

## Some Observations on Multi-Agent Based Negotiation in B2C E-Commerce

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**Abstract**— Multi-agent based negotiation is the emergent functionality of E-Commerce. There are several approach deployed by various researcher in the B2C, E-Commerce model. In this research paper we provide some observations on various negotiation mechanism which are deployed in various E-Commerce model

**Keywords**--*Negotiation, Agent, multi-agent-system, ANN, Data mining.*

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### I. INTRODUCTION

Negotiation is one of the established processes for an interaction between a buyer and a seller to reach at an agreement stage where both of them are at profitable state of business. Various classical as well as modern intelligent computing methods such as knowledge based systems (KBS), case based reasoning (CBR), artificial neural nets (ANN) and genetic algorithm (GA) have been deployed to implement the various steps in a negotiation process. Multi agent systems (MAS) have also been used to represent the buyers and sellers as agents and the broker as a coordinator agent. In this model the job of the coordinator agent is to take the required items of the buyer agent and to find out the proper seller agent(s) who can supply the items to satisfy the constraints on the requirement of the buyer agent as well as on the seller agents in supply of the items. The buyer agent constraints are related with price, quality, quantity, brand, payment mode etc. The seller agent constraints are related with the price and quality [1]. Very limited numbers of researchers have implemented the trust and other cognitive parameters in the negotiation process. We have paid attention to the cognitive parameter such as preference, desire, intention, commitment, capability, trust etc. as cognitive parameters for the selection of buyer and seller agents. Many different approaches for the selection of buyer agent have been reported in the literature. These approaches differ in procedures, technologies and methods. Each approaches cannot be used for complete cognitive parameters based agent selection and classification for negotiation in B2C e-commerce. The model will try to describe in this work basically provides interaction between buyer agents and seller agents through broker agent and customer orientation based selection of potential buyer agent

for valuable seller agent for negotiation in e-commerce. We will describe the application of cognitive parameters based agent selection for negotiation in the purchase domain in a cooperative system. In this domain the buyer agent has a set of requirements and set of seller agent fulfill the buyer agent's requirements through cooperative negotiation mechanism. We will further describe customer orientation based Multi-agent system in negotiation process. The customer orientation is of three type domains: profit centric, customer understanding, and customer relationship for selecting the most profitable buyer agent for potential seller agent. Further we have made a study to determine the rules, importance of the cognitive and business parameters such as preference, commitment, intention, desire, price, payment mode, quantity and quality and address mode etc.,. For classification and categorization of profitable buyer agents and potential seller agents using data mining (DM) techniques like ANN, C&RT and feature selection method. Finally we will try to develop trust building strategies using data mining method integrated multi-agent system for cooperative and competitive e-market with the help of logical combination of predictive results of features selection, and computational results.

Introduction and background in this section, drives this research towards "*finding patterns for trust efficient multi-agent based buyer strategy for electronic market*". Sub questions that support this research will be discussed in section 2 and section 3. In section 2 details state of the art technology in this research like *Agent and multi-agent technology, data mining, cognitive social and business parameters* will be further elaborated. Section 3 is the main focus of this research. We will discuss goal and methodology or techniques that will be used in this research.

Whereas in Section 4 research will touch on actions or activities that will be carried out.

## II. BACKGROUND

AI approaches are useful in the development of B2C e-commerce systems. In B2C e-commerce, AI is used primarily for product selection and recommendation, negotiation, auctions, solving real-world scheduling problems and enhancing servers' scalability, generating automated responses, and decisions on bundling and pricing of goods, etc.; AI is used in advising the users on the items they want to examine or purchase through the Internet (Driskill et al. 1998, Kautz 1998, Resnick 1997; Wettschereck et al. 1995; Hayes et al. 2001). This advice is helpful in navigating a large range of product descriptions. Specifically CBR ACF and GBR are used in negotiation process for different types of product selection and recommendation.

## III. MULTI-AGENT

An agent is a software program that acts flexibly on behalf of its owner to achieve particular objectives Some of the works on MAS based negotiation in B2C e-commerce are [2]. A multi-agent artificial market system, whose software broker agent can learn to build relatively long-term trust relationship with their clients, the goals of these broker agents are not only to maximize the total revenue subject to their clients' risk preference as most other agents do but also maximize the trust they receive from their clients. Social Settings such as trust, reputation and mental states of buyer, seller and broker may be used individually or in combination in agent based model. In general, various trust models have proposed with different components for different purposes[3]. Chandrasekharan and Esfandiari's model is based upon the cognitive approach in which trust and reputation are function of beliefs. Their trust acquisition network performs Bayesian learning. In the Model proposed by [5], trust is based upon probability theory that deals with Boolean impression: good or bad. The trust model of Hailes is based upon the information of witness. A trust model, based upon the most recent experiences and historic information uses probabilistic computational model of Dempster-shafer theory Yu and Singh. Castelfranchi and Falcone proposed a cognitive trust model based upon the mental background of delegation. In their trust model, trust is a set of mental attitudes which prefers another agent doing the action. It is based upon agent's intentions of doing an action. Trust is introduced into I-TRUST as a relationship between clients and their software broker agents in term of the amount of money they are willing to give to these agents to invest on their behalf. Broker agents are benevolent (i.e. they will not cheat their clients); each client can only have

