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New Means for ERP Systems by eContracting

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Abstract

Nowadays business to business (B2B) coordination is characterized by long term contracts albeit the fact that most interactions are already made electronically based on ERP-systems. Especially in cooperations, the flexibility offered by electronic coordination is rarely used. With the term eContracting we refer to electronic coordination among participants in the sense of the alienation and acquisition, between individuals, of rights of property and liberty in supply chains which are influenced by new information technologies. An interdisciplinary approach, i.e. incorporating economics as well as computer science, will provide new means to the alienation and acquisition of short to medium term contracts in supply chains.

Introduction

With the term "eContracting" we refer to the coordination in supply chains among economic actors, which is influenced by new information technologies. Only those relationships which are coordinated electronically are considered by eContracting. Typically, ERP-Systems are used to coordinate the production within business units. Emerging products from software vendors, especially advanced planning optimization tools, address the necessity of electronic business-to-business (B2B) contracting. However, still dominating are long term contracts made up face to face.

By enabling the electronic contracting in B2B interactions flexibility, e.g. short term integration of new actors and relationships among actors as well as their substitution, will be provided. Thus, the flexible integration of participants in supply chains is supported as well as the changing needs within the flow of goods in such networks (Christopher 1998; Knolmayer, Mertens, Zeier 1999). We propose that despite the technical challenging requirements in supply chains additional effort has to be provided in order to allow flexible coordination through short and medium term contracts (Beungard, Jezequel, Watkins 1999; Koistinen, Seetharaman 1998). Contracting in supply chains depends on national and international law as well as on varying business environments and last but not least on the incorporated information systems. Hence, an interdisciplinary approach is needed to generate an electronic contracting system (eCS). Additionally, cooperation with major software vendors, i. e. SAP and JD Edwards, will provide the necessary test environment for the eCS prototypes.

The paper is structured as follows: first the elements and structure of electronic coordination systems are presented. The following section explains our approach of analysis, modeling and refinement in constructing eCS, based on real world's data gathered through empirical studies. The paper closes with conclusions.

Electronic Coordination Systems (eCS)

An electronic coordination system is a triple determined by the following elements:

- law environment,
- coordination-mechanisms of short and medium term contracts (principal-agent-models), and
- B2B coordination in supply chains based on ERP systems (advanced planning tools).

In the research project different comparable eCS will be investigated. They may differ in each element of the triple.

As a first step we consider the law environment as fixed. The effects of the variation of the latter aspects will be investigated in the first phase of our research:

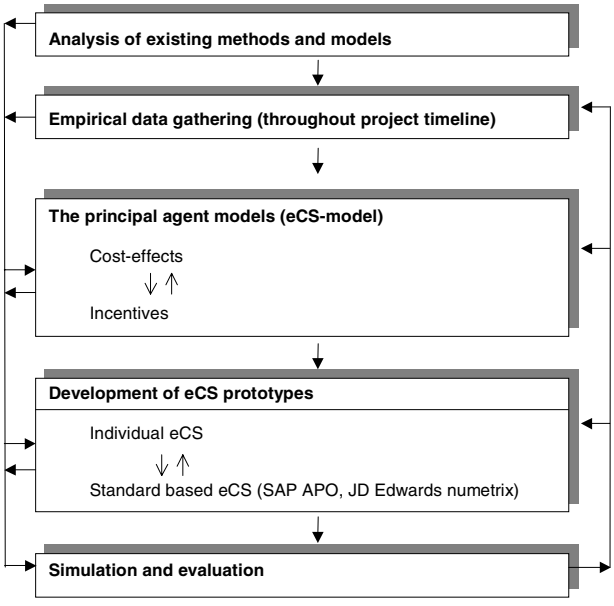
- In an economic view the term contracting is used to describe efforts by individuals to assign or to modify property rights. Hence incentive and costeffects of short and medium term contracts will be compared with those in long term contracts by analysing and modifying principal agent models. Efficient electronically generated short and medium term contracts will be generated by considering different tasks of business actors in supply chains Gibbons 1998; Koistinen, Seetharaman 1998; Libecap 1989, Masten 1996; Vickers 1995.
- Current ERP-systems are evolving such, that enterprise spanning production planning and optimization of supply chains is supported (Buxmann, König 1999; Knolmayer, Mertens, Zeier 1999). Thus, comparison between individual and standard based coordination will generate feedback for necessary extensions. The interoperability of existing ERP-systems (through all layers: e.g. business process models, network interaction and data representation) as well as security concerns have to be considered.

Based on real world's data an initial principal agent model is developed and refined through feedback of simulation in the eCS prototypes.

Project Schedule

Figure 1 illustrates the approach schedule. Notice that there are several feedbacks. The first empirical data gathered will be used for an initial model. Subsequent refinements of the empirical data will be used in the modeling process as well as generated results from the simulation.

Figure 1: Project schedule and dependencies



Empirical data gathering

Throughout the whole project timeline empirical data is gathered at distinct checkpoints, i. e. once a year considering

- strategies, objectives, and preferences of actors
- IT-solutions
- contract models

We put the focus on actors in supply chains as well as on actors with their view on supply chains, e. g. software vendors, system integrators. Additionally, the simulation and evaluation bases on the empirical data gathering. As a result subsequent refinements of the initial model are achieved.

The principal agent models

The first principal agent models are descriptive reflecting certain aspects of the empirically gathared data. The models consist of short, medium, and long term contracts with different cost and incentive effects in order to reduce the problems of information asymmetry (adverse selection, moral hazard, and hold up) by different but comparable approaches. Using the empirical data, dynamic models will be evolved from the initial static principal agent models. The models will be applied to different eCS prototypes in order to investigate the transferability of the eCS models. This will be evaluated in the prototypes (Lieske 1997).

Development of eCS prototypes

Two different prototypes will be developed. The prototypes are either based on standard ERP systems or realized on a Quality of Service management (QoS-management) infrastructure (Becker; Geihs (1998), Becker; Geihs (2000):

- Standard based eCS: new emerging software products, e.g. SAP APO or JD Edwards Numetrix, offer flexible planing of distributed processes among participants in supply chains. Evaluation of the coordination models in these products as well as the application of eCS models will be used in the simulation and evaluation.
- Individual based eCS: in contrast to the standard based eCS, which is embedded in an ERP system, the individual eCS prototype will focus merely on the coordination and contracting aspect. The transferable eCS models are the core of the individual eCS prototype.

Based on comparisons on the simulation, recommendations can be issued to software vendors of standard ERP solutions. The feasibility will be explicitly shown through implementations.

Simulation and evaluation

The simulation bases on real world's data gathered through the empirical analysis. The results will be fed back into the dynamic eCS models as well as in the eCS prototypes.

The objectives are:

- identify incentive and cost efficient contracts which can be implemented in the eCS prototypes (standard vs. individual)
- documenting necessary extensions to standard ERP-systems in order to represent and conclude efficient short and medium term contracts
- evaluating
  - the different identified contracts in given prototypes as well as
  - different prototypes (standard vs. individual) realizing a set of given contracts and hence allowing the benchmarking of the eCS models.

Conclusions

This research in progress paper shows an approach to facilitate electronic coordination in enterprise spanning B2B relationships.

We expect the following implications for research and practice communities. The growing interest in ERP systems, eCommerce, and Quality of Service management shows the need of spanning methodological and theoretical investigation of contracting and its

prototypical realization. Principal agent models provide the opportunity to address distinct parts of contracting between economic actors.

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