

ELECTRONIC NEGOTIATIONS OF THE TRANSACTIONAL COSTS PERSPECTIVE

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ABSTRACT

The negotiation process can be understood as a framework around a transaction. Thus, the paper analyzes research on electronic negotiations of the transaction-costs perspective. It reflects the consideration of different origins of transaction costs within the particular negotiation phases. The evaluation suggests three future research directions: Opportunistic behavior in all electronic negotiation phases, bounded rationality and uncertain information situations in the contracting phase and bounded rationality in the realization phase.

KEYWORDS

Electronic negotiation, transaction costs, bounded rationality, opportunistic behavior, uncertain information situation

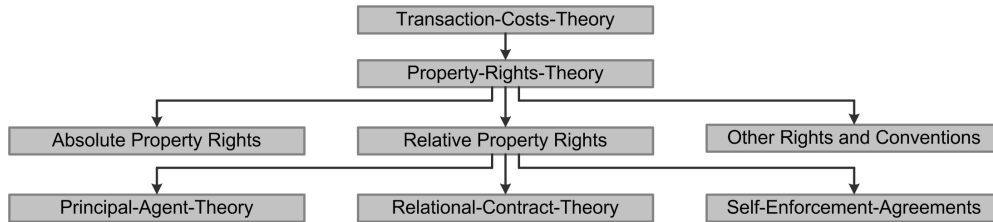
1. INTRODUCTION

To date, a lot of research on electronic negotiation has been done and many facets have been already considered. Electronic contracting has been applied in many fields, e. g. electricity markets, bandwidth allocation, manufacturing planning and scheduling, and electronic trading of financial instruments [Sandholm 1999]. One major chance of the electronic automation of negotiations clearly concerns the reduction of the interrelated transaction costs [Peters 2000]. This is one key for additional growth of economic welfare in future. Transaction costs in electronic negotiations are mainly caused by behavioral issues of the negotiation partners. Since Transaction-Costs-Economics (TCE) has intensively studied these behavioral phenomena, a study of electronic negotiations of the TCE perspective seems to be indicated. The text of the paper is divided into 5 parts: Section 2 shows a brief description of the TCE, its historical overview and origins of transaction costs. Section 3 briefly outlines the field of electronic negotiations, particularly the phases of the negotiation process. Section 4 reflects the research on the particular negotiation phases concerning the origins of transaction costs. Section 5 concludes research gaps and suggests future research directions on electronic negotiations. The paper analyzes the whole negotiation process and not only a single phase of the transaction costs perspective in order to reduce these kinds of costs. The research results contribute the state of the art in electronic negotiations, especially their economic foundations.

2. TRANSACTION-COSTS-THEORY

The development of economic theories got an important shift in direction by the essay "The nature of the firm" [Coase 1937]. The neoclassical theory has been extended or rather replaced by this work. On the basis of [Coase 1937] the Transaction-Costs-Theory was founded and with it the New Institutional Economics (NIE) as a new generated theory complex arose (Fig. 1).

Figure 1. The theory complex of New Institutional Economics



2.1 Brief Description

Transaction-Costs-Economics (TCE) studies the reasons for differences in transaction efficiency depending on the institutional arrangements. The object of investigation concerns the transaction. The terms "transaction" and "transaction costs" are not accurately defined: [Coase 1937] illustrates transaction costs as costs for market use: If transaction costs are not considered or rather explicitly equated to zero, the market would work efficiently at no charge. But this is a revised assumption of neoclassical economics. In this case there would be no reason for the existence of companies. [Jost 2001] generally defines a transaction as an exchange of goods between two actors. Here, a good is everything that founded utility. [Picot et al. 1997, p. 108] define a transaction as a transfer of property rights between two parties. The common definition by O. Williamson is the following:

Definition 1. A **transaction** occurs when a good or a service is transferred across a technologically separable interface [Williamson 1985]. **Transaction costs** are all direct or indirect expenditures that are caused by transactions.

Transaction costs are either of a monetary type (for example lawyer fees for making contracts) or concern tangible costs (particularly opportunity costs). Opportunity costs are generated by missed utility or a non-realized opportunity. The main purpose of TCE is the identification and reduction of the following types of transaction costs [Wigand 1997, p. 8]: (1) search and information costs, (2) modification costs, (3) contract costs, and (4) monitoring costs.

