

Electronic Negotiation Systems (ENS)

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E-business is a broad concept, in which business partners are connected by use of modern information-communication technologies (ICT). The communication alone is not sufficient to establish a business relationship; it is necessary that the parties in communication have technologies and tools for automatized negotiations at their disposal. Electronic Negotiation Systems (ENS) are especially significant in the realm of supply, with a special emphasis on public sector supplies. In this work the advantages of use of ENS in negotiation processes are analyzed and a review, as well as basic characteristics of some of the best-known electronic negotiation systems, are presented.

Introduction

The earliest electronic negotiation systems working via the Internet were the configurators, uploaded on the sites selling computers. These tools served as basis upon which the Internet sales of computers were conducted. They allowed for anyone who wanted to purchase a computer via the Internet to create their own configuration, i.e., to select the elements and components of the computer by deciding on the parts of the computer, the software supporting the site analysing whether it was possible to assemble the computer using these components. The customers are thus in a position to optimize the computer's performances on the basis of the amount of money they had to spend, since the software computed the total price of the chosen components. Today, these tools are numerous, supplied with various auxiliary programs (smart software agents). The customer can put together a computer (or any other device or machine) he likes, following a set of given rules, and the task of these tools is to use these same rules to show

the customer how much he will have to pay. The configurators, however, are only one in a series of the Internet *e*-negotiation systems. In addition to these, there are also *Negotiation Support Systems (NSS)*, and the *Decision Support Systems (DSS)*. These are the softwares created to help the negotiator during all or only certain stages in negotiations and may be categorized in different ways. The *ENS* differ from some other information systems in several key aspects. Firstly, they are directed towards the network and have to be linked to the Internet at all times. Then, they provide for the close link between the business processes within and out of the company (e.g., supply chain management), as well as a large number of access systems from any place you are. Their interface with the users is ensured through the web-browser: it is easy to understand and

common to many different applications. Besides the *ENS*, *Video Conferencing* is also used in economics or political negotiation processes, and this is also a type of electronic negotiations, given that information and communication technologies are used throughout all the phases of the negotiation process. The history of video conferencing dates back as early as 1956, when the US firm *AT&T* first tried its invention – a video telephone (*Pisturephone*). Fourteen years later, the users of the *AT&T* picturephone paid a monthly subscription fee of \$180, and as early as 1971 the *Ericsson* company presented their product – the transatlantic video telephone – *LME*. The first actual video conference was conducted using the analogous *TV* and satellites, then conferences followed using the digital systems, and then via the computer systems. These became a routine in the work of multinational companies in the 1980s. Today, the signal transmitting the picture and the sound is digital, therefore it can be sent in different ways. The video conference is most commonly carried out within a local network (e.g., *LAN*) or through the public telephone network (most frequently the *ISDN*, because of its financial profitability and a satisfactory quality of transmission).

Functions and activities of ENS

The negotiation systems used on the Internet differ from the systems used in autonomous computers and in the networks covering large areas in their mechanisms as well as in the methodologies they use. Some of these systems facilitate communication, others act as active mediators. There are also systems that facilitate a mutual preparation of the contents of documents (*Schoop and Quix 2001*), and the systems that allow the negotiators to present offers to be further forwarded to experts (*Cybersettle 2000, NovaForum 2000*). A mutual characteristic of both the software meant to be used in *e*-negotiating and of the systems

that incorporate some elements of *e*-negotiations is that they are uploaded on the Internet and are able to support, aid or act in place of one or more negotiators, mediators or assistants. They are, as said above, entitled the *e-negotiation systems (ENS)*, similar to the systems of *e-commerce*, *e-business*, or *e-market*.

The *ENS* can be defined as a software using the Internet technologies, positioned on the Internet and characterized by one or more following properties:

- a) supports decision-making and giving concessions;
- b) proposes offers and agreements;
- c) evaluates and critically analyses offers and counteroffers;
- d) provides a structural arrangement and organization of the process;
- e) provides information and expert opinion;
- f) facilitates and organizes communication;
- g) helps in preparations of agreements;
- h) provides access to negotiation knowledge.

