New Marketing Research Journal
Special Issue, 2014
PP: 55-68

Cross-Cultural Time Sensitivity in a Bilateral E-Negotiation System

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Abstract

For a long time, culture has been an influencing parameter in negotiations. Growth of international trades and business competitions has increased the importance of negotiations among countries and different cultures. Developing new technologies, particularly the use of artificial intelligence in electronic trading areas, has provided us with the application of intelligent agents to resolve challenges in e- negotiations. In this study, a model is developed and implemented to arm intelligent agents with time-sensitivity cultural parameter in negotiations in electronic commerce context. The seller's proposals are offered based on the estimated value of the buyers' time-sensitivity in delivering the products. It starts from the highest price which satisfies the buyer's time sensitivity. The simulations are based on the Salacuse's Cultural dataset related to five countries, Finland, Mexico, Turkey, India, and the United States of America. The negotiation algorithms were implemented in Java platform and MySQL database for both cases of with and without cultural differences in time sensitivity. The

evaluation shows that the cultural-based model starts the negotiation from an offer close to the buyer's desire. This yields less number of rounds and total negotiation time period. The simulation results also show that the buyer's budget as an economic factor can be effective in the negotiation outcomes in some cases.

Keywords: e-Negotiation; Culture; Agent; Time-sensitivity.

I. INTRODUCTION

Negotiation is a useful tool which resolves disputes in settings as diverse as business transactions, diplomacy and personal relationships. Nowadays, by using information technologies and communications as well as and enabling computer supported negotiations, an agent can be employed to negotiate on behalf of an individual with people or organization [1], [2]. Also these electronic agents could be a good training negotiation system for anybody who wants to learn it before entering the real wide world of negotiation [3]. The agents can work autonomously to reach agreements for which they are responsible [4], [5]. Along with world business growth and intense competition among countries, negotiation between cultures became wide spread [6]. Many studies showed the impact of culture on negotiations [7]. In fact these models had been established in literature of international negotiations by Weiss as cross-cultural paradigm [8]. Some researches about the impact of culture in negotiations include studies by Graham in intracultural negotiations [9] and Brett et al in intercultural negotiations [10]. Also, Salacus explained ten effective cultural factors in negotiations [11].

We propose a new agent-based model for simulating negotiations. In fact, this model is developed and implemented to arm intelligent agents with time-sensitivity cultural parameter in negotiations in B2C electronic commerce context. The results show that the model could reduce the negotiation's number of rounds and time.

The rest of this paper is organized as follows. Section II includes basic information about e-negotiation and effective cultural factors in negotiations. It also has a quick view on the studies about e-negotiations and cultural effect. In section III, the proposed model is presented and the agent negotiation system is designed and implemented. Section IV presents and evaluates the simulation results and analysis. Section V concludes and presents the future trends.

II. E-NEGOTIATION AND CULTURAL FACTORS

A. E-Negotiation

The need for computerized negotiation support was recognized in the 1970s [12]. As a result, different kinds of negotiation systems have been designed for supporting different negotiation activities over years [13]. Supporting or replacing one or more negotiators or mediators can be carried out through an e-negotiation system [14]. Other activities undertaken in in negotiations such as matching negotiators or exchanging data and comparing and analyzing offers can also be supported [15]. In other words, e-

negotiation is developed on top of the web for facilitating, organizing, supporting and/or automating negotiation interactions [16]. According to Bichler's study, there are three types of e-negotiation systems [17]: (a) negotiation support systems assisting users with communication and decision-making activities, (b) *e*-negotiation media provide a platform that implements a negotiation protocol, and (c) negotiation software agents replacing users in their communication and decision-making activities. Our proposed model falls in the third group. We model the agent who plays a role in B2C shopping process.

