offers are intentionally sealed). Similarly, multilateral negotiations are also characterised as public competitive negotiations, whereas bilateral negotiations have a private character and are therefore often referred to as cooperative negotiations.

Combinations of attributes within this classification can be used for a high-level design of negotiation protocols. A protocol for negotiations defines the rules by which parties come to agreements. We will compare the two most commonly used protocol families (shaded areas in Figure 2) *multilateral distributive negotiations* (bidding) and *bilateral integrative negotiations* (bargaining) in more detail later in this paper.

A classification is not necessarily persistent during a real negotiation process. An integrative negotiation can be reduced to a distributive negotiation if only one issue is subjected to discussion and all other issues are temporarily fixed. On the other hand a distributive negotiation can be extended to an integrative negotiation by adding issues to the discussion.

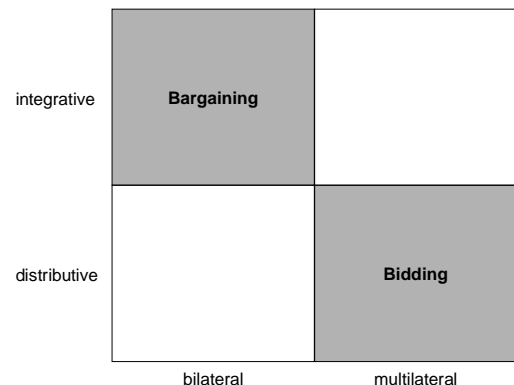


Figure 2: Types of negotiations

III. CHARACTERISTICS OF ELECTRONIC MARKETS

Electronic markets are information systems that coordinate business transactions through the forces of supply and demand [12]. From an economics perspective, electronic markets can, but do not necessarily have to, differ fundamentally from traditional markets. The following primary characteristics are relevant to the discussion in this paper:

- *Virtuality*. Electronic markets are virtual markets, which means that the objects of transactions and market participants do not have to be physically present. Participation in virtual markets can be both synchronous and asynchronous. It is not necessary for consumers and providers to meet at the same time. Participants might also use software agents to act on their behalf or to provide notification of events. Accordingly, virtual markets do not generally incur return costs, because goods do not have to be transported back and forth [13].
- *Transparency*. Electronic markets can be completely transparent due to zero or marginal search costs [14]. Market transparency is defined as the ability of market participants to observe information about the trading process. Information can be related to current or past prices, quotes, offers, volume and the identities and motivations of market participants. This information in electronic markets is available through advanced search and comparison services such as shopping agents or directories. Furthermore electronic transactions multiply the opportunities to collect data about consumers' purchasing behaviour. Sources of information range from records of online payments to logs of site visits and page views¹.
- *Size*. An important characteristic of electronic markets is that they are, in principle, not limited to political or regional borders, enabling trade with partners from all over the world. The entry thresholds for the market are generally low, which increases the number of potential trade partners significantly compared to traditional markets. It has to be considered though that partners might be located in another country with a different culture, different trade customs etc. [15], which can heighten the complexity of interaction.
- *Cost*. The costs for managing interactions (transaction costs such as advertising, searching potential trade partners and subsequent coordination) are generally low due to a high degree of automation and the cheap connectivity of the Internet [16]. In the early development stages of electronic markets, switching costs for consumers were rather high due to significant setup costs for electronic transactions (connections to proprietary market systems such as SABRE or Apollo). These costs have decreased as the Internet

and its related standards (TCP/IP, HTTP, XML etc.) homogenise the access channels. Once companies have connected to the Internet they can switch markets and providers at virtually no cost from a technical point of view (costs might still be imposed by system providers, e.g. for client software or registration).

IV. NEED FOR NEGOTIATIONS

Given the characteristics of electronic markets an important question is whether we can expect to see more or fewer agreements that are based on negotiations in electronic markets compared to traditional markets.

In general, there are many reasons already prevalent in traditional markets to negotiate the price as well as terms and conditions of a transaction, opposed to fixed offering. It is, for instance, very difficult to fix a price for transactions that are unique (e.g. power plants), are subject to diverse consumer valuations (e.g. fashion goods, art), are perishable (e.g. food, newspaper advertisements) or that face very dynamic demand (e.g. network bandwidth, electricity).