As softwares uploaded on the Internet, capable of aiding one or a number of negotiators, mediators or assistants, the *ENS* allow for the use of *e-mail*, *chat* and video technology, as well as automatic negotiations and auctions. The role of the *ENS* is in some processes passive (*e-mail* and video). More advanced systems take an active participation in the process, including the estimation of the consequences of the offers placed, the propositions for new offers and agreements as well as a critical evaluation of counteroffers.

The overall role and behaviour of the *ENS* in negotiations is of crucial importance when it comes to their creation and use. While passive systems can be understood as fast and sophisticated transmitters of messages, active systems can provide support, facilitate work and act as mediators. The systems capable of accessing and processing knowledge and able to work

autonomously as regards their users are characterised by a certain level of intelligence and can be proactive. It is from this aspect that we can class the *ENS* into three broad groups:

1. *Passive systems* – facilitate communication and interaction of users situated in different places. They help them present their ideas, offers and arguments. These systems can also provide support in information collecting, organizing, and processing. Passive systems, such as *e-mail* and chat, are not concerned with the manner in which the contents is created, nor with the use of resources required for the given contents.
2. *Active facilitating-mediating systems* – help users in formulating, evaluating and solving difficult problems, giving concessions and creating offers, as well as in evaluating processes and agreements. As a rule, these systems follow a negotiation process model to which the users have to reconcile. They also have the components for problem and solution structuring, as well as those for offering evaluation and for creating counteroffers. Models built into active systems are the models of the problem, of the negotiator and of the process itself.
3. *Systems of proactive intervention-mediation* – are characterized by the same properties as the systems of active facilitating-mediating, however, they are capable of coordinating the negotiators’ activities, of supervising their activities, as well as of giving propositions as to what offer should be given or what agreement should be accepted. In order to be able to act in this way, the systems of active intervention-mediation access and use the data bases and make use of the means of intelligent softwares that supervise both the negotiation process and the individual activities of the negotiators.

ENS functions and activities

Functions	Activities
Transfer and storage	<i>Communication, presentation and interaction</i> Information transfer among heterogeneous systems; storage in arrayed systems; safety Retrieval, selection, comparison and collecting shared information Data formatting for use in other systems; data visualization, presentation of alternative data, user-system interaction
Browsing and retrieval	
Formatting, presentation and interaction	

Functions	Activities
<p>Decision-making problem formulation</p> <p>Technical data on the decision maker</p> <p>Strategies and tactics</p>	<p><i>Decision-making and negotiator problem</i></p> <p>Decision-making problem formulating and analysis; viable alternatives; decision -making space , measuring</p> <p>Technical data on decision makers description notions; desires; alternative comparison measures; negotiators' models and styles</p> <p>Evaluation and selection of initial strategies and tactics</p>
<p>Forming and evaluation of offers and messages</p> <p>Analysis of the partners</p> <p>What if, sensitivity and analysis of stability</p>	<p><i>Process</i></p> <p>Forming offers and concessions: message and argument analysis; argumentation models</p> <p>Shaping and cheking of the models of negotiating parties; evaluation and anticipation of t heir behaviour</p> <p>Offer and counteroffer analysis; balance analyse; possible agreements evaluation</p>
<p>Process, history and their evaluation</p> <p>Search for knowledge and its application</p> <p>Negotiations protocols</p> <p>Strategies and tactics</p>	<p><i>Knowledge</i></p> <p>Shaping the negotiations history; process analysis; evaluation progress/regress; history based anticipation</p> <p>Access to external information and their use, knowledge of the situations in negotiations and the problems emerging in the course of the process; comparati ve analysis</p> <p>Specification and observing the plan in the negotiation rules</p> <p>Estimation of the other party's strategies and tactics in negotiations; change of strategies and tactics</p>

Source: Gregory E. Kersten: *E-negotiation systems: Interaction of people and technologies to resolve conflicts*, <http://interneg.concordia.ca/interneg/research/papers/2004/08.pdf>