Despite the name of the e-commerce, negotiation is not fully automated. In the other words, online transaction requires a high level of human intervention. They evaluate their choices about what to buy, when to buy, whom to buy from and also how to pay for the purchases. In fact, they would get involved in negotiation. An agent as a computational system would act like a human factor in e-negotiation simulation system. The "agent" is the flexible software which can reaches the specific goals on behalf of its owner [18]. In general, we can say that the agent properties include autonomy, social ability, reactiveness and pro-activeness [19]. The agent as a mediator goes through five stages [20]: need identification, product brokering, buyer coalition formation, merchant brokering and negotiation. In first stage, user profile is installed in the agent. Informed of the costumer need, it can notify the user whenever an appropriate good/service becomes available. The next stage is determining what product to buy to satisfy the need. In buyer coalition formation stage, the agent can done collaborating work with other agent like when the customer interact to other buyers for his/her shopping. Next stage involves the agent finding an appropriate merchant to purchase the item from. In the last stage which is the important one, the agent prepares bids for and evaluates offers on behalf of the parties with the aim of obtaining the maximum benefits. In this stage the price and the other transaction properties is determined which somehow contains levels of bargaining. Actually, bargaining includes the following levels [21]:

- The first party offers his/her suggestion to his/her opponent.
- The second party receives the proposal and follows one of these reactions:
- Accepts the proposal.
- Changes the proposal and sends it to his/her opponent.
- Denys the proposal.

B. Cultural Parameters

World Wide Web helps developing e-commerce and caused increasing of negotiations among nations more than before. Negotiations among countries could be perceived differently due cultural differences. Based on Gregory E. Kersten, e-negotiation systems should also consider the users' culture [22]. According to Markus and Lin's point of view, culture uniquely characterize common values and norms among individuals in a social group. "Culture is also the economic, social, political, and religious institutions that direct and monitor current group members, and that socialize new members" [23]. Realization of the effect of national cultures on negotiation is becoming very important in business. Indeed, cultural impact on negotiation enthuses

lots of researchers. Although this research mostly focuses on face-to-face negotiations, our study proposes a new approach for considering cultural effects on agent-based e-negotiations. The most well-known study in negotiation and culture is Hofstede-IBM work with 116,000 questionnaires containing the values of employees of IBM in 72 countries [24]. In his analysis, Hofstede found four dimensions for culture: power distance, individualism, masculinity, and uncertainty avoidance. Another study is Salacuse's research that found ten cultural dimensions affecting negotiations [11]. He selected five countries for consideration drawn from different cultural clusters to establish variation between cultures. Five countries representing five cultural clusters as follows: Finland is classified in the Nordic/Scandinavian cluster; Turkey in the Near Eastern/Middle Eastern cluster; Mexico in the Latin American cluster; the USA in the Anglo cluster; and India in the Southern Asia cluster [25], [26]. According to his study negotiators can use ten dimensions to systematically identify possible areas of tension, thereby making it possible to appropriately adjust their expectations and negotiation practices accordingly. Salacuse's ten cultural dimensions include [27]:

- *Goal:* This dimension refers to the primary goal of a business negotiation: It means to arrive at a signed contract or to build a relationship between the two parties.

- *Attitude:* Business negotiators tend to approach a negotiation with one of two basic attitudes: It means that it is either a process where both parties can gain or a struggle in which there is a winner and a loser.

- *Personal style:* This dimension refers to the way in which business negotiators talk to and interact with others.

- *Communication:* Negotiators from some countries prefer direct and simple communication, while others employ an indirect, more complex style of communication.

- *Time sensitivity:* Salacuse refers to whether negotiators from a given country are punctual or late and whether negotiators from a particular country negotiate slowly or are quick to make a deal.

- *Emotionalism*: The tendency to act emotionally and/or to display emotions while negotiating.

- *Agreement form*: This dimension refers to the degree to which the final agreement between the parties includes detailed clauses that attempt to provide specifically for as many future events and risks as possible.

- *Agreement building:* This dimension captures whether negotiators build agreement by negotiating the details, such as product characteristics, price, and terms of delivery, or whether they start from general principles and then proceed to specific things.

- *Team organization:* Some negotiating teams are led by one individual possessing complete authority to decide matters, while others stress team consensus in decision making.

- *Risk-taking*: Salacuse notes that negotiators from some countries are more risk averse than others.

III. THE PROPOSED MODEL

The goal of the proposed model is to gain results in e-negotiations in less number of rounds and time. The seller agent achieves outcome only by almost correct prediction of buyer's preferences. In this study, we consider time dimension as one of the effective factors in e-negotiations.

