Developing an Online Dispute Resolution Environment: Dialogue Tools and Negotiation Support Systems in a Three-Step Model

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I. INTRODUCTION

A. *General Introduction*

  Although artificial intelligence (AI) is commonly associated with anthropomorphic computers performing amazing feats, as in movies like *The Matrix* and *Minority Report*, AI is actually a much broader field of study whose results are not always mind-blowing. So what is AI? Two humorous definitions are "whatever computers can't do yet"[1] and "trying to solve by computer any problem that a human can solve faster."[2] Basically, AI involves the study of automated human intelligence. This includes both practically-oriented research, such

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  1. Marc Lauritsen uses this definition to suggest that once computers are able to perform "intelligent tasks," such tasks are no longer considered that special. He has also defined AI as "the study of what we know, how we think, and how we might get machines to do some of our knowing and thinking for us." Marc Lauritsen, *Artificial Intelligence in the Real Legal Workplace*, *in* INFORMATION TECHNOLOGY AND LAWYERS (Arno R. Lodder & Anja Oskamp eds., forthcoming) (on file with author).

  2. Ernie Thiessen used this definition in a presentation given at the United Nations Economic Commission for Europe (UNECE) Forum on Online Dispute Resolution in Geneva on June 30, 2003. The same and a slightly modified definition were also used in Arno R. Lodder & Ernest M. Thiessen, *The Role of Artificial Intelligence in Online Dispute Resolution*, 2003 PROC. UNECE F. ON ODR (Ethan Katsh &

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as building computer applications that perform tasks requiring human intelligence, and fundamental research, such as determining how to represent knowledge in a computer-comprehensible form. At the intersection of AI on the one hand and law on the other lies a field dedicated to the use of advanced computer technology for legal purposes: AI & Law. This article applies the authors' research in AI & Law to construct a model for online dispute resolution (ODR).

In the past, the authors of this article have individually developed AI & Law applications, including negotiation decision support systems (henceforth called "negotiation support systems")[3] and dialogical argument tools.[4] Negotiation support systems propose solutions for a conflict based on the information available on a case at hand.[5] These solutions aim to take into account the interests of the parties in the best possible way. Dialogical argument tools help disputing parties to structure the information exchange. This structure reflects the support relations between the statements put forward by the parties (i.e., how the parties' statements support a disputed issue).

Because of our shared interest in the potential of online dispute resolution (ODR), we analyzed our previous research and discovered that the negotiation support systems of Zeleznikow could fit nicely with the dialogical argument tool of Lodder, creating a well-rounded application for use in online dispute resolution. The weakness of one

Daewon Choi eds.), *available at* http://www.odr.info/unece2003/pdf/lodder_thiessen.pdf.

3. *See* John Zeleznikow et al., *Computer Tools for Aiding Legal Negotiation*, 6 AUSTRALASIAN CONF. ON INFO. SYSTEMS 231, 231-51 (1995). *See also* Emilia Bellucci & John Zeleznikow, *AI Techniques for Modelling Legal Negotiation*, 7 INT'L CONF. ON ARTIFICIAL INTELLIGENCE & L. 108, 108-16 (1999) [hereinafter Bellucci & Zeleznikow, *AI Techniques*].

4. *See* Arno R. Lodder & Aimée Herczog, *DiaLaw*: *A Dialogical Framework for Modeling Legal Reasoning*, 5 INT'L CONF. ON ARTIFICIAL INTELLIGENCE & L. 146, 146-55 (1995). *See also* ARNO R. LODDER, DIALAW: ON LEGAL JUSTIFICATION AND DIALOGICAL MODELS OF ARGUMENTATION *passim* (1999) [herinafter LODDER, DIALAW]; Arno Lodder & Paul E.M. Huygen, *eADR: A Simple Tool to Structure the Information Exchange Between Parties in Online Alternative Dispute Resolution*, *in* LEGAL KNOWLEDGE AND INFORMATION SYSTEMS JURIX 2001: THE FOURTEENTH ANNUAL INTERNATIONAL CONFERENCE 117-29 (Bart Verheij et al. eds., 2001).

