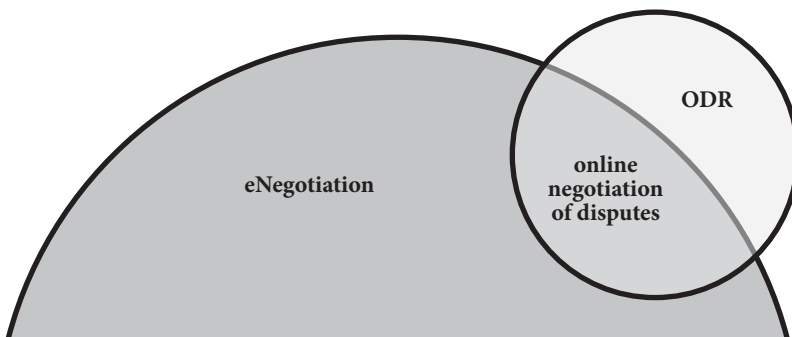


16 ODR AND eNEGOTIATION

Ernest Thiessen, Paul Miniato and Bruce Hiebert

Online dispute resolution (ODR) and eNegotiation are two overlapping components within the world of electronic group decision support systems. eNegotiation encompasses all online transactions in which two or more parties seek an agreement through negotiation. These negotiations can range from e-Commerce to international peace treaties. ODR includes all forms of electronically assisted dispute resolution, often with human intervention including online mediation and arbitration processes that do not involve negotiation (Figure 7). In exploring the use of eNegotiation for ODR, these boundaries can become fuzzy, and in the future they may blur even more as intelligent agents become part of eNegotiation technologies.

Figure 7 Relationship Between eNegotiation and ODR



1 eNEGOTIATION

eNegotiation is derived from “electronic negotiation” in the same way that e-mail is short for “electronic mail”. It is a process that uses a negotiation support system including computers or other forms of electronic communications that enable parties to negotiate their own agreements. In its most advanced form, eNegotiation is a form of artificial intelligence that fully automates mediation (perfectly neutral, super intelligent, and very secure). While in many cases unnecessary, eNegotiations can include face-to-face meetings if such meetings enhance the process.

Research on computer-mediated negotiation or eNegotiation began in the 1970s. The first prototype negotiation support systems were built during the 1980s. The problem of automating the negotiation process is not a simple one. This is evidenced by a myriad of systems (mostly still research efforts) around the world, including the following (in alphabetical order):

- Adjusted Winner¹
- AniMed²
- AutoMed³
- Cybersettle⁴
- AssetDivider⁵ (previously known as FamilyWinner)
- Fair Outcomes⁶
- Genie⁷
- Genius⁸
- Graph Model⁹
- Invite¹⁰
- Joint Gains¹¹
- Negoisst¹²
- Smartsettle¹³

1 <www.nyu.edu/projects/adjustedwinner>, last accessed 27 January 2011.

2 R. Lin, Y. Gev and S. Kraus “Facilitating Better Negotiation Solutions using AniMed”, 2010. Available at <<http://u.cs.biu.ac.il/~linraz/Papers/linetal-acan11.pdf>>, last accessed 13 June 2011.

3 M. Chalamish and S. Kraus, “AutoMed – An Automated Mediator for Multi-Issue Bilateral Negotiations”, *Journal of Autonomous Agents and Multi-Agent System*, 2011.

4 <www.cybersettle.com>, last accessed 27 January 2011.

5 B. Abrahams, E. Bellucci and J. Zeleznikow, “Incorporating Fairness into Development of an Integrated Multi-agent Online Dispute Resolution Environment, Group Decision and Negotiation”, published online 3 March 2010: <<http://0-www.springerlink.com.library.vu.edu.au/content/2jl7774266830554/fulltext.pdf>>.

6 <www.fairoutcomes.com>, last accessed 10 February 2011.

7 J. Wilkenfeld, S. Kraus, K.M. Holley and M.A. Harris, “GENIE: A Decision Support System for Crisis Negotiations”, 1999. Available at <www.sciencedirect.com/science/article/pii/016792369400027P>, last accessed on 13 June 2011.

8 R. Lin, S. Kraus, D. Tykhonov, K. Hindriks and C.M. Jonker, “Supporting the Design of General Automated Negotiators”, in T. Ito, M. Zhang, V. Robu, S. Fatima, T. Matsuo, and H. Yamaki (eds.), *Innovations in Agent-Based Complex Automated Negotiations*, Volume 319 of *Studies in Computational Intelligence*, Berlin/Heidelberg, Springer 2010, pp. 69-87.

9 <www.systems.uwaterloo.ca/Faculty/Hipel/SYDE533.html>, last accessed 10 February 2011.

10 <invite.concordia.ca>, last accessed 3 March 2011.

11 <www.sal.tkk.fi/en/personnel/raimo.hamalainen/publications>, last accessed 27 January 2011.

12 <www.wi1.uni-hohenheim.de/negoisst.html>, last accessed 27 January 2011.

13 <www.smartsettle.com>, last accessed 27 January 2011.

Among these systems, Cybersettle, Fair Outcomes and Smartsettle are available for commercial application. Cybersettle is a simple system that uses double blind bidding¹⁴ for single-issue negotiations. Fair Outcomes, Inc. provides parties with access to several proprietary systems that are grounded in mathematical theories of fair division and of games. Smartsettle uses a method called visual blind bidding¹⁵ that is applicable to simple cases and scalable to complex multiparty cases. Rapidly expanding computing power means that sophisticated algorithms are the likely direction for future development. More developers will enter the field as the body of knowledge expands and computing power continues to increase. In the long-term, fully automated eNegotiation software systems can be expected.

eNegotiation systems are often contrasted with other negotiation systems that require an intervenor such as a facilitator, a mediator, an arbitrator, or an adjudicator as an integral part of the process. eNegotiation also involves a structured and durable form of information that is exchanged between the parties. In eNegotiation primary parties can easily involve secondary stakeholders as required and quickly communicate the relevant context. The easy inclusion of professionals such as technicians, accountants, engineers, and lawyers ensures that the decision is fully informed and enforceable. In addition to involving secondary stakeholders, the parties may bring in facilitators or mediators (either as unprivileged observers to both sides, or as privileged observers to either side). This permits a graceful transition from stalled eNegotiation to eMediation. The key difference with eNegotiation is that the parties are in full control both during the process and in accepting or rejecting an outcome (Table 4).


Differing eNegotiation systems represent a wide range of approaches to the negotiation process and the correct choice of eNegotiation system can either augment or diminish the possibility of conflict. For example, unstructured email is generally ineffective in resolving disputes and in practice can even create or escalate conflict.¹⁶ Well-designed eNegotiation systems will reduce the conflict or eliminate it by changing the fundamental nature of the interaction between the parties.