The use and the impact of passive systems upon the negotiation process and its outcomes has also been studied. Negotiations via *e-mail* have shown that a narrow scope of communication has a negative impact upon the negotiation process, therefore the scope should be increased by the methods of communication known so far. The findings in the reasearch have also stressed the importance of the activities that are not related to the negotiation task itself, as regards the re-

lations and the outcomes of the negotiations. The activities that are not related to the task are very important to the negotiators who are supposed to establish a close relationship and trust. They ought to bridge the social differences existing between themselves and the other party, as well as use a positive or a negative “emotional style“ instead of a “rational style“. Other researchers perceived the presence of prejudices when it comes to negotiations via *e-mail*, i.e., “temporary

simultaneity“, “bridges burnt“, the information circle and the “malicious imputation“.¹

ENS review

In order that the differences among the passive, active and proactive *ENS* be better understood, we will give some examples of the existing systems developed at the Concordia University – *SimpleNS*, *Inspire*, *Aspire* and *eAgora*.

The *SimpleNS*, as a passive *ENS*, does not impose upon the negotiators the need to formulate and exchange complete offers. The system does not enquire into the negotiators’ wishes, it does not create a benefit function, nor does it show the negotiation graphs. It is only slightly more eligible than the *e-mail* system, since it allows for the separation of offers as regards messages, and the whole negotiation flow is readily accessible to view and chronologically presented on one side. The *SimpleNS* has only three pages: one with the case description, one with the data entered and one showing the negotiation flow.

A different, active system *Inspire* was developed in 1995, as part of the *InterNeg* research programme. Since 1996 it has been used to conduct anonymous bilateral negotiations. The system uses a threefold negotiation model:

1. prenegotiations;
2. negotiations; and
3. a phase following reaching the agreement (negotiations termination).

The *Inspire* system is commonly used in lectures and trainings. The use of the system is free of charge, on condition that the users fill in two questionnaires and that the developers of the system are allowed to use the obtained information, which they exchange for the purpose of further study. Typical negotiations via the *Inspire* system last three weeks, however, the users may demand that the terms are prolonged. During the negotiations the participants can check the history of the offers and counteroffers presented, as well as view a graphic presentation of the offer exchange flow. On reaching the agreement by the negotiating parties, the system decides whether the negotiations are concluded successfully. If the compromise was not successful, the system proposes entering the negotiations

termination phase. This phase starts by calculating successful alternatives prevailing in the compromise reached. Once the negotiations have been terminated, the parties may agree on whether either of them should present its desires to the other party. This allows for the system to create a negotiation flow graph. Since the users achieved a favourable agreement, no improvements of the situation are necessary. In the 1996 – 2004 period, 6,126 people from 62 countries used the *Inspire* system to negotiate. The majority of users were students, managers, lawyers, engineers, and physicians.

One example of a classic proactive electronic negotiation system is the *Aspire*, which is actually the *Inspire* active system expanded by a software agent called *Atin* ($Aspire = Inspire + Atin$). The *Atin* negotiation software retrieves the information from the basis of negotiation knowledge and gives advice to the negotiator. The advice is based upon:

1. the rules of negotiations derived from literature;
2. the status of the actual negotiation process; and
3. information on the negotiator stored in the database of one user. At the beginning of negotiations each negotiator decides, using the *Aspire* system, whether they wish to use the services of the *Atin*. The user’s agent can access only the information available to this user and his knowledge database; private information on the other negotiating party are not available.

The *Atin* constantly supervises the negotiation process, thus giving the agent an opportunity to warn the user about the actions he undertakes, especially those which may have a negative impact upon his situation in negotiations. The *Atin* uses simple “traffic signs“, to show the user the evaluation it created of the situation at one particular moment. Thus the green colour means there are no warnings for the user (negotiations proceed as planned), the yellow colour means a warning, while the red colour warns the user that the *Atin* perceives a certain step as a wrong one. In such a case the user opens a separate window in which the reasons for showing the red sign are shown, as well as a proposition towards the solution to the problem. Besides, the user can require that the agent make an evaluation of the previous activities, as well as advise on potential further steps. In order to give the best possible propositions, the *Atin* may ask the user for additional information (e.g., negotiation strategy, willingness to make concessions, etc.). then, the user may ask the *Atin* for advice concerning possible strategies. The agent then shows a list of strategies together with explanations of their positive and negative aspects.