Key to a specific view of the need for negotiations in electronic markets are low transaction costs and especially low search costs. If search costs for price information are zero, we can expect that consumers enjoy perfect price information. This typically leads to price wars. Providers then have the following alternatives: make price comparisons more difficult, differentiate their products, or create markets that emphasise product information over price information [17]. As we will show now, all of these strategies are incompatible with advertising fixed offers.

To impede price comparisons basically means to reintroduce search costs. Typically this can be done by charging different prices to different consumers for the same transaction. Perfect price discrimination achieves this through exploiting differences in consumer valuations. This discrimination strategy requires detailed consumer information, customised products and independent billing. Such conditions can occur in electronic markets [18]. Hence price discrimination requires knowledge about the situation-specific individual consumer valuations, which cannot be analysed based on fixed offers.

By differentiating horizontally or vertically, providers can decrease the substitutability of their products/services and customise offers to the requirements of specific consumers or market segments (mass customisation). In such a market it is possible for providers to extract consumer surplus even among consumers who have perfect price information. This is the case because consumers tend to remain loyal to providers of products and services that best match their requirements. With a differentiation strategy, fixed pricing is again rarely possible because in the extreme case every transaction is unique and non-repetitive.

Markets that emphasise product information steer consumers to the provider with the best offer. Providers might even be able to charge for this service, which then raises the entry barrier for competitors. But if product information dominates

¹ The future availability of personalised consumer information is difficult to estimate because of the current discussion regarding privacy in the Internet.

price information, then it is again advantageous for providers to omit price information completely because individual prices are always more efficient than uniform pricing (as has been shown by Philips in [19]).

A specific discussion is necessary regarding markets for commodities. There are not many options to differentiate or emphasise product information for mass-marketed consumer products such as CDs or books - the online selling of commodities is though often bundled with add-on services (e.g. sound samples or gift-wrapping). But there is also a shift towards negotiated agreements in electronic markets driven by new possibilities to increase consumer power. Services such as the buyer consortium Accompany [20] accumulate demand in order to negotiate better prices. This is, because of minimal interaction cost, also effective for low-value goods.

The conclusion therefore is that we can expect more negotiations to take place in the agreement phase of electronic markets than in traditional markets. Supporting electronic negotiations is therefore not only a necessity but also a critical success factor for many markets, which may face price wars and exiting providers.

Hypothesis: The number of negotiated agreements will increase in electronic markets.

The market for airline tickets is the most popular and most intensively studied example of an electronic market that displays a pattern of virtualisation, price wars and differentiation/discrimination strategies. Currently it is easy to search for convenient flights but finding the best rate is cumbersome because the number of different tariffs is huge. Airlines deliberately introduced this discriminated price structure (early reservation discounts, frequent flyer bonus, weekend tariffs etc.) to reduce market transparency after a phase of open price competition [21].

Just recently the next level of dynamic offering was introduced to the market. After airlines started to run auctions for unsold tickets, services such as Priceline [22] now allow consumers to specify the amount they are willing to pay for a ticket. Then Priceline will query the market to see if an airline is willing to accept this price. Differentiation strategies are also manifested in new bundled offers that for instance combine business class tickets with free rental cars. This clearly shows that the market is constantly moving towards more variable prices and more differentiated offers, resulting in more negotiated agreements.

V. EFFECTS ON AGREEMENT PROCESSES

The specific characteristics of electronic markets not only affect the likelihood of negotiations in general but also have implications for the execution of agreement processes and the sources of power in negotiations. In the following sections we develop several additional hypotheses regarding the implications of electronic markets.

A. Implications for pre-negotiation processes

The characteristics of electronic markets can affect the processes precedent to negotiations in the agreement phase in the following way.

1) *Matching*: Because the number of potential trade partners increases with the size of the market, the chances of finding a closer match to the requirements specified are higher. The matching process itself benefits from the virtuality of the market because the process can be based solely on the comparison of offer and request information without the need to inspect transaction objects physically in order to retrieve attributes for the matching. Several mechanisms already exist to support the matching process (e.g. [23]), allowing improvement of the situation at the beginning of negotiations.

Hypothesis: Greater size and virtualisation are beneficial to the matching process.

2) *Scoring*: The more information available in the market, the better for the scoring process. Detailed information, for instance about providers (history, references etc.) or the range of service/product attribute values across the market (e.g. warranties vary from 1 to 3 years), increases the number of input parameters to be considered and reduces the uncertainty about the decision to determine the best match.