14 In double blind bidding both parties are unaware of the specifics offered by the other party, only that a negotiation is in process. The computer operates according to a formula and when the offers are within a specific range it announces a deal.

15 In visual blind bidding visible suggestions are put forward by each party and the computer operating as an intelligent agent, but each side's acceptances are kept hidden from the other party. The computer announces a deal when hidden acceptances coincide.

16 R.A Friedman and S.C. Currall, "Conflict Escalation: Dispute Exacerbating Elements of E-Mail Communication", *Human Relations* (2003) 56, pp. 1325-1347.

Table 4 Participant Control and Type of Dispute Resolution

Conflict Resolution Continuum	Degree of Control
eNegotiation	most control
offline negotiation	
Facilitation	
Mediation	
Arbitration	
Court	least control
Violence	out of control

1.1 *eNegotiation System Components*

eNegotiation support systems are comprised of several components including communication, structure, decision support, and algorithms. eNegotiation systems incorporate one or more of these components and may do so in significantly different ways.

1.1.1 **Communication**

Every eNegotiation support system has mechanisms for parties to communicate for the purposes of information exchange, relationship-building, brainstorming, collaborative document production, and other requirements of the process. Communication is greatly facilitated when the parties cannot easily meet in person but have an electronically structured means to facilitate their negotiations. While electronic communication can sometimes hamper the emotional content needed for relationship building, there are times when removing some of the emotional content can help reduce conflict, especially when one party feels dominated. Types of communication support include email, forums, chat, and fax. A special case is when parties speak different languages.¹⁷ eNegotiation using formal processes can more easily include a translation (allowing cross-lingual operation).

1.1.2 **Structure**

Human communication in negotiation processes ranges from the highly structured to the informal. More structured communication is better suited to an efficient negotiation process and is easily facilitated by eNegotiation. Structured communication enables the production and use of a Framework for Agreement, exchange of package proposals, and double blind-bidding or visual blind-bidding. Managing and structuring communication

¹⁷ The implications to eNegotiation of cultural differences other than language is less well understood.

in an eNegotiation system using natural-language processing is likely to be more user-friendly, but currently presents considerable technical challenges.

1.1.3 Decision Support

Computer software designed to facilitate eNegotiation may provide the ability to model a complex problem throughout its evolution. The factors included in these models can include private preferences and relationships between issues under negotiation. Specific software¹⁸ can also assist the parties in clarifying their negotiation context and objectives, evaluating proposals, generating new possibilities, and guiding them toward an outcome.

1.1.4 Optimization

When a negotiation problem is modeled, a computer can act as an intelligent agent using optimization algorithms that seek the best solution. Such algorithms create a representation of party preferences that can be used to generate packages (bundled positions on issues) that are helpful in the process. Such suggestions for resolution can be based on private information that remains private to the parties but is visible to the neutral eNegotiation system. A computer generated package can encourage the process, resolve impasses, and improve negotiated agreements – all without reducing the control of the process by the negotiating parties. Optimization algorithms utilize detailed and highly accurate information from all parties, information that they would never provide each other and in some cases not entrust to a human mediator. With anything other than the very simplest of cases, this optimization is beyond the capabilities of any unassisted human.

2 ADVANTAGES OF eNEGOTIATION

eNegotiation systems offer a great many advantages to traditional forms of negotiation. In the field of ODR these advantages can make the difference between achieving a resolution and the necessity of litigation or a failure to address a conflict. While some of these advantages pertain to all eNegotiations systems, others are specific to more complex systems using intelligent agents.

18 C. Boutilier, R.I. Brafman, C. Domshlak, H.H. Hoos and D. Poole, "CP-nets: A Tool for Representing and Reasoning with Conditional Ceteris Paribus Preference Statements", *Journal of Artificial Intelligence Research* (2004) 21, pp. 135-191. Also available online: <<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.11.495&rep=rep1&type=pdf>>, last accessed 13 June 2011.

2.1 *High Cost of Conventional Negotiation*

Drawn-out negotiations can be very expensive in time, negotiation energy and use of environmental resources, especially when they involve face-to-face meetings or high-priced professionals.

2.1.1 **Advantage**

A well-designed eNegotiation system, especially one with setup assistants¹⁹ for initial input and modeling, reduces much of the cost of conventional negotiations. The use of experts is minimized and the actual time for negotiation is reduced.

2.2 *Coordinating Meeting Time and Space*

Conventional dispute resolution meetings require coordination of disputants as well as mediators or arbitrators. Arranging communication can be complex, time consuming, and costly in support resources. These difficulties are multiplied if face-to-face meetings are required.

2.2.1 **Advantage**

eNegotiation systems offer asynchronous and global access using the Internet. This makes access easy, cuts operational costs, and speeds up the process.

2.3 *Complex Problems and Issue-by-Issue Thinking*

Many disputes have multiple components and without sophisticated tools to deal with the inherent complexity, decision-makers are forced to deal with issues one at a time. A piecemeal approach to negotiation encourages positional rather than mutual gains bargaining.

2.3.1 **Advantage**

A well-designed eNegotiation system allows parties to model their entire problem. It allows them to exchange packages and consider packages generated by the system rather than struggle with bits and pieces.

19 A software setup assistant, sometimes called a “wizard”, is a user interface element that presents a user with a sequence of dialog boxes that lead through a series of well-defined steps. Tasks that are complex, infrequently performed, or unfamiliar may be easier to perform using an automated assistant. In contrast, an expert system guides a user through a series of (usually yes/no) questions to solve a problem.

2.4 *Irrational Decisions*

Multiple issues and numerous possible outcomes may lead negotiators to make decisions based on psychological dynamics and emotion rather than reason. These problems are even greater in cases involving multiple parties. Reasonable outcomes are compromised when decision-makers make logic errors, take short-cuts, or permit emotions to get the upper hand when under the stress of intensive negotiations. Without properly assessing the risks, parties are often unrealistically confident of a favourable outcome, should the matter be taken to court.

2.4.1 **Advantage**

A well-designed eNegotiation system with an intuitive graphical user interface allows parties to model the problem and represent their preferences well. Negotiators can see their situation better in order to reduce complexity and make more rational decisions.

2.5 *Multi-Party Disputes*

Multi-party disputes can be much more complex and require many meetings and expert intervention in order to facilitate resolution of the conflict. Such disputes can be facilitated electronically through document transmission and conference calls, but they still exist primarily in the face-to-face realm.

2.5.1 **Advantage**

A well-designed eNegotiation system allows multiple parties to interact flexibly and asynchronously. A whole category of disputes currently not being considered for ODR has become appropriate for application of comprehensive eNegotiation systems.

2.6 *Training*

eNegotiation systems can provide unique opportunities for user training. Decision makers can improve their negotiation skills by practicing with hypothetical cases and even simulate their own case before negotiating for real. Role reversal is an ideal training method that can also be used to motivate parties to collaborate in finding a solution to their negotiation problem.