¹ L. Thompson, J. Nadler: Negotiation via Information Technology: Theory and Application, *Journal of Social Studies*, no. 58/2002, pp. 109-124.

The *eAgora* system is a proactive *ENS* prototype providing the services of an electronic market to the users who wish to sell or buy goods in such a way. The services of this system include the existence of a software agent that presents offers and criticizes the ones presented by the purchaser (seller) and their partners in negotiations. If the user activates the agent, the agent will require the information on the approach and the strategy of the user. This data, together with the offers and counteroffers exchanged during the negotiations are used to determine a number of possible offers (packages) which are presented to the user. The agent analyses the information on the user, his approach, wishes and the reserve levels, in order that it should evaluate the offer the user wants to place, as well as the offers the user is given. If the user wants to propose an offer that violates the reserve levels of a certain disputable issue or that does not conform to the chosen negotiation strategy (e.g., a competition bound user offers a significant concession), the agent warns the user and criticizes the offer. It also criticizes the user's move to accept an offer that does not fulfill his reserve level. The agent's capability of criticizing helps the user understand the possible deviations from the strategy and the initially agreed wishes, as well as a need that they should be corrected.

Negotiations via video conferences (Video conferencing)

Video conferences, defined as *communication by which the sound and the motion picture are exchanged among two or more locations*², are the most suitable method of conducting international electronic negotiations. Using information and communication technologies (ICT), the video conference allows for the people situated in different places to see and hear one another, which is very important in conducting negotiations with high stakes. Therefore the video conference is frequently used, not only in *Distance Education*, but also in business, and increasingly so in international politics.

In terms of the quality required in transmitting the motion picture and the sound and in terms of financial means, we distinguish between the *Desktop Video Conference System* and the *Room-based Video Conference System*. Also, in terms of the type of the equipment used, we can distinguish between the *Desktop and Room-based Video Conferences*. Besides the basic equipment required for conducting a video conference, there is additional equipment which allows for presenting written materials, graphs, or the presentation of the screen background. The equipment used by

the participants in a video conference may come from different manufacturers and may vary in terms of model and size.

The desktop video conference is the most commonly conducted video conference, employing the computer to which the monitor, the video camera, the microphone, loudspeakers, and the processing unit called "codec" (*Coder-decoder*) are attached. The codec provides video conferencing via telephone (in case of desktop negotiations). Its task is twofold. On the front it has a role of the coder, that is, it receives the analogous video signal and codes it (digitalizes and compresses it). On the reception side it has a role of a decoder, that is, it decompresses the incoming, digitalized video signal and transforms it into the analogous signal. The quality of picture and sound transmittance largely depends on the codec, since losses occur during the compression of the outgoing video signal and the bandwidth. The consequences of a slow codec or a poor bandwidth are the interrupted picture and the delay in the sound signal. In February 1994 the *CU-SeeMe* software for *Macintosh* was created, making it possible for the video conference to be conducted. Next year the same was created for the *Windows*. The *Microsoft NetMeeting*, whose improved version is still used in computer-conducted video conferences, was created in April 1999.

As regards the type of communication network, the desktop video conference can be conducted in the following two ways:

- a) by an analogous video conference via a modem – the modem and an analogous telephone line are used to connect the computer with another personal computer, i.e., the participant that uses similar communication equipment.
- b) using digital networks – digital networks ensure a high quality of picture and sound transmission.

The above quoted equipment, the modem, the analogous or digital communication lines help conduct an Internet video conference, too. The Internet is, however, still too slow for conducting a quality video conference. An additional flaw is that the line capacity is shared with other Internet data, which causes an interrupted video picture and a delay in the sound signal. New methods in picture and sound compressions, as well as new capabilities of the Internet technology will allow for a higher quality video conferencing in the near future.