Hypothesis: Transparency is beneficial to the scoring process.

B. Implications for the negotiation process

The analysis in the previous section suggests that pre-negotiation agreement processes generally benefit in the context of electronic markets. If the execution of processes in the pre-negotiation stage is already simplified, this also has positive effects on the negotiation process itself simply because the selection of potential agreement candidates is more effective (matching results with better quality at lower cost, scoring with higher accuracy and less uncertainty). Compared to traditional markets, negotiations with a higher agreement potential can be pursued and negotiations with no zones of agreement are identified a priori. But this generic benefit of electronic markets is, on the level of single characteristics, biased towards the different types of negotiations. In the following discussion we will focus on a comparison of bargaining versus bidding with the goal to determine which characteristic is most beneficial to which type of negotiation.

1) *Bargaining*: If personalised consumer information is available to the extent that a provider organisation knows about the preferences of its consumers, this is very favourable for the integrative negotiation process because the exchange of preference information is a necessary requirement [24].

If greater size results in a higher number of agreement candidates, bargaining is more complex because it requires

comparing multiple preference profiles and managing multiple simultaneous bilateral negotiation sessions.

With regard to costs, the fact that transaction costs are low is not critical for bargaining because integrative negotiations do not rely on high quantities of standardised simple interactions such as price bids in distributive negotiations. Interactions in integrative negotiations are much more unstructured (inquiries, positional statements, challenges etc.) and costs are mostly associated with the decision process (see Section VI). In addition, low costs for setting up a transaction and switching providers also allow short-term trade relationships, which are not based on long-term mutual commitments but are established dynamically. Parties therefore might not have previous experience or make further deals with each other. Traditional strong arguments for concessions such as past compromises or linking with potential future deals are therefore weaker in an electronic market if short-term relationships are prevalent. This will make negotiations less amicable, which is not favourable for integrative negotiations regarding their joint-problem solving nature.

Hypothesis: Bargaining benefits especially from high transparency.

2) *Bidding*: Multilateral distributive protocols are represented by auctions. Auctions benefit from the size of electronic markets because they rely on competition. With an increasing number of competing consumers and providers, negotiating parties are forced to unveil their true valuations and the resolved prices are more efficient than in traditional bilateral negotiations [25]. Participants also benefit directly from low transaction costs. Whereas providers generally have to pay setup costs and a proportional sales fee, the participation of consumers is free, which again amplifies the size factor. Searching for the right auction item is cheap and already supported by various search engines and agents (e.g. AuctionWatch [26]). As multilateral protocols, electronic auctions also benefit from virtuality because the potentially high number of participants are not required to be at the same place at the same time. High transparency on the other hand is not crucial in electronic auctions because a rational strategy for bidding in typical electronic auction protocols such as the Dutch or Vickrey auction is only dependent on a bidder's internal reservation price. Determination of the reservation price does benefit from high transparency. But this task is usually performed in the knowledge or intention phase and, as will be shown in Section V.C.2 transparency can even have a negative impact on the bidding process.

Hypothesis: Bidding benefits especially from greater size, low transaction costs, and virtuality.

C. Implications for negotiation power

We can informally define power in negotiations as the ability to influence the other party in a way that contributes to the achievement of personal goals in a negotiation.

In business negotiations the following sources of power² might be used [27]:

- *Resource control* (money, time, critical services or human capital)
- *Information power* (ability to assemble information that supports a position, respect, or credibility)
- *Personal power* (attractiveness, emotion, integrity, persistence and tenacity)

Sources of power are applied in negotiations, for instance, to persuade or to put pressure on the other party. But these sources of power call for special consideration in an electronic market setting. Negotiation power is a relational concept. One party tries to gain a power advantage in a certain area.

In Section IV, an example for increased consumer negotiation power in electronic markets was introduced as an argument to support the increased likelihood of negotiations. The source of greater negotiation power in the example of buyer consortia is based on the accumulation and coordination of demand, leading to an increase of the resource controlled (in this case consumer money).

It is difficult though, to gain information power (having more or better information than the other party) if the cost of searching for information is low. In markets with high transparency we can assume that both parties always have the same level of information. Therefore it will be very difficult to gain information power.

As electronic markets are virtual exchanges, sources of personal power are not present. Current technology does not yet provide any means of conveying attractiveness or anger, for example, other than through the wording used in electronic mails. The desired high degree of automation is also not favourable for expressing personal power because the main goal of automation is to reduce personal involvement.