2.6.1 **Advantage**

Significant time can be saved and a more valuable outcome can be achieved if negotiators agree on an efficient process.

3 CHALLENGES AND OPPORTUNITIES²⁰

While the advantages of eNegotiation systems are substantial, there are obstacles to overcome before such systems become not only practical but widespread. As the field develops each of these challenges provides an opportunity for new approaches that will eliminate the challenge and move eNegotiation from obscurity to mainstream. Significantly, many of these are not technical issues but issues related to user understanding and expectations.

3.1 *Adoption by Those Currently in Conflict*

3.1.1 Challenge

Those currently in a dispute have already made an implicit commitment to a particular method of conflict resolution. Confronted with a new technology, parties will have questions regarding the advantage that new technology might provide to other parties. If one side decides to adopt it, the other side may tend to perceive the technology as biased toward the other, leading to a rejection. This is exacerbated by contexts where negotiations are regular and traditions have arisen regarding their format.

3.1.2 Opportunity

An eNegotiation system with a range of features provides an opportunity for introducing parties to eNegotiation tools in stages. One party might first be persuaded just to use the system's decision support features as an aid to their own side of the negotiation. Later, they could attempt to model their counterparty's preferences and use the tool to simulate the entire negotiation as an aid to better understanding. To provide even greater comfort prior to actual negotiation parties may be given the opportunity to participate in role reversal simulations. Such practices have been shown to be effective in increasing understanding of the negotiations and the value of an eNegotiations tool.²¹ With sufficient familiarity all parties can gain enough trust to use an eNegotiation tool in their real-life situation.

20 Portions of the material in this section are adapted from E.M. Thiessen and J. McMahon, "Beyond Win-Win in Cyberspace", *Ohio State Journal on Dispute Resolution* (2000) 15, pp. 643-667.

21 Based on the authors' experience.

3.2 *Social Value of Adversarial Tactics*

3.2.1 **Challenge**

Inter-personal conflict is highly valued within some sectors of all societies, and even by some cultures as a whole. Win-lose thinking is present everywhere. A focus on individual success encourages face-to-face confrontation rather than mediated and more cooperative computer-based systems. This may be an especially significant issue in cultures where angry confrontation is an expression of manliness.

3.2.2 **Opportunity**

The productive value and possible individual improvements must be stressed as part of the introduction to these systems. For high-value transactions, where computer-based tools such as spreadsheets are already used, the advantage of sophisticated eNegotiation systems will be recognized much sooner. For low-value transactions, especially in some cultures, it may take explicit marketing programs to demonstrate the value of collaborating using eNegotiation systems.

3.3 *High Cost of eNegotiation Systems*

3.3.1 **Challenge**

eNegotiation systems are currently very costly to develop. Proprietary systems are beyond the reach of all but the wealthiest corporations.

3.3.2 **Opportunity**

A robust system easy enough for average technologically literate users to adopt and flexible enough to handle multiple types of conflicts would be of high value as a commercial opportunity.

3.4 *Discomfort with Technology*

3.4.1 **Challenge**

Only computer-literate individuals are comfortable using technology for a complex process.

3.4.2 **Opportunity**

Advances in graphical user interfaces now make it possible to build intuitive interfaces for eNegotiation systems, even for users who are not very computer literate. Automated tools

for data gathering and templates for specific negotiation contexts offers further possibilities for creating interfaces that simplify demands on users.

3.5 *Secure Systems Accessible to all Parties*

3.5.1 **Challenge**

There exists much distrust of the ability of online systems to deliver reliable, highly secure communication.

3.5.2 **Opportunity**

eNegotiation systems can use third-party neutral servers and high levels of encryption. This allows for secure and reliable data movement between parties that minimize the risk of privacy violation or loss of communication capacity. In certain high-value cases with extraordinary security requirements, a special dedicated neutral server may be operated under the aegis of a mutually-trusted authority, such as a court, escrow agency, or the UN.

3.6 *Useable, Affordable, Multilingual Interface*

3.6.1 **Challenge**

Proprietary systems and user-installed interfaces can be rigid and difficult to use. They may cause conflicts with other systems and be unavailable to disputants who do not own computers.

3.6.2 **Opportunity**

An eNegotiation system with a web-based interface and multi-lingual capacity holds the potential to be affordable and work within many environments. Web interfaces are popular and relatively well-understood. Such approaches open the possibility of dispute resolution to anyone with access to the Internet.

3.7 *User Understanding of Intelligent Agent eNegotiation Tools*

3.7.1 **Challenge**

The concept of “beyond win-win” sounds like an impossibility to many potential users. Some find it difficult to understand how an eNegotiation system can function as an intelligent agent.

3.7.2 Opportunity

eNegotiation developers can produce systems that explain themselves through an interactive, iterative process, leading to better user understanding and increased comfort with the process.

4 SMARTSETTLE: AN eNEGOTIATION SYSTEM WITH APPLICATIONS TO ODR

An example of a comprehensive, multiparty, intelligent-agent eNegotiation systems currently available for commercial use is the Smartsettle Infinity system developed by iCan Systems Inc.²² and the authors of this chapter. It was designed to meet the challenges represented by a wide range of ODR environments. It integrates sophisticated tools that facilitate non-linear modeling, uses effective optimization algorithms and puts users in control of the process. This leads any number of parties to a relatively quick solution to their negotiation problem.

The Smartsettle system helps parties focus on:

- collaborating regarding their case;
- building a Framework for Agreement;
- keeping track of versions;
- allowing dynamic representation of issues;
- tracking shared issues and private variables with constraints and formulas;
- eliciting and analyzing user-preferences;
- providing a mechanism for the exchange of packaged proposals;
- making intelligent suggestions for resolution.

4.1 *Smartsettle Infinity Features*

The features of Smartsettle Infinity currently include, a graphical user interface, tools to reduce user barriers, asynchronous and chat communication modes, visual blind bidding, preference elicitation, and optimization. The current system is based on a patented process and has had almost twenty years of development. As commercial use expands iCan expects to move the system to a more intuitively interactive interface that meets more of the challenges of the eNegotiation environment.

22 iCan has a second eNegotiations system, Smartsettle One, a two-party one-issue system comparable to other commercial products such as Cybersettle. <www.smartsettle.com>.

4.1.1 Graphical User Interface

To give the user a sense of relationships a graphical interface is provided (see Figures 8-12 below). This includes sliding scales and line graphs that display the actual value and the relationship between values that the user is looking for. Users can click and drag components for easy interaction.

4.1.2 User Barrier Reduction

To bring down the psychological barriers to using the system, it includes tutorial cases, demonstrations, and hands-on user training with simulations. It can also be used as a stand-alone decision support system for either party.