2.2 Historical Overview

Indeed R. H. Coase has firstly analyzed transaction costs in an intensive way [Coase 1937, Coase 1960], but [Smith 1776] had already pointed out the potential problems of information asymmetry and different interests between workers, managers, directors, stakeholder etc. Further before R. Coase, [Mill 1848] and [Hicks 1935] had analyzed transaction costs phenomena. At that time the term "friction" was used instead of transaction costs. [Stigler 1961] emphasized the valuableness of information. [Alchian 1969] equated transaction costs with information costs. A further milestone of the history within the scope of NIE was put in 1969 by K. J. Arrow. He showed in [Arrow 1969] that market failure can be well founded by excessive transaction costs. On that basis, [Williamson 1971] presented proposals for transaction costs internalization. [Alchian and Demsetz 1972] analyzed problems of measurement regarding productivity and reward. On that basis, [Jensen and Meckling 1976] presented in their well-known article the concept of agency costs.

2.3 Origins and Precautions of Transaction Costs

The following origins cause transaction costs: Following the behavioral key findings from [Simon 1947], TCE presumes **bounded rationality**. Indeed, the transaction partners try to act rationally but they can only act bounded rationally because of the incomplete information situation and their limited computational capacity. **Simplification and reduction of complexity** are adequate measures to prevent from transactions costs caused by bounded rationality. Concerning the information situation, the Transaction-Costs-Theory assumes an **uncertain information situation** [Alchian 1950]. [Williamson 1985, p. 57ff.] differentiates two types of uncertainty: Environmental uncertainty caused by forecasting problems and behavioral uncertainty due to opportunistic behavior of the contractual partner (so-called strategic uncertainty). **Transparency** prevents from effects of uncertain information. Furthermore, **opportunism** is assumed [Williamson 1985]. O.

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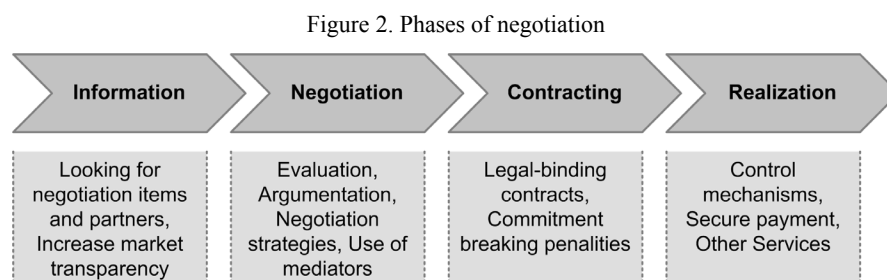
Williamson concludes from both assumptions the following acting maxim: "Organize transactions so as to economize on bounded rationality while simultaneously safeguarding them against the hazards of opportunism" [Williamson 1985, p. 32]. **Mechanisms of legal certainty** prevent from costs effects caused by opportunism.

3. ELECTRONIC NEGOTIATIONS

The literature shows many definitions for (electronic) negotiations [Lee 1996, Rosenschein and Zlotkin 1994]. A pragmatic way to define a negotiation is the following [Bichler et al., 2003, p. 316]:

Definition 2. A negotiation is an iterative communication and decision making process between two or more participants who: (1) cannot achieve their objectives through unilateral actions, (2) exchange information comprising offers, counteroffers and arguments, (3) deal with interdependent tasks, and (4) search for a consensus which is a compromise decision.

Even though the automation of negotiations was forecasted by [Davis and Smith 1983] more than two decades ago, the automation level of present negotiation systems is still different. Most of the negotiation systems are partly-automated (so-called hybrid models), e. g., [de Paula et al. 2001], or simply facilitate the negotiation process, e. g., INSPIRE [Kersten and Noronha 1997] or www.ebay.com. Existent fully-automated systems are seldom because of their strict requirements concerning standardization and structuring. So that mainly the bargaining stage is fully-automated. However, in order to completely exploit the enormous potential of electronic automation regarding the decrease of transaction costs all phases of the negotiation process have to be researched. According to [Merz et al. 1998, Peters 2000, Schmid and Lindemann 1998, Stroebel 2000] the negotiation process can be separated in four phases (Fig. 2).



4. CONSIDERATION OF TRANSACTION COSTS ORIGINS WITHIN THE NEGOTIATION PROCESS

4.1 Information Phase

The first stage of the negotiation process is mainly marked by environmental uncertainty and thereof by search and information costs. Since information-gathering is very costly [Larson 2006], the automation of this stage caused profitable cost reductions. Search and information costs are generated by the identification and comparison of products on the demand side as well as advertising on the offer side [Stigler 1961]. In this stage, the customer recognizes the need for a product or a service [He et al. 2003, p. 988].