A. Assumptions

1) Input data: The data in Table I show quantitative comparison of ten effective parameters in negotiation for five countries including Finland, India, Mexico, Turkey, and the USA [28]. We assume that the primary knowledge of the agent is a 1×5 matrix where each cell is related to one country. Depending on time and cultural characteristics of the people our matrix will be changed. Normalizing the data before using them is one important thing to mention. By considering time sensitivity as an independent parameter in pricing items, the proposed model is simulated. In this study, we map the time parameter to time delivery.

TABLE I. NEGOTIATING TENDENCY-MEANS [28]

Dimension/Country	Fin	India	Mexico	Turkey	USA
Goal	3.57	2.76	2.61	1.98	2.90
Attitudes	4.20	3.66	4.26	2.93	4.02
Personal styles	2.54	3.30	3.58	3.33	2.90
Communications	1.85	1.62	1.70	1.63	1.87
Time sensitivity	2.63	2.02	2.22	1.81	2.55
Emotionalism	3.03	3.31	2.87	3.53	3.15
Agreement form	2.36	2.29	2.16	2.17	2.10
Agreement build	4.14	2.65	3.10	3.27	2.84
Team organization	2.63	2.93	3.01	3.86	3.62
Risk	3.36	2.28	2.66	2.51	2.63

2) Buyer and seller agents: Our agents are selected from the countries shown in Table I. The knowledge is also initialized from the same data.

(a) The buyer agent has the real time sensitivity parameter which depends on the buyer's characteristics and culture. Also the buyer declares his/her financial capability to the buyer agent.

(b) The seller agent receives its data from the database getting from Lynn et al research (Table I). The data is not static and would be changed as the culture changed. We also consider that this agent doesn't have any access to buyer's financial capability.

3) Traded item: Two prices are considered for items and products:

(a) Normal price (p_n) includes the manufacture price (p_m) and normal delivery price (p_{nd}) which depends on the distance.

$$p_n = p_m + p_{nd} \quad (1)$$

(b) Special price (p_s) which depends on the delivery time of the item (p_{dt}). For the buyers who prefer to receive the item earlier, it costs a specific price (p_{sp}) per each day before.

It is worth to note that there is a minimum price for the seller that he/she cannot consider any deals below this price.

$$p_s = p_m + p_{nd} + p_{dt} + day \times p_{sp} \quad (2)$$

B. Mechanisms

Whenever a user from specific country likes to negotiate, he/she would be influenced by his/her culture. After choosing an item by the user, to start the negotiation the buyer agent's budget is initialized by the user.

From this level to the end, for evaluating the number of rounds which negotiations take, simulation is divided into two scenarios:

1) With considering buyer's time sensitivity: Prior to starting the negotiation, the seller agent gets all the information about buyer's culture by buyer's IP address. Then by retrieving the appropriate knowledge matrix from the database and calculating the culture tendency of the buyers, the agent would offer the initial proposal. The initial offer is calculated as below:

Delivery=NormalDelivery–(Sensitivity×NormalDelivery) (3)

DeliveryPrice=(NormalDelivery–Delivery)×ExpensePerDay (4)

Price=ItemPrice+DeliveryPrice (5)

where, Delivery is the delivery time by considering the buyer's time sensitivity, NormalDelivery is a constant number that seller offers to everybody without knowing his/her customers, Sensitivity is a normalized number that we consider for time-sensitivity of each country, and ExpensePerDay is the extra cost that buyer should pay for receiving the item earlier than its normal time.

Therefore, the first round of the negotiation starts around the buyer's desire. In this round, the following situation occurs:

- The proposal is beyond the buyer's budget. Thus, the seller decreases the price till (a) the offer becomes appropriate for the buyer and the negotiation would have successfully ending; (b) the offer reaches the minimum value for the seller and still it is not within the buyer's budget range, so that the negotiation would have a failure ending.

- The proposal is within the buyer's budget. So, by asking the buyer about accepting the price or not, the entire results and the number of negotiation rounds would be recorded for the purpose of future data analysis.