4.1.3 Communication

To maximize ease of use and security, the system uses encrypted transmissions, an embedded forum system for participants, and a secure off-line mode that ensures no data confidential to one party is transmitted to the other.

4.1.4 Visual Blind Bidding Process

The negotiation process uses visual blind bidding with visible proposals and anonymous suggestions but hidden acceptances that become a deal if they coincide at the end of a session. An algorithm that rewards generosity encourages parties to move quickly to the zone of agreement.

4.1.5 Preference Elicitation and Analysis

In order to maximize satisfaction for all parties, the intelligent agent uses interactive modeling that takes into account user-confidence. It dynamically learns how each party becomes satisfied on each of the issues. With well-represented preferences, every package is rated so that a party can easily compare them.

4.1.6 Optimization

Fair and efficient outcomes are produced with the optimization algorithm “maximize the minimum gain”.²³

23 There are a number of optimization algorithms, starting with the work of Nobel Laureate, John Nash. The version used by Smartsettle and developed by Dr. Ernie Thiessen has been singled out for its excellence. H. Raiffa, *Lectures on Negotiation Analysis*, PON Books 1996.

4.2 *Smartsettle Collaborative Process*

In practice, the Smartsettle Infinity system takes users through a series of eight steps that prepares them for negotiation and puts them in control of a process that quickly leads to a fair and efficient outcome. By following these steps users focus on achieving outcomes that are personally valuable and mutually acceptable rather than caught in a see-saw trade-off process that polarizes participants. These steps are applicable to all negotiations including ODR.

4.2.1 **Prepare for Negotiation**

The most important participants in any negotiation are the decision makers, but they need to involve other professionals in order that decisions are as well informed as possible. The Smartsettle process is designed to engage top-level decision makers directly in a way that they interact efficiently with other professionals. A well-rounded team can clearly identify the problems to be solved and assign priorities with respect to objectives. It is especially important that the decision makers are familiar with the process. Role playing simulations including role reversal exercises are useful for orientation.

4.2.2 **Formulate Alternative Plans**

Parties may consider a number of ideas before coming up with one or more plans to consider more seriously for their negotiation. This is a collective process between the participants and may include a number of brainstorming sessions that produce options and generally determine the range of proposals to be negotiated.

4.2.3 **Create a Framework for Agreement**²⁴

A Framework for Agreement is like a final agreement, but with blank spaces representing issues still to be resolved. Building a comprehensive Framework for Agreement is a collaborative exercise that helps to create good will among the parties. It also ensures that the agreement is not derailed later in the process by conflict over specific language. Lawyers for each side should be involved at this stage to make sure that the wording is clear. With an initial draft of the Framework for Agreement in hand, the issues can be summarized. All the issues are then negotiated together as a package. The Framework for Agreement is expected to continue to evolve as the negotiation process clarifies aspects of issues that may not have initially been considered.

24 Our definition of "Framework for Agreement" is similar to the definition of 'Framework Agreement' defined as "a document in the form of an agreement, but with blank spaces for each term to be resolved by negotiation". R. Fisher, W.L. Ury and B. Patton, *Getting to Yes: Negotiating Agreement Without Giving In*, Houghton Mifflin 1991, p. 171.

4.2.4 Build a Model for Evaluating Packages

The next task is to build a dynamic model for evaluating packages. In most negotiations parts of the model are shared and other parts are kept private. Shared components generally include constraints that all parties agree to. The private components of the model define individual objectives for each party as each party uses the Smartsettle interface to represent their own preferences. Smartsettle has various tools such as “even swaps” that can assist parties to analyze and represent their own preferences. With complex real-world negotiations, this assistance can involve hundreds of millions of computer calculations, evaluating more alternatives in minutes than an unaided human could review in a lifetime. Parties will often return to this stage as negotiations proceed and new relationships between issues are revealed through the evaluation and weighting of various packages.

4.2.5 Exchange Proposals

Once parties have created a model for evaluating packages they can continue the negotiation process by exchanging formal proposals. The initial exchange of optimistic (best conceivable) proposals helps to establish bargaining ranges for all the issues. Parties may wish to continue with counter-proposals in order to narrow bargaining ranges. Additional suggestions can be generated in order to produce settlement options that reflect the preferences of all parties.

4.2.6 Reach a Tentative Agreement

Each party uses their private preference representation model to consider suggestions generated by the system. If a particular package is acceptable to a party, they can place a hidden acceptance on that package (visual blind bidding). A tentative agreement is reached at the end of a session when all parties have accepted at least one package in common. As an intelligent agent, the Smartsettle system generates improved suggestions as the parties evaluate and rank specific packages.

4.2.7 Uncover Hidden Value

Once a tentative agreement is reached, most negotiators forgo hidden value that may remain on the table. Trade-offs that may be relatively minor to one side may generate substantial benefits for another party. Negotiators either have no means of uncovering the hidden value, are too exhausted, or both. Negotiators using Smartsettle can use powerful optimization algorithms to uncover those benefits. Smartsettle uses an algorithm called “maximize the minimum gain” to divide those benefits fairly among all the parties. This improvement replaces the tentative agreement only if all parties agree to it. However, if all parties have accurately modeled their own preferences, the improvement will usually represent a gain for each of them. If, after consideration, a party decides that their preferences could be better represented, they can adjust their model and request that the

improvement process be retried before making their decision on replacing the tentative agreement.

4.2.8 Implement the Agreement

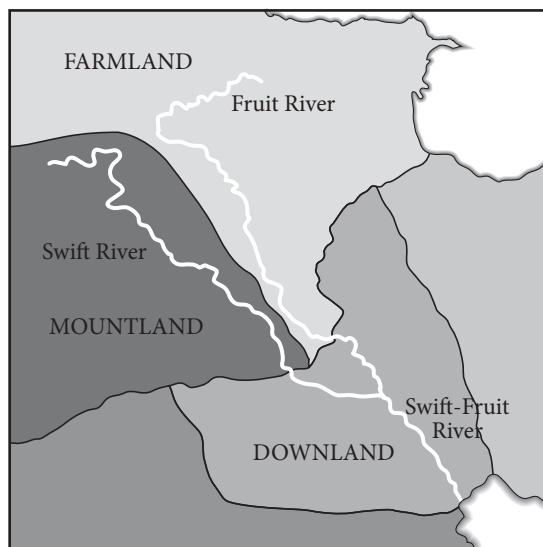
Once an agreement is reached, the Smartsettle process ensures that the agreement is well-crafted and can be implemented immediately. No follow-up drafting process or legal review is necessary. This permits the agreement to be speedily implemented, further improving the whole process for all participants.

