Commitment-Based Approach to Categorizing, Organizing and Executing Negotiation Processes

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Abstract

In the current research and development of e-commerce systems, the negotiation process and the enforcement / execution of the results of the negotiation process are often treated as separated business activities. The separation creates an integration problem because these activities should be integral parts of most business transactions. In this paper, we have proposed an approach to categorizing, organizing, and executing negotiation results through business commitments. First, we classify negotiation attributes into 5 categories based on the 5 key elements of news reports. Second, we propose a category-based negotiation process that would allow negotiators to simultaneously bargain on negotiation attributes within an attribute category, and categories of negotiation attributes can be negotiated either sequentially or in parallel. Third, we have described the approach to convert these negotiation attributes into business commitments that are executable in a management platform.

1. Introduction

Negotiation plays an important role in business transactions. Roughly speaking, a business transaction, especially in B2B E-Commerce, a transaction will go through three phases: searching, negotiation, and execution(http://web.nps.navy.mil/~menissen/papers/jipc omm.htm). In the current research and development of e-commerce systems, the negotiation processes and the enforcement / execution of the results of the negotiation process are often treated as separated business activities. The separation creates an integration problem because, in many cases, these activities should be integral parts of most business transactions. In this paper, we have proposed an approach to categorizing, organizing, and executing negotiation results through business commitments. After negotiation results are achieved through a successful negotiation process, these results can be enforced and executed by the means of business commitments. A business commitment is defined as an agreement to do something in the future. Business commitments are service-level agreements that are aimed for addressing business issues. During the process of executing business transactions, if the agreed business commitments are violated, one party would promise to take certain actions, either to notify related parties or to provide some remedies to compensate the violations. Business commitments come with many forms; examples include terms and conditions in business contracts, internal/external service-level agreements between service providers and service consumers and so on. Currently, there are research prototypes and commercial products about business negotiation. However, current approaches to negotiation do not address the issues of how to make effective use of the negotiation results. Consequently, the information of negotiation results is largely ignored. The scope of negotiation research covers negotiation proposal representation, negotiation protocol design, and the design of negotiation policy and negotiation strategy. However, there is little work on how to represent the final result of negotiation in such a way that would facilitate the enforcement and execution of the negotiation results. Section 2 describes related work and Section 3 describes the categorization of negotiation attributes. Section 4 is about category-based negotiation process, and Section 5 describes business commitments. Section 6 concludes the papers with a summary and future work.

2. Related Work

Negotiation is a popular research topic because of its importance in our daily lives, business activities and government management.

Su presented a system view of an automated negotiation system in [1]. The paper discussed the negotiation protocol, the negotiation primitives and messages, the cost-benefit analysis to find the negotiation results. The final negotiation result is simply represented as a set of negotiation attribute/negotiation value pairs. The system is standalone and does not interoperate with others to utilize the negotiation results.

Commitment is a word with rich semantics. Commitment is closely related to speech act theory [2]. In this theory, when people say (i.e., speech) something, they are "committed" to take certain actions (i.e., act) in the future. As a result, commitment can be used in the personal, social and business settings. Becker developed the notion of commitment in sociology in [3]. Bond proposed a formulation and computational model of the basic notion of commitment in DAI (Distributed Artificial Intelligence) in [4]. The paper by Bond defined

a commitment as mutually agreed constraints on action, belief and world state. However how these constraints are derived from the source is not discussed. In our view, these constraints could be the result of a negotiation process.

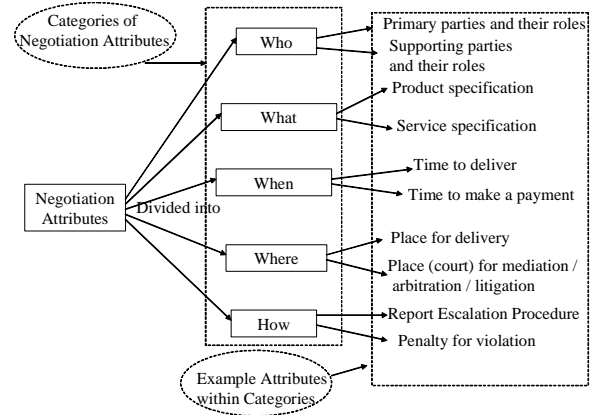## 3. Categorization of Negotiation Attributes in Negotiation Results

In most news reports, there are 6 elements describing different aspects of each piece of news. They are commonly called "five Ws and one H" [5]: Who, What, Where, When, Why, and How. If a negotiation process is treated as a reportable event (it may be a long-running event lasting for several weeks, months, and even years), the outcome of the event can be similarly described in several key elements described as follows.

• The "Who" part provides the identities of the parties involved in the targeted negotiation processes. These parties can be further divided into primary parties (stakeholders of the negotiation, for example, a buyer and a seller) and secondary parties (supporting entities such as financial institutions, shipping companies, accounting companies). "Who" can also specify the roles individuals play in the negotiation.

• The "What" part answers the question about the negotiation subject and its inherent attributes. For example, if the negotiation is about purchasing personal computers, the specification of personal computers, such as the CPU model, OS, main memory size, hard disk size, and others, should belong to the "What" category.