Belonging to the information phase a lot of research has been published in order to handle complexity: E. g., concerning the number of participants. In this regard, bilateral, one-sided multilateral and double-sided multilateral negotiations are separated (protocol category) [Bichler et al. 2003, Rebstock 2001]. Bilateral negotiations are restricted to two negotiation partners (one buyer and one seller) and were first analyzed by [Smith 1980, Davis and Smith 1983, Rosenschein 1985, Zlotkin and Rosenschein 1989]. One-sided multilateral negotiations are deemed to be the standard form of auctions [Lomuscio et al. 2003, p. 37] and are

either characterized by one seller and many buyers or vice versa [Rebstock 2001, p. 611]. Finally, double-sided multilateral negotiations are characterized by many buyers and many sellers. Furthermore, a negotiation can be separated into public and closed sessions [Bichler et al., 2003, p. 318]. As in public negotiations new participants can take part dynamically, this is not allowed in closed sessions. This is also an aspect of complexity handling. With it the problem of **bounded rationality** is well considered. Online catalogues and comparison shopping sites increase market transparency and prevent from cost effects caused by **uncertain information situations**. The introduction of mediators and reputation mechanisms decrease search and information costs. By mediators potential negotiation partners can get together, e. g., [Klein et al. 2003b]. Therewith the problem of **opportunistic behavior** of the negotiation partners is also considered.

4.2 Negotiation Phase

Most of the research concerning electronic negotiations has focused on this phase and to date, a lot of automated negotiation models have been developed [Buettner 2006a]. This stage is characterized by modification costs. That costs are expenditures for necessary adaptations during the negotiation life cycle. They express a consequence arising out of the uncertainty of the development of the relationship between the contracting parties, the setting of terms and conditions as well as the bounded rationality in decision-making [Podolny 1993].

At first, J. S. Rosenschein and G. Zlotkin analyzed strategic interactions between self-interested agents [Rosenschein 1985, Zlotkin and Rosenschein 1989, Rosenschein and Zlotkin 1994] on the basis of the fundamental game-theoretic work by [von Neumann and Morgenstern 1944]. Their formal analysis is based on the distributed problem solving approach (see [Bond and Gasser 1988]) adapted from the work of [Harsanyi 1967, Harsanyi and Selten 1972] and [Kreps et al. 1982]. The underlying game-theoretic approach studies the equilibrium conditions and tries to find out the optimal strategy between identical agents [Nash 1950, Nash 1951, Schelling 1960, Selten 1975, Kreps and Wilson 1982]. Game-theoretic models are deemed to be mathematically elegant, but they are very restricted in use because of their assumptions of perfect rationality and unlimited resources [Jennings et al. 1998]. In order to relax these restrictions, heuristic approaches have been adapted for electronic negotiations. Heuristic approaches solve the problematic assumption of unlimited resources by using thumb rules, e. g., [Kraus 2001]. Thus, the assumption of perfect rationality is also rejected. But, electronic negotiation models based on heuristic approaches need an intensive evaluation, regular via simulation or empirical investigations [Jennings et al. 2001, p. 210]. Finally argumentation-based negotiations have been developed. There, the agents have the possibility to reason about their positions. When the negotiation partner is persuaded, he will change his negotiation position [Wooldridge 2002, p. 148f.]. This approach increases the possibility and the quality of an agreement compared to game-theoretic or heuristic approaches [Karunatillake and Jennings 2004, Rahwan et al. 2003] and decrease therewith transaction costs, especially modification costs. The first argumentation-based approach was realized by [Sycara 1987] (PERSUADER).

Within the negotiation phase a lot of research for handling of negotiation complexity has been published, e. g., concerning the negotiation item: Depending on the number of attributes of the negotiation item that are taken into account during the evaluation, two attribute types are distinguished: In the single-attribute case the negotiation item is evaluated only by one characteristic, normally the price. All other attributes, for instance quality or warranty, are agreed in advance and will not be negotiated. In contrast, in multi-attribute negotiations more than one characteristic is taken simultaneously into account, e. g., [Kersten and Noronha 1997]. Beyond, the number of positions describes the quantity of independent items in a single negotiation over there a final decision is made. Electronic negotiation systems with the possibility to contract a high number of positions (e. g., [de Paula et al. 2001]) are of significant practical relevance [Klein et al. 2003a]. Thus, electronic negotiation systems can handle efficiently complex negotiations. With it modification costs caused by **bounded rationality** of the negotiation partner are continuously minimized. [Buettner 2006b] showed that near the half of current electronic negotiation models assume bounded rationality. Most of the publications model bounded rationality via simplifications (heuristics or rather rules of thumb): E. g., [Sandholm and Suri 2003] used heuristic search algorithms, [Sen 1997] heuristic bidding-strategies. [Cardon et al. 2000] used heuristics based on genetic algorithms. In [Rubinstein 1997], bounded rationality was modeled by the explicit reduction of the negotiation process. [Bichler 2000] modeled bounded rationality through a predefined utility function. Another way to represent bounded rationality was provided by