We call this a time-sensitive negotiation scenario.

2) Without considering buyer's time sensitivity: In this case, without any attention to the buyer's culture, the seller agent proposes the initial offer. The rest of the rounds are the same as the previous scenario.

It is worth to note that the final results of the both scenarios are the same.

We call this a *normal negotiation* scenario.

C. Implementation

The three layered architecture of the e-negotiation simulation system is implemented as follows:

Layer 1 - Data base: MySQL database is used for this system. It contains the initial data and basic knowledge matrix. These date could be changed as the time passes.

Layer 2 - Intermediate layer: Connecting to the database occurs through this layer. In fact, one part of it receives the data from the users and the other one retrieve the information and data from the database.

Layer 3 – The presentation layer: The system consists of two access level for the users, the buyers and the manager of the system.

IV. Experiments and Evaluation

Assessing this software needs statistical populations of the five countries be considered for running and getting the results. Because of difficult access to this large population, the input data of our system uses random generated IP addresses to show users from these five countries. We ran the software for 800 users. Fig. 1 shows the total number of negotiations taken with buyer agents from the five countries.

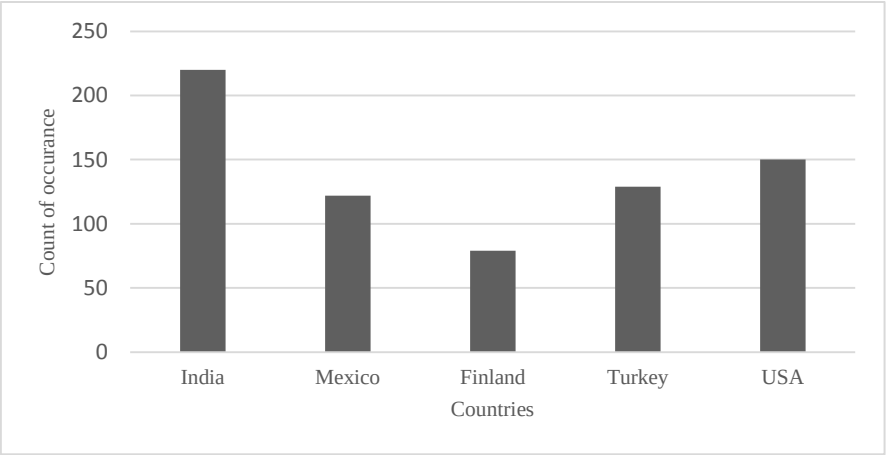

Fig. 1. Distribution of random buyer agents

After finishing the experimental negotiations and evaluating the outcomes, the results are divided into two groups. Group-a had less number of negotiation rounds in time-sensitive than normal negotiations. Group-b had more number of negotiation rounds in time-sensitive than normal negotiations. Among 800, some negotiations took place in less number of rounds for time-sensitive compared to normal negotiations. Fig. 2 shows the total number of the experiments whose results are classified into the first group. In other words, the seller agent with the information about time sensitivity of the buyers could offer the buyers appropriate proposals which decreased the negotiation number of rounds. Fig. 3 depicts one sample of negotiations which were classified in Group-a. Left and right sides show the seller and buyer's offers, respectively. Time-sensitive and normal cases are represented in top and bottom boxes where they respectively concluded in agreements in 1 and 11 rounds.

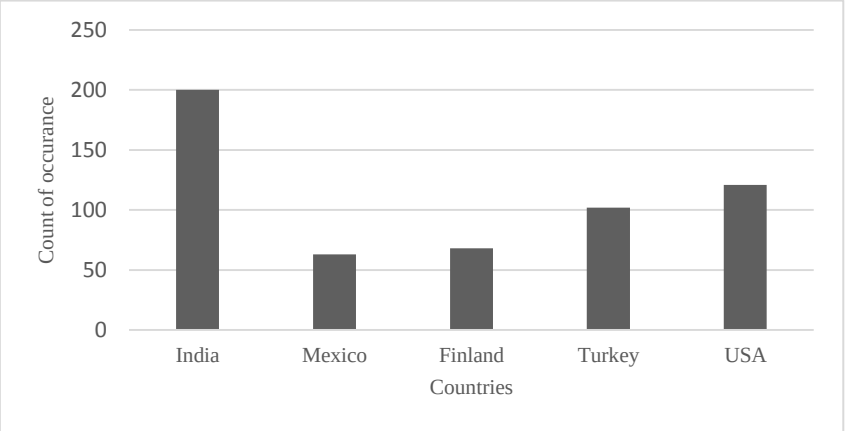

Fig. 2. Total number of negotiations falling in Group-a.