• The "Where" part describes the location information about the negotiation process and the negotiation results. It can be the locations where the negotiation should take place. It can also be the places to which the products should be delivered. In international trades involving physical products, it could be the destination ports for the products. If the product to be delivered is electronic content, the attributes inside the "Where" category could be the physical server machine that hosts the electronic content.

• The "When" part describes the time-related information about the negotiation process and the negotiation results. It can be the time that the products need to be delivered. It can also include things like the date and time the payment should be made.

• The "Why" part describes the motivation of the negotiation itself. It is difficult to describe the "Why" part in the negotiation results. Even in news reports, the "Why" part usually contains subjective descriptions from the reporters' perspectives. Most news reports tell the "facts" about the events and leave the decision and evaluation (the "why" part) to the audiences. However, in the arena of business negotiation, the "Why" part is usually implicit: the reason why two negotiators want to negotiate is that because none of the negotiators can achieve better results if all of them act on their own.

• The "How" part can be used to invoke remedial actions if the agreements that are specified in the negotiation attributes within the "W" categories are violated. It is essentially a description about "how to enforce the agreements".

Figure 1 describes the categorization. In our approach, negotiation attributes consist of 5 categories. Example attributes within categories are shown at the right side of the figure.

Figure 1. Categorization of Negotiation Attributes

Let us take an example from the purchase of computer equipments. Suppose Company A wants to buy computers from Company B. They have to negotiate on who should be the shipper for the equipment. Should it be UPS, FedEx, or USPS (the Who group)? These two companies need to negotiate on the specification of computers, should it be Pentium 4 2.0 GHZ, or Pentium 4 1.5 GHZ (the What group)? These two companies need to negotiate on the time to deliver the computer equipments and the time to make a payment. Suppose these two companies are not in the same country, so they need to determine which court should be used for any dispute. Is it in the country where Company A resides, or the country where Country B sides, or a third country like Switzerland? At last, these two companies may need to set up the penalty for failing to fulfill the requirements.

4. Category-Based Negotiation Process

Traditional negotiation work divides a negotiation process into two types: sequential negotiation processes and parallel negotiation processes. These two types all assume that negotiation attributes have been pre-determined and their semantics have been agreed-upon by both negotiation parties. In sequential negotiation process, negotiation attributes are bargained one by one. Once a negotiation attribute has been picked up, both parties work on it until an agreement about the value for the negotiation attribute has been reached. Then both parties move on to the next negotiation attributes. Once

all negotiation attributes have been settled, the negotiation process is over. In parallel negotiation processes, all negotiation attributes are bargained in parallel. One party proposes tentative values for all negotiation attributes to form a complete negotiation proposal and sends it to the other party. Once the other party receives the proposal, he/she can accept the proposal, terminate the negotiation process, or suggest a new set of values for negotiation attributes (i.e., produce a counter-proposal). The negotiation process terminates once two parties reach an agreement on values for all negotiation attributes.

Sequential and parallel negotiation processes are an abstraction of real world situations. In reality, two negotiators usually do not strictly follow sequential or parallel negotiation process. A more realistic situation is that negotiator would focus on a particular group of negotiation attributes, bargains over negotiation attributes in it, and moves on to another group. Each group contains related negotiation attributes so that they are tightly coupled and are able to be solved together. The idea of 5 categories closely matches the concept of groups of negotiation attributes. The category-based negotiation process works as follows. In step 1, negotiators identify possible negotiation attributes and group them into 4 Ws and 1 H. In step 2, negotiators pick one category from 4 Ws and 1 H. In step 3, negotiators bargain over the values for negotiation attributes, and eventually come up with mutually agreed-upon values for these negotiation attributes. The negotiators repeat step 2 and step 3 until all categories have been processed.

Category-based negotiation process has obvious advantages over sequential and parallel negotiation process. First, category-based negotiation process is a natural combination of sequential and parallel ones. Second, category-based negotiation process matches 5 elements adopted by most news reports, so negotiators can easily follow the smooth flow of negotiation process. Third, category-based negotiation process is an excellent fit for the execution of negotiation results, as we will show in the next section.
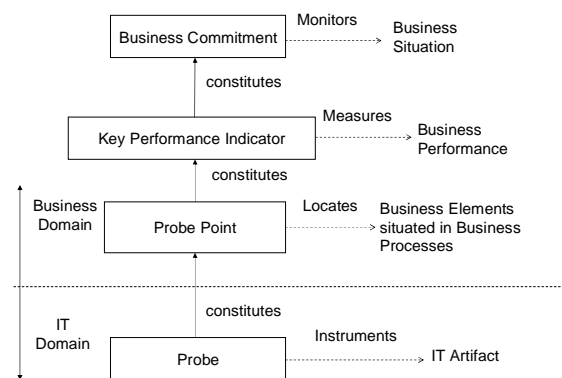
5. Business Commitments

A commitment is an agreement or pledge to do something in the future. Business commitments are broadly defined as commitments related to business issues such as buying / selling of products/services. Commitments can be used to refer to the business agreements between a person and her business partner (called external commitments), or between internal parties within a business organization (called internal commitments). The definition of business commitments captures not only the state information ("agreement") but also future actions ("to do something") when the agreements are violated; therefore it is an appropriate

concept to describe certain types of business relationships and interactions that may require both agreements and actions from participating parties.