Hypothesis: Better means to coordinate resource control lead to stronger consumer negotiation power - but sources of information and personal power are vanishing in electronic markets.

This again has biased implications for the negotiation processes.

1) *Bargaining*: Information power is not critical in the joint problem-solving effort of integrative negotiations. More important is to share any kind of knowledge that leads to pareto-optimal solutions. On the other hand personal power has historically played an important role in traditional bargaining, especially in face-to-face negotiations. But research [28] indicates that avoidance of threats, positional statements and other kinds of messages related to personal power promote integrative solutions.

2 Two other sources of power are identified: legitimate power and one's location in the organisational structure. These sources are not relevant in the context of non-hierarchical market coordination.

Hypothesis: Lack of personal power is beneficial to bargaining solutions.

2) *Bidding*: For bidding, information power is important. Given better information than one's competitors, a participant might have a more accurate estimate of the reservation price and therefore a reduced risk of paying too much. If information power is not achievable, the common value assumption holds. All bidders have the same valuation (reservation price) and the winner has to pay a price higher than the common valuation, suffering the winner's curse [29]. This will deteriorate incentives for participation. Personal power however does not matter for bidding because the interaction is restricted to the submission of price bids.

Hypothesis: Lack of information power is disadvantageous for bidding participation.

VI. ANALYSIS OF CURRENT NEGOTIATION SUPPORT

In this section we will discuss briefly the existing support for electronic negotiations in order to review the hypothetical implications for negotiation processes derived in the previous sections.

From a current perspective, support for electronic negotiations is limited to distributive negotiations and, more specifically, to bidding [30]. The most successful and popular application of bidding is the electronic auction. Today, large transaction volumes in electronic markets are coordinated via auctions in business-to-consumer as well as business-to-business scenarios. Successful examples include auctions for bandwidth or procurement. Many variations of protocols are used (e.g. [31]). Less ubiquitous types of bidding are implemented based on autonomous agents (e.g. the Kasbah project [32]). These agents incorporate a specification of the negotiation strategy (risk friendly, risk averse) used in the negotiation with competing agents that act on behalf of other market participants.

The fact that bidding dominates electronic markets whereas applications of bargaining are missing completely provides a high-level backing for the hypotheses we derived. Figure 3 summarises the biased effects of electronic markets on bidding and bargaining.

Bidding benefits more from the factors size, cost and virtuality, whereas only one factor is more favourable for bargaining: transparency. Based on this analysis and assuming equal power of the impacts, protocols based on bidding seem to be better suited for electronic markets than protocols based on bargaining.

This is strengthened by the fact that the characteristics of greater size and low transaction cost are a reality in many markets today. We reasoned in Section IV that high transparency is unstable because providers have an incentive to reduce transparency if consumers enjoy perfect information.

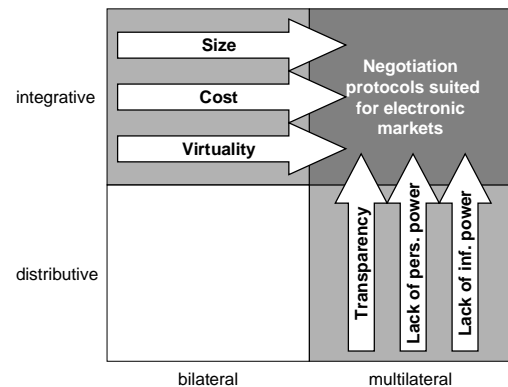


Figure 3: Biased effects of electronic markets

Figure 3 suggests very generic arguments that favour multilateral integrative protocols as suitable electronic market negotiation protocols on a macro-market level. The choice and design of a protocol for a single market scenario will also be driven by other considerations such as the nature of the traded product (value, configuration space etc.).

There is another reason why bidding currently dominates bargaining, which we denote as the 'formalisation frontier'. The goal of complete automation is the execution of tasks with no human intervention. To investigate the degree of possible automation necessary, aspects such as formalisation of the task and sufficient aspects such as the efficiency of automated processing versus human execution have to be considered [33]. Regarding formalisation, the decision tasks within the respective negotiation processes are especially critical.