5. There have been numerous approaches to building negotiation support systems. For detailed coverage of the use of game theory and bargaining strategy to provide negotiation support, see HOWARD RAIFFA, THE ART AND SCIENCE OF NEGOTIATION (1982). *See also* Emilia Bellucci & John Zeleznikow, *Representations of Decision-making Support in Negotiation*, 10 J. OF DECISION SYSTEMS 449, 449-79 (2001) [hereinafter Bellucci & Zeleznikow, *Representations*] (discussing AI tools that provide negotiation support); Katia P. Sycara, *Persuasive Argumentation in Negotiation*, 28 THEORY & DECISION 203, 203-42 (1990).

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application is the strength of the other, and while both applications are individually helpful to their users, neither of them offers full support for dispute resolution. In this article, we propose merging the dialogical reasoning tools of Lodder with the game-theory-based negotiation techniques of Zeleznikow to construct an online dispute resolution environment. We do not present a finished, ready-to-use ODR environment, but rather, we aim to pave the way for the development of such a system.

The remainder of this article is structured as follows. In Part I, we provide background information on the field of AI & Law, alternative dispute resolution (ADR), and online dispute resolution. In Part II, we discuss the essential components of our proposed ODR environment: the assumptions that underlie our model, and how argument tools and negotiation support systems work, both individually and together. Part III illustrates the working of our three step model: first, the calculation of a "BATNA"[6] to inform the parties about their chances in an eventual court proceeding; second, the attempted resolution of disputes through use of a dialogue tool; third, further attempts at dispute resolution through the employment of compensation strategies and trade-offs constructed by a negotiation support system. Part IV raises some final considerations about our proposed environment, discussing potential problems and drawbacks. Part V concludes the article.

B. *Artificial Intelligence & Law*

In 1950, Alan Turing,[7] one of the founding fathers of AI, predicted: "I believe that at the end of the century. . .one will be able to speak of machines thinking without expecting to be contradicted."[8] Some results in AI have proven more impressive than were expected: for example, the victory of the chess-playing computer Deep Blue

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6. BATNA stands for "best alternative to a negotiated agreement." *See* discussion *infra* Part III.A.

7. Turing, who is considered a founder of computer science and who helped break the German code in World War II, is famous for the "Turing test": a person communicates without knowing whether he or she is talking to a human or a computer. *See* A.M. Turing, *Computing Machinery and Intelligence*, 59 MIND 433, 433-35, 442 (1950) (introducing the test). *See also* THE ESSENTIAL TURING: SEMINAL WRITINGS IN COMPUTING, LOGIC, PHILOSOPHY, ARTIFICIAL INTELLIGENCE, AND ARTIFICIAL LIFE 433-34 (B. Jack Copeland ed., 2004). If, during a certain limited time period (e.g., 15 minutes), the person decides that he or she is probably talking to a human, the program has passed the test and can be considered "intelligent." *Id.*

8. Turing, *supra* note 7, at 442.   **R**

over chess world champion Gary Kasparov in 1997. In most subfields of AI, however, progress has been slower than initially anticipated.

Such has been the case in the subfield of AI & Law. Initially, many commentators expected that it would be possible to place all of the relevant legal rules within a specific domain into a computer and have software resolve all possible cases. Researchers in civil law domains considered this accomplishment a probability.[9] While there are still some believers,[10] most people agree that notwithstanding our state-of-the-art technology we are very far away from computers sitting in the judge's chair.[11] To be fair, AI & Law scholars do not aim to design computers that can take over the role of the judge. One reason for this, mainly uttered by lawyers, is that allowing computers to make judgments is morally undesirable. A more fundamental objection is that because laws require interpretation, it would not be feasible for software systems to make judicial decisions. Computer systems are "closed" systems, while arguments in lawsuits cannot be known in advance and so cannot all be implemented into a computer application: law is an "open" system.[12]

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9. Civil law may be defined as the legal tradition that has its origin in Roman law, as codified in the Corpus Juris Civilis of Justinian and as subsequently developed in Continental Europe and around the world. Civil law eventually divided into two streams: codified and uncodified Roman law. Civil law is highly systematized and structured and relies on declarations of broad, general principles, often ignoring details. Civil law systems are closed, in the sense that every possible situation is ideally governed by a limited number of general principles. In some highly exceptional cases, however, it might occur that a situation cannot adequately be resolved under existing principles (e.g., the introduction of "unjust enrichment" by the Dutch Supreme Court in the 1950s, see Quint/Te Poel, HR 30 January 1959, NJ 548). In addition, one can argue that, in practice, civil law systems appear open in that judges can add new elements to the system.