5 ILLUSTRATIVE EXAMPLE: THREE NATIONS WATER DISPUTE

The vast majority of ODR applications are for situations where two parties are in dispute over a single issue. However, as the sophistication and capacity of eNegotiation systems expand, it is possible to conceive of complex multiple party disputes using these systems as their primary means of resolving the conflict. In this hypothetical example, three nations are in dispute over the correct conditions of their individual usage of the watershed of their central and shared river system (Figure 8).²⁵ This case assumes that the three nations have agreed that the dispute must be resolved through negotiation. The actual negotiations in a similar real-life case would be more complex than the version presented here, but a robust eNegotiation system using an approach like Smartsettle could handle that higher level of complexity.

²⁵ The data for this case is loosely drawn from J.M. Trondalen, *Water and Peace for the People: Possible Solutions to Water Disputes in the Middle East*, UNESCO Publishing 2008.

Figure 8 Three nations share a river watershed of vital interest



5.1 *Prepare for Negotiation*

At the beginning, each nation is required to be aware that a conflict exists among the users of the watershed. They must understand that a collaborative resolution of the conflict would be much preferable to the current state or to a solution involving war. The conflict is over the quantity and quality of the water that remains when each of the upstream nations has used the river. The downstream nation has its own purposes that may have an impact on the future use of water by the upstream nations.

5.2 *Formulate Alternative Plans*

From this recognition of conflicting interests, the nations would need to meet and brainstorm possible alternative plans before they can begin organizing for their negotiations. These initial meetings would be based on engineering studies and computer modelling of possible options. Each nation would need to understand the full range of implications for differing water flows and water quality (the key characteristics to be negotiated in this dispute). They should also be in agreement on the core issues that need resolution. In this case there is a key fourth party, a donor capable and willing to provide financial incentives toward a solution. This might be an organization such as the World Bank, the United Nations, or a foreign power with strategic interests in the region.

5.3 *Create a Framework for Agreement*

The outcome of the preliminary process would be the development of a Framework for Agreement. While such a document would typically run to hundreds of pages, it would contain key sections such as the following:

5.3.1 **Preamble**

Mountland, Farmland, and Downland are sovereign countries that recognize that their future livelihood depends on the joint management of their shared water resources. The headwaters of the Swift River are located in Mountland. The headwaters of the Fruit River are located in Farmland. Swift River flows from Mountland to Downland. Fruit River flows from Farmland to Downland. The confluence of Swift River and Fruit River is located in the center of Downland where it becomes the Swift-Fruit River. Downland would benefit from water quantity and quality guarantees from Mountland and Farmland. Water quality could be enhanced with desalination plants located on the Swift River and Fruit River just upstream of where they flow into Downland. Downland has the ability to produce surplus power that could be transferred to Mountland or Farmland. The Donors are interested in supporting a project that would promote long-term stability in the region.

5.3.2 **Core Terms of Agreement**

- The discharge guaranteed by Mountland at Downland boundary shall be _____ (5 – 10 bcum/yr).
- The discharge guaranteed by Farmland at Downland boundary shall be _____ (5 – 10 bcum/yr).
- The water quality guaranteed by Mountland at Downland boundary shall be _____ (500 – 600 mg TDS/l).
- Water quality guaranteed by Farmland at Downland boundary shall be _____ (500 – 600 mg TDS/l).
- Power transfer from Downland to Mountland shall be _____ (0 – 30 GWh/yr)
- Power transfer from Downland to Farmland shall be _____ (0 – 30 GWh/yr)
- Funding provided by Donors to Mountland shall be _____ (0-10 billion dollars)
- Funding provided by Donors to Farmland shall be _____ (0-10 billion dollars)

where

- TDS/l = total dissolved solids/liter
- bcum = billion cubic meters
- GWh/yr = gigawatt hours per year

These core conditions would not likely be stated this simply or clearly, but be accompanied by certain caveats. For example, the definitions could be in terms of multi-year moving averages to account for year-by-year weather variations. It might also include financial penalties for violating guarantees. In a real-life case, bargaining ranges would be private, rather than set out in the Framework for Agreement as in this simulation.

5.4 *Build a Model for Evaluating Plans*

In a negotiation like this, each party would model their preferences and establish the relative importance for each of the issues. To make the presentation simple, the preferences of the parties stated below have been greatly simplified. This information would not be revealed to other parties in a real-life case. However, astute negotiators would often have an approximate idea of the preferences of their counterparties. Note that importance of each issue relates to the given bargaining range.

5.4.1 **Mountland**

- *Least Important:* water quality guarantee by Farmland
- *Most Important:* donor funding to Mountland

5.4.2 **Farmland**

- *Least Important:* water quality guarantee by Mountland
- *Most Important:* donor funding to Farmland

5.4.3 **Donors**

- *Least Important:* discharge guarantee by Farmland
- *Most Important:* donor funding

Donors are not particularly concerned about how the funding is distributed between the parties, so they define one private variable²⁶ called Total Funding to take the place of the individual funding issues:

$$\text{TotalFunding} = \text{MountlandFunding} + \text{FarmlandFunding}$$

5.4.4 **Downland**

- *Least Important:* donor funding to Mountland
- *Most Important:* average Downland water quality

26 Variables that appear in formulas are written as they appear in the Smartsettle interface, *i.e.* compound words without spaces. Where no explanation is given, the authors consider them to be self-explanatory.

Downland has defined three private variables to help them better represent their preferences. Downland is not particularly concerned about the quality of water received from each of its upstream neighbours as long as the average quality meets certain standards. This variable, called Average Downland Quality, is tracked in the Smartsettle interface with the following formula:

$$\text{DownlandQuality} = (\text{MountlandDischarge} * \text{MountlandWaterQuality} + \text{FarmlandDischarge} * \text{FarmlandWaterQuality}) / (\text{MountlandDischarge} + \text{FarmlandDischarge})$$

Also important is Total Discharge Guarantee. This is defined as:

$$\text{TotalDischarge} = \text{MountlandDischarge} + \text{FarmlandDischarge}$$

Less important is Total Power Transfer, defined as:

$$\text{TotalPower} = \text{MountlandPower} + \text{FarmlandPower}$$

Once each party has set their own private preferences they prepare packages to be published using the eNegotiation system. What follows are the stages of the negotiation as developed using the Smartsettle Infinity eNegotiation system. To illustrate each stage a screenshot illustrates the process of negotiation from Downland's point of view.