It is possible to host bidding services in a completely automated way because formalisations for the decision task have been developed: the winning bid is the one with the lowest, second-highest or highest price (depending on the type of auction). Even for more complex scenarios (bids on price and quantity, combinatorial auctions) clearing algorithms have been developed [34],[35]. Participation in the bidding process (monitoring bids, reacting on outbids etc.) is, again depending on the type of auction, also automisable with software agents (e.g. eBay's proxy bidding). This is the case, for instance, when there is only one rational strategy to bid (see above). Hence, only one decision task cannot be formalised in an efficient manner: the determination of the maximum bid (the reservation price).

Typically, negotiations demand decisions under uncertainty (unknown reservation price of the other party, possibility for future concessions from the other party etc.). Hardly ever can decisions such as the determination of the reservation price be isolated from a number of interdependent business parameters (e.g. the level of stock or available manufacturing capacity) or other related decisions (in real estate scenarios there might be concurrent negotiations between a buyer/seller and buyer/bank). In the case of bidding, this critical decision usually takes place in the knowledge or intention phase and is therefore beyond the scope of the agreement process.

Due to its integrative character, the situation is more complex for bargaining. If multiple attributes are subject to discussion and the negotiating parties have different preferences towards these issues, the task to host a service that determines and selects the most efficient agreement is not trivial. This is especially the case if the bargaining situation is ill structured (incompatible offers, not all attributes are known a priori, there are many non-quantifiable attributes etc.) and preferences are subject to change. The achievement of win-win solutions might also require suggesting creative alternative solutions, potentially with new attributes outside the initial agreement zone.

For these reasons, decision tasks in the bargaining process are much more difficult to formalise than in the bidding process and therefore much more difficult to automate. Kersten and Noronha [36] even question completely the possibility of achieving complete automation for integrative negotiations and argue for a combination of decision support and software agents.

But the cost reduction achievable with a high degree of automation is one of the necessary success factors for electronic markets. Nobody has an incentive to participate in a market where the cost of coordination is higher than the improved efficiency of the agreements it provides. This limits negotiations with high coordination costs to markets for high-value transactions, where the potential for optimising agreements is correspondingly high. Therefore the lack of formalisation for integrative negotiations currently impedes implementations in electronic markets- and will do so in the future, unless either formalisations can be found or the scope of electronic markets is extended to goods of higher value, which enables agreement processes with human intervention.

VII. SUMMARY

On the basis of fundamental characteristics of electronic markets, we demonstrated that negotiations are not only needed in electronic markets but also that product differentiation, price discrimination and buyer accumulation strategies will lead to even more negotiated agreements than in traditional markets. This can already be verified using the example of the airline flight market.

However the characteristics of electronic markets also have an impact on negotiations and other processes in the agreement phase of electronic transactions. It is our belief that these agreement processes should, in general, be easier to execute in an electronic market with biased impacts on the negotiation process itself. We postulated these findings in several hypotheses, which have to be evaluated in the future, based on the performance of real agreement processes in electronic markets. The tremendous success of electronic auctions provides early support of one of our main arguments: negotiations based on bidding especially benefit from electronic market characteristics.

Given that integrative negotiations are needed in electronic markets we come to the conclusion that to support these

kinds of negotiations is better not to implement pure bargaining but to use integrative negotiation protocols that share the multilateral character with bidding protocols. Integrative multilateral protocols have to our knowledge not been considered so far for use in electronic markets. But based on the findings presented in this paper, they seem to be a promising candidate for negotiation support in differentiated markets for complex products and services. However, the conclusion of this analysis is not that there is no space for distributive protocols in the future. Distributive negotiations will continue to play an important role in electronic markets, but it is our belief, that in comparison to traditional markets, there will be a shift towards more integrative negotiations.

One of the challenges to the design of multilateral integrative protocols was identified in this paper as the formalisation frontier. Assuming that complete automation is not feasible, the design has to incorporate a smooth transition from automisable processes (e.g. matching) to the core negotiation activity, which relies to some extent on human intervention.

Our next step is to design such a negotiation protocol and to combine it with the matchmaking and scoring facilities that have already been developed as part of the virtual marketplace project [37]. These facilities exploit the benefits of electronic markets in the pre-negotiation stage. The envisioned extension of the marketplace will eventually result in an integrated framework for agreement processes that support multi-dimensional negotiations beyond simple discussions of price.

In addition, we will extend this analysis to a more detailed framework that maps specific business models to criteria for the selection and design of negotiation protocols.

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