one broker agent at one time. Reputation is considered on the basis of two users rating[9]. Histos reputation model is based upon the use witness information i.e. the most recent experience with the agent that is being evaluated[13]. Carter have calculated the reputation value for each agent by a centralized mechanism that monitors the system. Therefore, the reputation value of each user is a global measure shared by all the observers. Shoham defines an agent to be "an entity whose state is viewed as consisting of mental components such as beliefs, capabilities, choices, and commitments". A generic classification of an agent's attitudes is defined as follows: Informational attitudes i.e. Knowledge and Beliefs, Motivational attitudes i.e. Desires and Intentions Commitments Few attempts by researchers are made to develop a computational model which integrates social settings and mental states of agents for the performances of some processes in B2C e-commerce. For example, MAGS, a monitoring multi-agent system for the management of business process in a web services environment can be integrated with applications in the enterprise and web services provided by cross organizational business partners. Capabilities are added to BDI agent in MAGS to offer mechanisms of monitoring process execution, carrying out alerts and access control[16]

## NEGOTIATION

Very limited numbers of works are available which try to implement the cognitive parameters for selection of agents in negotiation. These works also provide the implementation of limited number of cognitive parameters for negotiation approach. There is no complete deterministic computational model or complete probabilistic model for cognitive parameters. Further due to availability of many types of cognitive parameter computational model (both probabilistic and deterministic model) using different domains, it may also always confuse the developer of a multi agent based system to select a particular approach to meet his requirement for negotiation. It is also found that the reported literature on agent based negotiation in e-commerce provides a limited modeling for the selection of potential (best) buyer and seller agent.

The DM integrated MAS based trust and negotiation is performed for the categorization (classification) and predictive analysis results between the buyer and sellers agents with and without broker agent for different goals. Kohler. have proposed a data mining techniques for automated negotiation[17]. In their method, they combine the process of determining negotiation strategies with the process of behavior recognition from buyer. Using clustering analysis on the history of negotiation, similar buyers and strategies are grouped, and during negotiation process, the group to which a new buyer belongs will be determined. They use clustering behavior analysis to find

clusters by of buyers such that the buyers in the same cluster have similar behavior and buyers in two different clusters have dissimilar behavior. Then seller uses the strategy being successful in previous knowledge for the group found by data mining. This method in useful because of using history of data; therefore seller has experience during negotiation. The technique for learning behavior of negotiators presented in this proposed word is based on clustering analysis. They apply clustering analysis to the data collected from past negotiations to find similar buyers behavior. They use clustering behavior analysis to find clusters of buyers such that buyers in the same cluster have similar behavior and the buyers in two different clusters have dissimilar behavior. Present a new multiple service provider model of operation for the internet delivery of data mining services. This model has several advantages over the currently predominant approach for delivering data mining services such as providing clients with a wider variety of options, choice of service providers agents and the benefits of a more competitive marketplace. Approach based on the customer satisfaction survey for the profitable customers segmentation[18]. They have proposed a multi-agent - based system, celled the survey-profitable customers segmentation system that executes the customer satisfaction survey and conducts the mining of customer satisfaction survey, socio-demographic and accounting database through the integrated uses of business intelligence tools such as DEA (Data Envelopment Analysis), Self-organizing Map (SOM) neural network and C4.5 for the profitable customers segmentation. Very few works are reported which discuss the use of DM in multi agent based trust and negotiation process.

The problem of discovering trust based agent integrated e-market model for negotiation is very challenging. The approximate nature of agent behavior in the e-commerce domain increases the complexity of mining tasks. We need to discover, along with the patterns of knowledge, a flexible description of how they vary with various cognitive and business parameters.

**IV. OBSERVATIONS**

New concepts and methods are needed to extract more complete and detailed information the buying and selling behavior of agent in e-market place. In response to such a demand, research wants on how to develop *an efficient strategy integrated with deterministic and probabilistic agent based model algorithm for finding buyer and seller trust in electronic marketplace for negotiation*. Various cognitive factors, why the trust is chosen to determine the behavior of software agent for negotiation. Pattern of knowledge that was extracted from trust should have capabilities with the options of business parameters especially the features of negotiation. The Pattern of

knowledge also applied with the features of negotiation. On the basis of various research of previous researcher and current research following observations are the needs of the above research .

Table: Comparative view of observations

Method	Cognitive and mental features	Business computation features	Utility features	Role of broker agent
Ali, M Enrio Method	Only preferences are predicted on the basis of history	No	Utility model proposed but no view of combined utility	Take care for bilateral negotiation of both parties
Groeber, Maes proposed method	No	No	Yes but no view of combined utility	Not specify
Wilkes, J proposed method	No	No	Yes but no view of combined utility	Not specify
Bandini, S proposed method	No	No	Yes but no view of combined utility	Not specify
Kohler, T.A proposed method	No	No	No	For selection evaluation and filtering the sellers profile
Goldstone proposed method	No	Yes	No	For selection of seller agent

**V. CONCLUSION**

Hence from the above table we can find observations for B2C negotiation process. Very limited numbers of researchers have implemented the trust and other cognitive parameters in the negotiation process. We have paid attention to the cognitive parameter such as preference, desire, intention,

commitment, capability, trust etc. as cognitive parameters for the selection of buyer and seller agents.

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