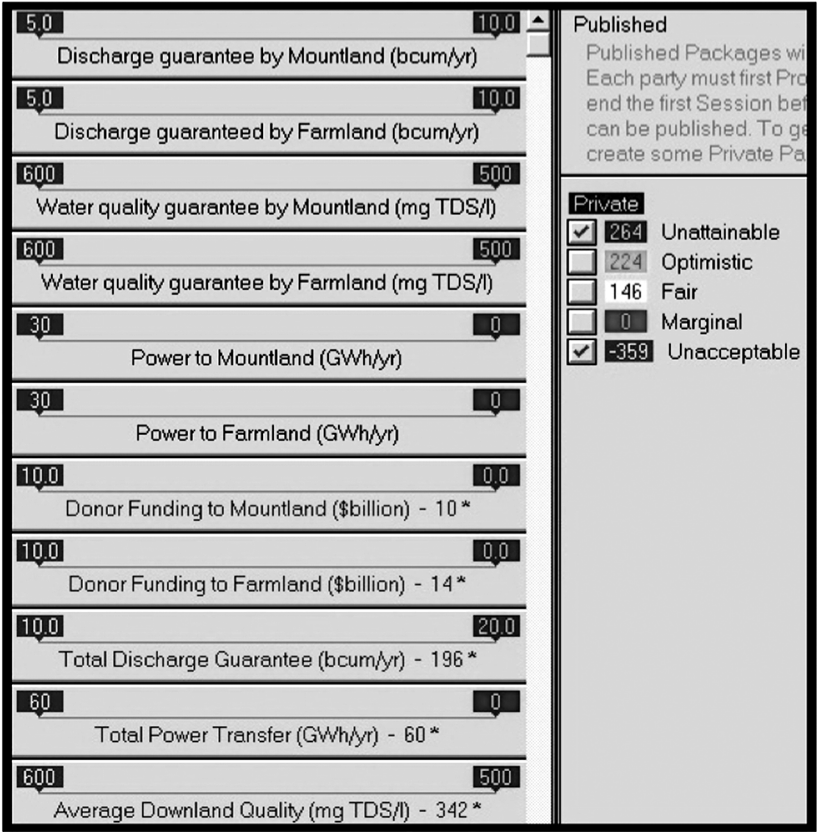
5.4.5 Bargaining Ranges and Relative Importance

In order to set up their private view of the case, each party must specify a private bargaining range for each of the issues, bounded by better and worse outcomes according to their own preferences. Each party should expect the final outcome to fall within those ranges, but can modify them later if that turns out not to be the case. In Figure 9, all the issues and their ranges are from Downland's point of view and shown on the left-hand side of the figure. By default, the bargaining ranges are oriented so that Downland prefers the values on the right-hand side. This is illustrated by the two hypothetical private reference packages being displayed, Unattainable (purple boxes and numbers) and Unacceptable (brown boxes and numbers). In a two-party dispute, the screen of each disputant could be a mirror image of the other, but that would obviously not be possible for every party in a multiparty negotiation such as this one.

Downland has created a model to represent their preferences that is a function of the five variables at the bottom of the list (issues coloured purple and appended with a numeric value and *). Recall that three of those are private variables that do not appear on the counterparty screens. The other variables (coloured black) are not needed and are excluded from Downland's preference representation. The numeric value to the right of each included issue represents the relative importance of that term based on the specified range. Average Downland Quality, a value for the quality of the water entering Downland, is most

important (Value: 342). The weighted relative importance of each of the other four issues are much less (10, 14, 196, and 60). These weights are established by Downland through direct input. They can be modified by Downland and are under the control of the user and by the eNegotiation system itself as the negotiations proceed and other weightings are determined to more accurately represent Downland's interests. Near the beginning of the negotiation, relative importance values may not be well-represented. They become better represented as the negotiation proceeds and parties take advantage of Smartsettle's sophisticated preference analysis routines to fine-tune their preference representation.

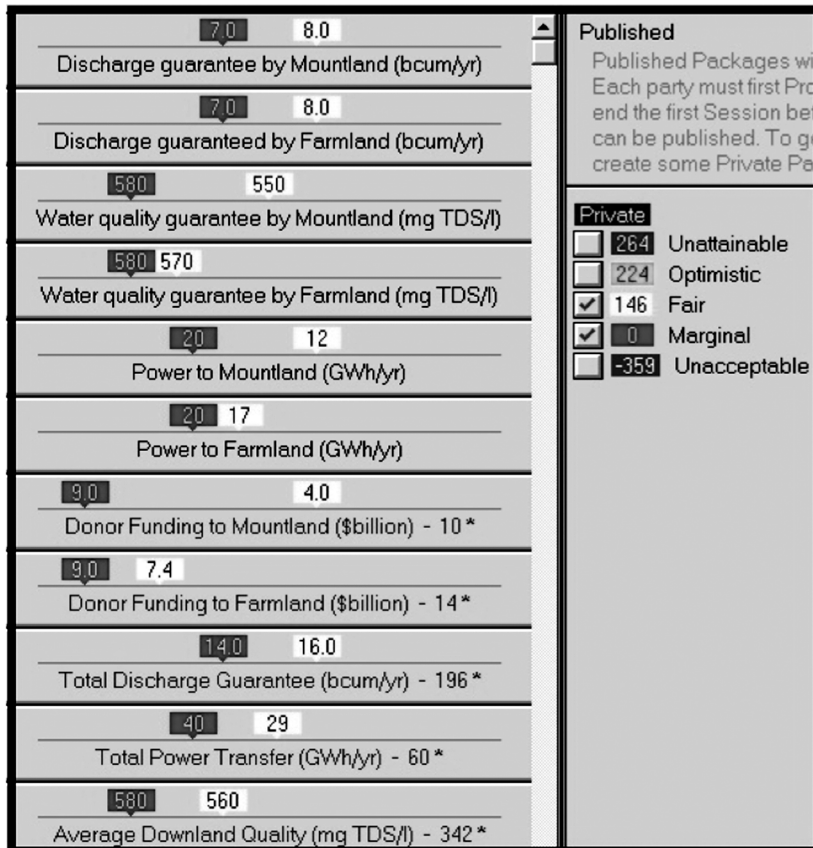
Figure 9 Downland's Bargaining Ranges and Relative Importance



The system evaluates the preferences assigned by Downland's negotiators and assigns to each one a numeric rating. In Downland's case, the values of the packages range from – 359 to 264 (shown on the right side of the screen). The high rating minus the low rating

is the sum of all the relative issue importance values. In Figure 10, the issue values of Downland's Fair package, worth 146 points, are compared on the left side of the screen with the issue values of another package named Marginal. Agreeing to anything worse than Marginal would be totally unacceptable to Downland. Downland's goal is not to merely achieve an acceptable package (better than Marginal), but to achieve an outcome that is fair. As such, they are not willing to agree to any package worth less than 146 points. It is important to realize that the specific values identified by this package do not represent the lowest value that is acceptable to them for each issue. The concept of "bottom line" makes no sense when negotiating with packages of issues since there could be any number of packages with different combinations of issue values that could represent the point that the party would walk away from the negotiation.