10. *See, e.g.*, Pamela N. Gray, Artificial Legal Intelligence 313 (1997) ("Choice according to right reason may in fact be automated, so that the work of informed decisionmaking and co-ordinated human autonomy can be done by machines. Justice, reason and human benefit might be compounded in one system of social exchange, a decision making system which implements the exchange, secured by the rules of law."). *See also* Hans Franken & H. Jaap van den Herik, *Rechtsprekende computers?*, *in* Informatietechnologie voor Juristen 263 (Arno R. Lodder & Anja Oskamp eds., 2d ed. 2002).

11. Fully automated prosecution does take place in some settings. For instance, in the Netherlands speeding tickets are issued after a picture is taken automatically ("caught in the act") and without human intervention. The penalty is sent by ordinary mail to the owner of the car. *See* Anja Oskamp & Maaike W. Tragter, *Automated Legal Decision Systems in Practice: The Mirror of Reality*, 5 Artificial Intelligence & L. 291, 291-322 (1997). Australia follows a similar practice. The owner of a car is fined and loses points unless he identifies someone else as the driver.

12. *See* Paul Scholten, Mr. C. Asser's Handleiding Tot de Beoefening van Het Nederlandsch Burgerlijk Recht, Algemeen Deel 76 (1931). *See also* Lodder, Dialaw, *supra* note 4, at 17-20.

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The first contribution to the field of AI & Law dates back to Bruce Buchanan and Thomas Headrick's 1970 paper, *Some Speculation About Artificial Intelligence and Legal Reasoning*.[13] Other landmark papers are L. Thorne McCarty's 1977 discussion of the computer program TAXMAN and Edwina Rissland's 1990 overview of the discipline.[14] In between these two publications, the field really began to flourish after an international conference on AI & Law was held in Florence, Italy in 1981.[15] Six years later, the First International Conference on Artificial Intelligence and Law (ICAIL) was organized. In 1991, the International Association for AI & Law (IAAIL) was established, its main aim being to organize the ICAIL conferences and edit a journal. The first edition of the journal *Artificial Intelligence and Law* appeared in 1992.

In the early days of AI & Law, researchers focused mainly on computer software called "expert systems" capable of resolving cases in the same manner as an expert.[16] One early, famous project was the implementation of a logic programming system designed to apply the British Nationality Act.[17] The system was built by Marek Sergot and others at Imperial College, London to determine whether an individual would be eligible for British citizenship under the legislation of the British Nationality Act.[18] It represented a major application of logic programming as a tool for constructing legal expert systems. Unfortunately, although the system represented an interesting application of logic, the proposal was jurisprudentially flawed because it assumed that the law was straightforward and unambiguous. For example, the model's designers claimed that whether or not "an infant was born in the United Kingdom" was a readily verifiable fact.[19] But the boundaries of the United Kingdom are both constantly

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13. Bruce G. Buchanan & Thomas E. Headrick, *Some Speculation About Artificial Intelligence and Legal Reasoning*, 23 STAN. L. REV. 40, 40-62 (1970).

14. L. Thorne McCarty, *Reflections on Taxman: An Experiment in Artificial Intelligence and Legal Reasoning*, 90 HARV. L. REV. 837, 837-93 (1977); Edwina L. Rissland, *Artificial Intelligence and Law: Stepping Stones to a Model of Legal Reasoning*, 99 YALE L.J. 1957, 1957-81 (1990).

15. The First International Conference on Logic, Informatics, and Law focused on deontic logic, computational linguistics, and legal information systems. Subsequent conferences were held in Florence in 1985, 1989, 1993, and 1998. Deontic logic is a form of logic that deals with permissions and obligations. It has two operators in addition to those in first order predicate calculus: O (obligation) and P (permission).

16. Expert systems are computer programs that function at the standard of (and sometimes at an even higher standard than) human experts in given fields.