probability-based models, for example [Park et al. 2000]. Finally, the fuzzy approach also presents a possibility for simplifications, e. g., [Luo et al. 2003]. The problem of **uncertain information** has been explicitly considered: At first, [Rosenschein and Zlotkin 1994] analyzed scenarios with an imperfect information situation. [Buettner 2006b] showed that the majority of the researched publications assume an imperfect information situation. However, the focus is mainly on the negotiation partner. Just 8 percent assume an imperfect information situation concerning the negotiation item. Opportunism has been extensively studied in multi-agent literature, e. g., [Genesereth and Ketchpel 1994, Castelfranchi 1995, Wooldridge and Jennings 1995]. By the introduction of the "Contract Net Protocol" (CNP) by [Smith 1980, Davis and Smith 1983] as the first multi-agent contracting protocol the problem of **opportunistic behavior** was considered. Furthermore, research on integrative negotiation models considers opportunism [Kersten 2001]. The goal of integrative models is to maximize the collective utility of all partners (win-win approach). In contrast, in case of the distributed model, every negotiation partner tries to maximize its own utility (win-lose approach).

4.3 Contracting Phase

The contracting phase is marked by the establishment of legal-binding contracts. [Sandholm and Lesser 1995] extended the CNP by the introduction of conditional commitment breaking penalties. Therewith the problems of limited resources and **opportunistic behavior** have been considered. Furthermore, electronic negotiations can be distinguished by the binding type. Binding negotiations (e. g., www.ebay.com) ask for an authentication of every participant in advance.

4.4 Realization Phase

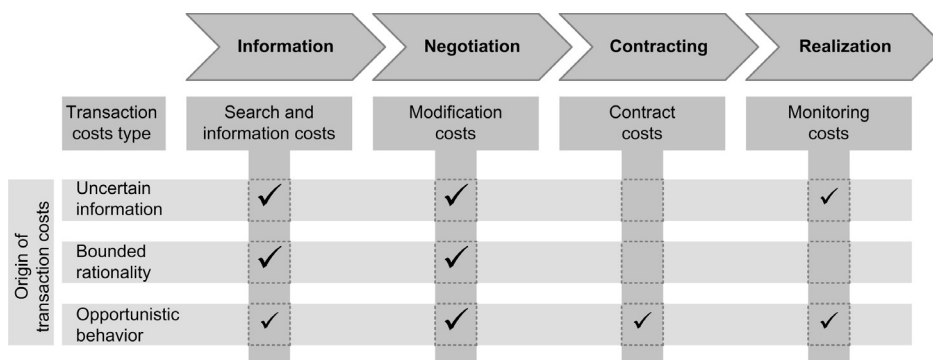
The realization phase is emerged by the monitoring of the compliance with the contract conditions. Especially for this reason control costs are consciously accepted in order to minimize the costs generated by opportunistic behavior of the contracting parties [Williamson 1985]. The realization phase involves product services (e. g., repairing, upgrading, secure payment procedure) and evaluation (e. g., measuring the degree of satisfaction of the user concerning the negotiation object and the buying procedure).

Reputation platforms increase market transparency and consider therewith the problem of **uncertainty**. These platforms reduce transaction costs. Other trust mechanisms also reduce transaction costs, for example PayPal (www.paypal.com) within the field of the problem of **opportunism**.

5. CONCLUSION

To date, a lot of research concerning electronic negotiations has been published. However, the information and the negotiation phase were mainly researched. The contracting and the realization phase are not sufficient represented (Fig. 3).

Figure 3. Type of transaction costs along the negotiation process



Three future research directions can be derived from the transactional costs perspective in order to reduce these kinds of costs: One focus should be on opportunistic behavior in all electronic negotiation phases. In addition, further research on the contracting phase is needed, particularly against the background of bounded rationality and uncertain information situations. Finally the realization phase should be more considered with the main focus on bounded rationality.

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