The Business Process Commitment Language (BPCL) [6 and 7] is an XML Schema-based markup language to specify commitments in the context of business process management. Business negotiation process is one type of business processes, so it is appropriate to apply BPCL to the negotiation process. Business commitment, KPI (Key Performance Indicator) and probe point are important concepts in BPCL. In BPCL, a business commitment is a statement that would be evaluated when the evaluation process is triggered. If the evaluation result is true, some pre-defined actions are taken. The condition is a Boolean expression over a set of KPIs and other business metrics.

Figure 2 shows steps in specifying business commitments. Beginning from the top, the business commitments are used to define monitored business metrics and business situations. The basis for monitoring is the set of KPI values. Since a KPI's value can be derived from other KPI values, KPI definitions can actually form a tree-like graph. A probe point is a leaf node in the tree structure. Probe points are logical entities that can be inserted into a business process (thus becoming a probe) to get the "raw" data from the business process. Probe points fetch "raw data" from business processes on the fly. A probe point is used to locate business elements within a business process. Probes are used to instrument IT artifacts. Probe points and probes are the way to link high-level performance monitoring with low-level IT resources.

Figure 2. Steps in Creating Business Commitments in BPCL

Figure 3 shows the relationship between 5 categories (4 Ws and 1 H) and business commitments. Categories are shown at the left side and they are fed into a transformation program to generate different types of commitments. The transformation program would take heuristic information to guide the transformation process. If we assume that different categories of attributes are

represented as XML documents or XML fragments, an obvious choice of heuristics is XSLT scripts. Results from the transformation program are sets of commitments. Commitments transformed from 4 Ws are used for the detection of business situations that are the deviations of negotiation attribute values from the designated ones. These commitments are inputs to situation detector program that monitors the business situations. If a business situation has been detected, it is fed into Actuator to invoke management actions. The Actuator program accepts "How Commitments" converted from "How Attributes". These commitments are used to select appropriate actions to be taken once a particular business situation has been detected.
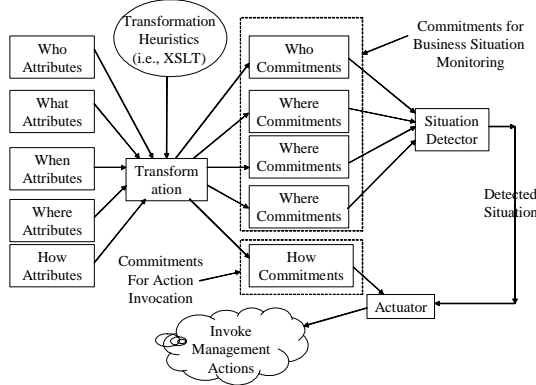
Figure 3. Attribute Categories (4 Ws and 1 H) and Business Commitments

One of the important parts of business commitment is "Guarantee". The following is an example of guarantee for "Time to deliver":

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<bpsm:Guarantee>
<bpsm:GuaranteeName>AverageBaseRequestResp
onseTimeGuarantee</bpsm:GuaranteeName>
        <bpsm:Disjunct>
        <bpsm:Conjunct>
            <bpsm:BooleanLiteral>
  <bpsm:Operator>LessThan</bpsm:Operator>
<bpsm:Operand>/bpsm:KPI/bpsm:AverageBaseReq
uestResponseTime </bpsm:Operand>
<bpsm:Operand>/bpsm:BusinessCommitmentProfi
le/bpsm:Property
[bpsm:Name='MaximumAverageBaseRequestRespo
nseTime']/bpsm:Value</bpsm:Operand>
            </bpsm:BooleanLiteral>
        </bpsm:Conjunct>
    </bpsm:Disjunct>
</bpsm:Guarantee>
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This guarantee basically says that the delivery time (in days) must be less than the value defined in a business commitment profile.

6. Conclusion and Future Work

We have proposed an approach to categorize negotiation attributes so that they can be easily managed. Our approach facilitates the negotiation process in the following ways. First, we have divided negotiation

attributes into 5 categories based on the essential elements of news reports. As far as we know, there is little work to analog negotiation results to news reports in journalism. Second, we have proposed a category-based negotiation process that would negotiate in parallel on negotiation attributes in a category. Categories can be negotiated sequentially. Therefore, our approach covers both sequential and parallel negotiation processes and gives negotiators flexibility in grouping negotiation attributes. Third, we have described the approach to convert these negotiation attributes into business commitments. These business commitments can be executed and enforced in management platforms such as business process management systems described in [8].

There are several directions for the future work. At first, we would like to evaluate the feasibility of assigning a category to each negotiation attribute. We feel that more work needs to be done in order to answer the question of whether the categorization is complete. Second, we would like to study the importance of ordering in category-based negotiation process. For example, should "What" group be negotiated before "When" group? If so, what is the implication?

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