Every participant in an audio or a video conference must be supplied by a necessary software that controls the messages exchange process between the partici-

² Introduction to Videoconferencing, <http://www.video.ja.net/intro/>

pants. Certain programmes, such as the above mentioned *Microsoft NetMeeting* and the virtual classrooms packages produced by *Centra* and *LearnLinc* companies are specially created for conferences, while in some other cases the necessary functionality may be achieved at special *Web* sites.

Besides the change in the video picture, the sound and the data, the desktop video conference frequently includes the document sharing. The notion “shared document” means a possibility to add, amend, prepare or print a document which is simultaneously available to other parties. Thus, for example, if one of the participants has an open *Word* document and is writing in it, the other participant can see the same document on his screen and can add, alter, write in or print that same document.

The room-based video conference is meant for work among a larger number of participants, which meets all the conditions required in conducting any more complex negotiations. A video conference may have a very high quality of transmission, however, the price of the communication and equipment in this case is equally high. Contrary to the desktop video conference, the room-based video conference uses one or two large monitors similar to television screens, larger loudspeakers and a larger video camera, most commonly positioned between the monitors. Nowadays video-beams are increasingly used. The equipment is usually mounted on a moving platform, therefore it is not confined to only one location, especially as regards the video-beam. It is connected to the communication network by more than two digital lines (most frequently a combination of 3 to 6 digital lines is used). The desktop and the room-based video conferences are only the types of video conferences as regards the equipment used, and they can be employed in the *point-to-point* and the *multi-point* types of communication too. Participation of more than five parties in a video conference is considered to result into a poor, ineffective communication. The multi-point video-conference is conducted via a specific device called “bridge” (*Multiple conference unit*). In case a computer is used, there must be a specific software.

The *Satellite video conference* is a video conference via digital satellite television, and is commonly used by well-known world universities as a method of linking groups of students from different geographical areas. This communication may be conducted via electronic mail, via picture or via sound. The satellite video conference ensures a high bandwidth and great transmission speeds towards the satellite and back.

Today’s mobile phones allow for the meetings to be held in real time, with picture and sound, therefore we can also talk about a *mobile video conference*. They are available to all the subscribers of the third-generation network (3 G) who own the respective models of mobile phones. A number of persons can participate in such conferences, with the screen showing each of the participants. It is also possible that the screen is not shared, that it shows only the portrait of the participant currently speaking. These conferences have become a commonplace in the business world, at least when the negotiations including lower stakes are concerned. In the world of foreign affairs they can be used as a modernized version of the so-called “napkin diplomacy”.

CONCLUSION

The development of the ICT and electronic business brought forth a significant acceleration in the negotiation process. This acceleration reached the level at which it is difficult to follow the processes without appropriate tools. On the other hand, globalization of business made it necessary that the negotiation processes be conducted on a world level, among the parties geographically distant from one another. Companies became global, with a need for the communication to be conducted both within their organizational units and with the environment. Communication is carried out on a number of levels:

- Communication within the organization;
- Communication between organizations (bilateral);
- Communication among organizations (multilateral, network communication);
- Communication with local leaders;
- Communication with and among decision makers;
- Communication with the media;
- Communication between the conflicting parties.

In order that contacts on a global world level should be conducted, it is necessary that we dispose of the technology capable of supporting such contacts. It is the *ENS* that make the preconditions of business linking and negotiations.

The *ENS* differ from other information systems in that they are primarily directed towards networks and depend on an ever-present connection to the Internet. They allow for a close connection of business processes within and without the company (e.g., value chain systems and supply chain management) as well as a large number of systems ensuring access from any place. The negotiation systems used on the Internet dif-

fer from the previous systems that were used on personal computers and in local and even the networks covering large areas in both the mechanisms and the technologies of use.

Finally, a conclusion can be drawn that electronic negotiations in local and international business and political relations have a future, because of the safety of negotiating parties, because mutually favourable agreements can be reached in a shorter period of time and because of the lower costs in conducting the negotiation process in comparison to classic negotiations.

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