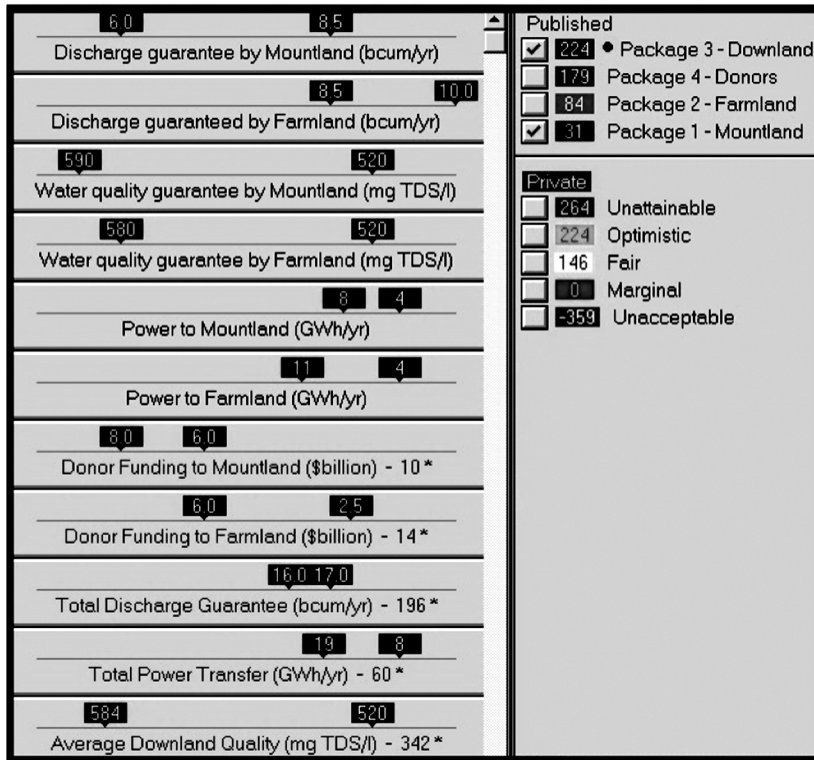
Figure 10 Downland's Fair and Marginal Packages



Each party to the negotiation develops similar positions and each party's objective is to achieve an outcome that is fair. Every package presented throughout the negotiation needs careful assessment by Downland's negotiators to be sure that its rating is truly consistent with their preferences. Downland's negotiators may find that they have not correctly modeled their preferences as they assess offers. They can then adjust or change their preferences and the system will correspondingly reset all package ratings.

5.5 *Exchange Proposals*

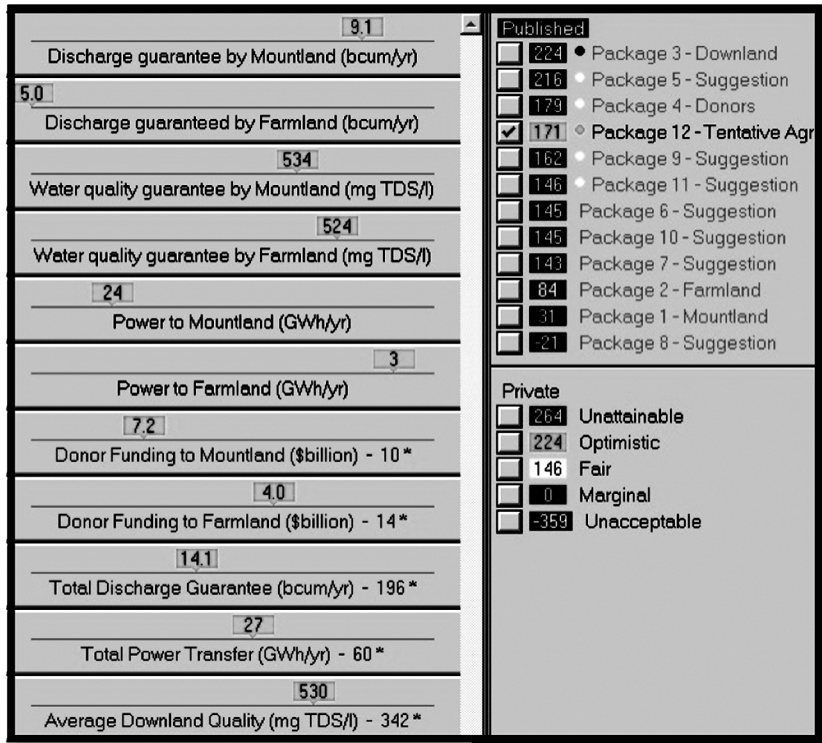
When all parties have succeeded in creating a reasonable representation of their own preferences, the next step is to exchange initial optimistic proposals. Figure 11 shows the ranking of the four proposals from Downland's point of view. On the left side, Downland's proposal is being compared with Mountland's proposal. These initial proposals represent to each submitting party a realistic and hoped for outcome to the negotiation, usually something better than what they expect. The result is a situation where all the parties have revealed their desires but have kept hidden what they are really prepared to accept (visual blind bidding). In this first session, Downland could accept the proposal from Donors as better than fair. The proposals from Mountland and Farmland are better than Marginal but Downland does not consider either of them to represent a fair outcome.

Figure 11 Downland's View of Initial Proposals

5.6 *Reach a Tentative Agreement*

After initial proposals are exchanged, parties can continue with counter-proposals or they can request suggestions to be generated by the eNegotiation system (Figure 12). Parties can also contribute their own suggestions anonymously to the mix. Every party privately evaluates each suggestion for its acceptability. In this case Downland has placed a hidden acceptance (yellow dot) on the five packages that score better than Fair (146+). These acceptances are known only to the system, which then compares them to see if any of the packages is acceptable to all the parties. If all parties have accepted the same package at the end of the session a tentative agreement is identified (green dot beside package 12).