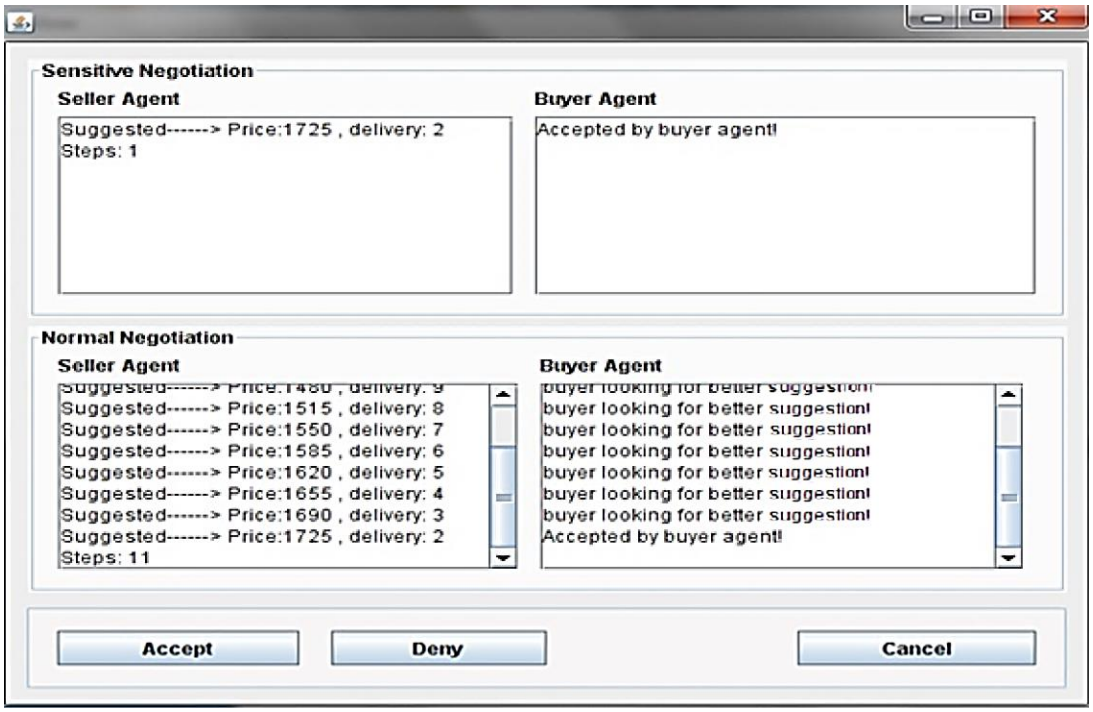

Fig. 3. A sample Group-a negotiation in time-sensitive and normal scenarios

Group-b somehow shows exception cases of the study. According to Fig. 4, information about the buyer's time sensitivity was not helpful in decreasing the number of rounds in time-sensitive negotiations compared with normal negotiations. These cases occurred when the budget given to the buyer agent could not cover the costs of early delivery offers. Since the seller agent has had no information about the buyer agent’s budget as an effective factor, the negotiation is forcefully continued in more rounds to reach an offer within the budget range of the buyer agent. Therefore, these negotiations reached to agreement in more number of rounds compared to normal negotiations. Fig. 5 exhibits a Group-b negotiation. This sample shows that time-sensitive negotiation resulted in agreement in 9 rounds compared to normal negotiation which took 4 rounds to reach the outcome.