Figure 12 Tentative Agreement Among Packages Acceptable to Downland

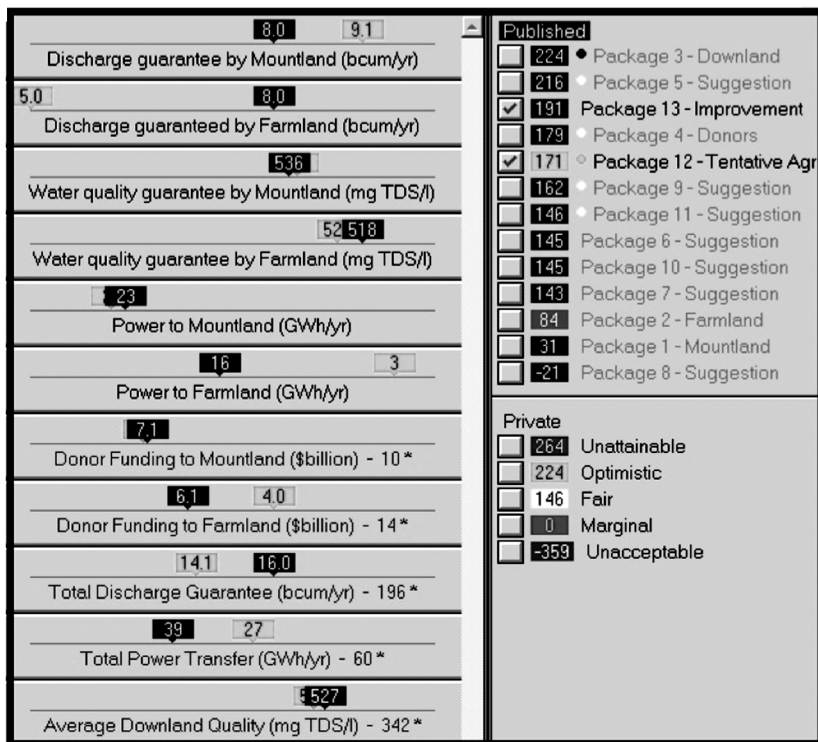


5.7 Uncover Hidden Value

Once a tentative agreement has been reached parties may request the Smartsettle system to look for an improvement. In complex negotiations like this, it is very likely that there is hidden value still on the table. In conventional negotiations, it would be unheard of for a group of international parties dealing with a multitude of issues, to reopen negotiations after reaching a tentative agreement. The task of juggling all the variables in order to find something better for everyone would be virtually impossible without the assistance of computing power. Acting as an intelligent agent, the Smartsettle system is capable of quickly analyzing the full range of possibilities. If the preferences of all parties are well represented, the final optimization process can occur in a relatively short period of time and find an improvement that uncovers remaining hidden value and distributes it fairly among all the parties.

The improvement found by Smartsettle in this simulation is illustrated by Package 13 in Figure 13 as having a rating for Downland that is about ten percent better than the existing tentative agreement. What is not shown is that this same improvement package is also about ten percent better for each of the other three parties, as measured by their own ratings. For this reason, unless they decide to revise their preference model, each of the parties will find it reasonable to accept this improved package in place of the existing tentative agreement. And each will see that they have gained considerable value in the process.

Figure 13 Smartsettle Generated Improvement



5.8 Implement the Agreement

Prior to accepting any package proposed for implementation, each party to the negotiation will have carefully inspected that package for its fit with national needs. When an agreement is revealed at the end of a session and no improvements can be found, it is a simple matter of completing the Framework for Agreement that was prepared beforehand with the entire final wording. All that is needed is the announcement and the signing ceremony.

Throughout the process the parties to the dispute focus on achieving national goals and are never aware of the walkaway or other hidden positions of the other parties. There is no posturing or tedious back-and-forth regarding specific individual issues leading to delays or breakdowns in the process and exhausted and frustrated negotiators (and nations). The process has produced an optimal outcome on the basis of clear decision criteria that are acceptable to all parties.

6 THE FUTURE OF eNEGOTIATION AND ODR

As the multinational water dispute case demonstrates, the potential use of eNegotiation in ODR opens the possibility of significant expansion in the array of types of issues and disputants that can be addressed through ODR. As intelligent agent approaches expand and the ease of use increases through more user-friendly systems, it also holds the possibility for the substantial reduction in the need for human arbitrators and mediators in the online environment. More likely, by expanding the range of applications amenable to ODR, advanced eNegotiation systems will lead to a substantial increase in the total number of cases being processed. Since some cases always need assistance beyond that of even the best eNegotiations system, human mediators and arbitrators may be more necessary than currently. Almost certainly, ODR will increase and undergo significant changes to keep pace with technological advances. These changes are most likely to occur in a number of areas.

6.1 *Low-Value, Two-Party Disputes*

eNegotiation holds the possibility of substantially reducing the cost of resolving simple low-value, two-party disputes through full automation of the process. Well-developed systems with multi-lingual capacity could easily become standard tools for all low-value commercial disputes. As automated systems, their cost would be minimal, especially as they become widespread in their use. Within the framework of some commercial transaction systems, fees for the use of such a system might be included in the cost of the initial transaction leading to essentially free access to ODR for these disputes. In any case, they are likely to become the system of first resort, with disputants attempting an automated solution before the need to move to more sophisticated and costly ODR methods.

6.2 *Commercial Disputes*

Commercial disputes over long distances or crossing jurisdictional boundaries can be extremely time-consuming and costly to resolve, and even more so if face-to-face meetings are required. The use of high-priced experts only drives the cost higher. Sophisticated eNegotiation systems capable of working with multiple issues and remote and asynchronous access become the obvious first step in trying to resolve such disputes. While the cost of setting up such a system is not low, the cost is still going to be much less than that of a conventional system. It is likely that initial commercial agreements regarding goods and services will soon require the use of such mechanisms as the first step for resolving disputes.

6.3 *Multiparty Disputes*

Multiparty disputes can become so complex and expensive to resolve that they are rarely considered outside of the courts. This means that they are only used for very high-value cases. However, there are many other types of multiparty disputes, and moderate or even low-value disputes can be resolved through sophisticated eNegotiation systems. Expect that as the system capacities become understood, groups involved in multiparty disputes will come to rely on such systems as an alternative to extremely expensive court processes.

6.4 *Intergovernmental and Transnational Disputes*

As in the case study, intergovernmental and transnational disputes with multiple parties can gain significant advantages by working through an eNegotiation system. The complexity of the issues such systems can handle far surpasses the capability of humans involved in these types of issues. While these tools are unlikely to replace face-to-face negotiations, they can easily augment those negotiations and improve on final outcomes in a significant way.

6.5 *Reducing the Possibilities for Conflict*

eNegotiation systems offer one further possibility of significance to ODR and that is a reduction in the total level of conflict that requires dispute resolution. eNegotiation systems, with their sophisticated abilities to negotiate settlements that approach the efficiency frontier, and to do so through more collaborative negotiation processes, reduce the likelihood of conflict emerging in the first place. While there are many sources for conflict, a poorly negotiated agreement is certainly one and one that can be reduced, if not eliminated, through advanced eNegotiation systems. Using strong preference analysis tools, operating

in a non-adversarial way that maximizes party satisfaction with the outcomes, eNegotiation systems produce results that lead to long-term cooperative relationships between parties. They also hold open the possibility of continuous cooperation through on-going re-evaluation and negotiation. Use of intelligent agents makes it easy to address changes in the environment that have an impact on the parties involved. eNegotiations could ultimately bring humanity to a point where there are no disputes, but simply points of transition in continuously negotiated circumstances as parties work together to accomplish mutual objectives.

It is clear that eNegotiations are a significant part of ODR. They will expand in that role as more sophisticated eNegotiation systems are developed and users come to accept them as a normal part of the negotiation environment. Strong emphasis needs to be placed on advancing and integrating these systems as commercial, non-governmental, or governmental dispute resolution systems move into the future. However, it is essential to develop these new approaches with flexibility as advanced intelligent agent systems suggest that the very meaning of negotiation could change.