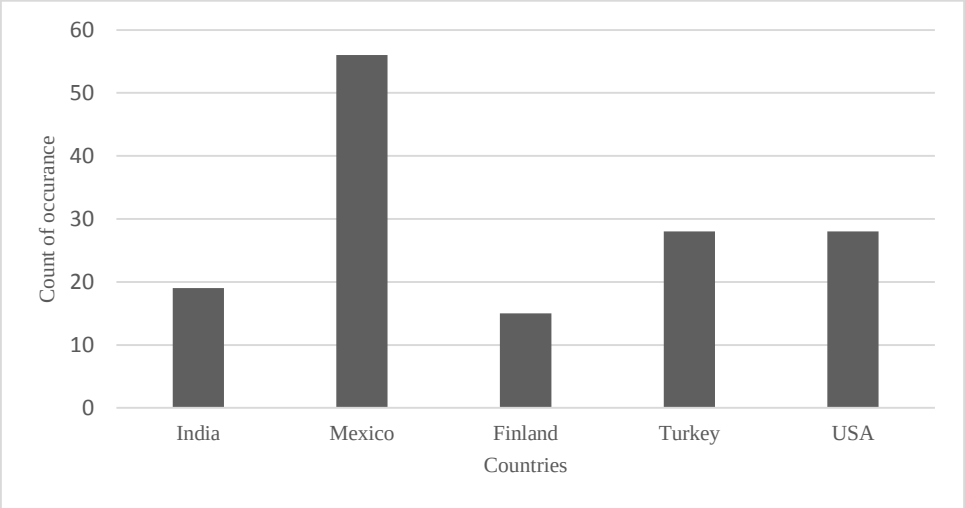

Fig. 4. Total number of negotiations falling in Group-a

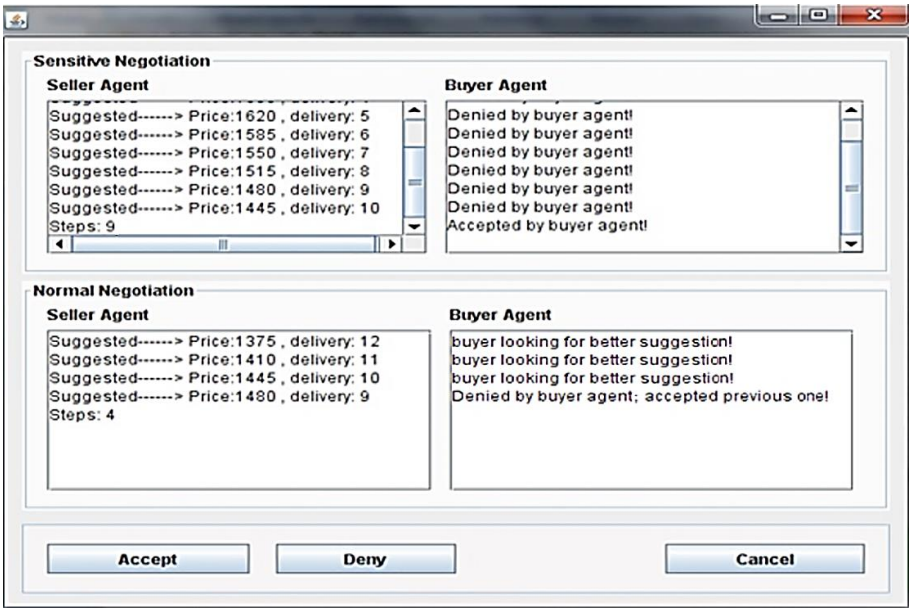

Fig. 5. A sample Group-b negotiation in time-sensitive and normal scenarios

We could also have a side conclusion from the Group-b results. In this study, some countries like Mexico had better negotiation results in Group-b experiments than Group-a. Maybe it is because of the prevailing economic situation in the country. This result could be helpful for economists to analysis the economic situation of the population of buyers from a specific country.

We let the users to decide about accepting successful agreements reached by their agents through e-negotiations. According to Fig. 6, another observation we got from this study is about the negotiations that buyers didn't accept offers, although the offers were suitable with respect to their budgets. So we could get some probable conclusion from this occurrence:

- That buyer acts completely different from the dominated culture of his/her community.

- Dominant culture of the community is getting changed. For solving this problem, we could add a feature to the software for updating the knowledge matrix after certain number of the transactions.

- We may consider other parameters in delivery time to get better results.

We classify these results in Denied group.

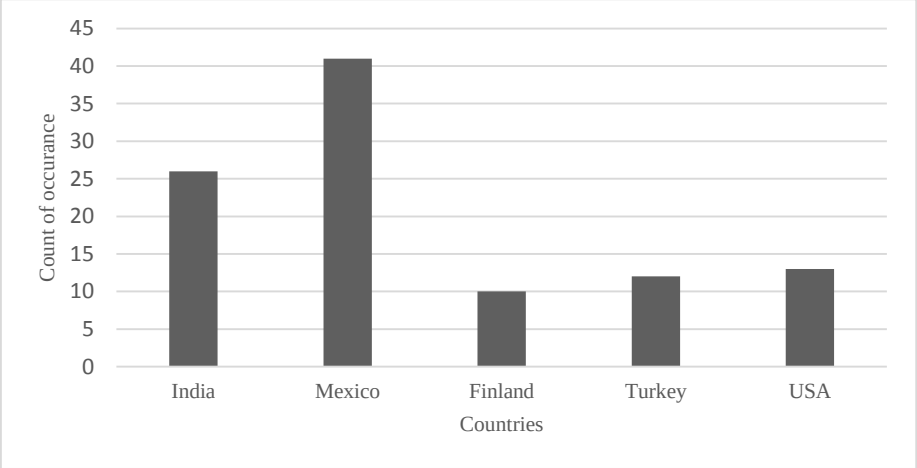

Fig. 6. Total number of successful negotiations gained by agents which not accepted by the corresponding buyers

Table II summarizes the results. It shows the three types of results obtained from the simulation based on the negotiation results falling in Group-a, Group-b, or Denied. This table demonstrates that in about 70 percent of cases, time-sensitive negotiations reach in agreements in less number of rounds compared to normal negotiations. However, it cannot outperform normal negotiations in about 17 percent of interactions. Moreover, buyers denied agreements gained by their agents in about 13 percent of the cases. Therefore, it shows that culture-based time-sensitive model could be an effective tool in e-negotiations among countries. Further studies in future researches could improve its performance in these 40 percent of the cases.

TABLE II. THE PERCENTAGE OF SUPERIORITY OF CULTURE-BASED TIME-SENSITIVE NEGOTIATION VS. NORMAL NEGOTIATION WITH RESPECT TO NUMBER OF ROUNDS TAKEN

Type / Country	Finland	India	Mexico	Turkey	USA	Total
Group-a	24.875	8.125	8.75	13.125	15.25	70.125
Group-b	2.125	6.375	1.75	3.125	3.125	16.5
Denied	3.25	5.75	1.25	1.5	1.625	13.375
Total	30.25	20.25	11.75	17.75	20	100

V. CONCLUSIONS AND FUTURE WORKS

A. Summary

Along with the advancement of information technologies, negotiations were also changed. Indeed, information technologies have had a great influence on them. Fortunately e-Negotiation system not only can help the process of communication and

decision making, but also it can collect both the data obtained from the negotiation process and the results obtained from the data which does not happen in face-to-face negotiation unless the entire process is recorded. This study first reviewed Salacuse' ten cultural dimensions and the role culture in negotiations. After all, we focused on Salacuse's time dimension which is mapped to delivery time. The study, then proposed a new model that automatically negotiate with the buyer agent to bargain over the price and delivery time. This model was simulated based on real benchmark data. The final result could meet the objective of the study in reducing the negotiation number of rounds under the condition that the buyer has adequate funding to support his/her time sensitivity for delivery.

B. Future Trends

For developing this study to be simulated much like the real negotiations, the following suggestions are recommending. In the current model the buyer just accepts or denies the seller's offers. That is, the seller agent is the one who changes the values and proposes offers. We suggest equal options for both agents to be considered to evaluate the impact on the number of rounds in negotiation. In addition, by considering buyer's budget, economic level of the buyers in a specific geographical area, nine other cultural dimensions according to Salacuse' research and more data from more countries, better results could be obtained.

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