17. M.J. Sergot et al., *The British Nationality Act as a Logic Program*, 29 COMM. OF THE ACM 370, 370-86 (1986).

18. *Id.*

19. *Id.*

changing and in dispute. For example, prior to June 30, 1997, if a child was born in Hong Kong, was she born in the United Kingdom under the Act? Hong Kong citizens had British citizenship at that time but did not have the right of abode in the United Kingdom. Further, are the Falkland Islands (the Malvinas) part of the United Kingdom? These are issues that cannot be determined by reference to the Act, or even precedents. They may depend on international treaties (with China and Argentina) and delicate negotiations.

Richard Susskind has outlined the historical use of information technology (IT) and indicated probable future uses of IT by the legal profession.[20] He indicated that until recently, there was only limited use of IT by legal professionals.[21] For example, while the use of word processing, office automation, case management tools, client and case databases, electronic data/document interchange tools, and fax machines is now standard, only recently have law firms commenced using IT for knowledge management purposes.[22]

The use of applied legal decision support systems is still in its infancy. Of the commercially successful systems that have been developed, Zeleznikow and Dan Hunter note that most have employed rules.[23] There are two major reasons for this: rules are easy to model, and there are many tools for building rule-based systems. In the area of administrative law, knowledge-based systems,[24] which usually employ rules, have proven particularly useful. These systems make simple legal decisions by analyzing relevant facts input by human agents. For example, such systems can decide whether or not an unemployment benefit should be granted.[25] The decision of the system is checked by the employee using the software before being communicated to the applicant. Such systems are called decision

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20. *See generally* RICHARD SUSSKIND, TRANSFORMING THE LAW: ESSAYS ON TECHNOLOGY, JUSTICE AND THE LEGAL MARKETPLACE (2000).

21. *Id.*

22. *See id.* at 10-17. *See also* Anja Oskamp et al., *Mutual Benefits for AI & Law and Knowledge Management*, 7 INT'L CONF. ON ARTIFICIAL INTELLIGENCE AND L. 126, 126-27 (1999) (discussing the relationship between AI & Law and knowledge management).

23. *See* JOHN ZELEZNIKOW & DAN HUNTER, BUILDING INTELLIGENT LEGAL INFORMATION SYSTEMS: REPRESENTATION AND REASONING IN LAW 230-37 (1994). A rule is of the form **if** <condition(s)> **then** <action>. *Id.* at 96.

24. A knowledge-based system is a computer program in which domain knowledge is explicit and contained separately from the system's other knowledge (such as the reasoning mechanism).

25. In such domains, the applicant will be denied the benefit unless certain facts are fulfilled: for instance, that the applicant is under age 65 and earns less than $5,000 per year.

support systems.[26] Laws prohibiting drunk driving could also be modeled using rules.[27] Other examples include: 1) the BOS system[28] used in the Netherlands by the Prosecuting Authority to determine punishment in cases with a maximum penalty of up to four years imprisonment, and 2) legal knowledge-based systems developed by SoftLaw, an Australian software house that primarily builds systems related to government entitlements for domains such as social security legislation.[29]

Although some systems operating on small, straightforward legal domains proved successful, the AI & Law community realized that developing legal expert systems was far more complicated than it first appreciated. In an attempt to solve complex issues such as how legal reasoning and argumentation could best be represented in a computer, researchers in the 1990s concentrated on fundamentals, investigating, for instance, techniques that more closely resemble the manner in which legal professionals reason. Such techniques include argumentation theories,[30] systems of non-monotonic logic,[31] case-based reasoning,[32] legal ontologies,[33] and knowledge discovery from

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26. *See generally* CLYDE W. HOLSAPPLE & ANDREW B. WHINSTON, DECISION SUPPORT SYSTEMS: A KNOWLEDGE BASED APPROACH (1996).

27. An example rule might be **if** (blood_alcohol_level(X) > .0005) **then** drunk(X). **If** (drunk(X) and drive(X)) **then** license_loss(X).

28. The acronym BOS stands for Beslissings Ondersteunend Systeem (Decision Support System). Both the software used and information on the system (in Dutch) can be downloaded from http://www.om.nl/bos (last visited Oct. 30, 2004).

29. *See* Peter Johnson & David Mead, *Legislative Knowledge Base Systems for Public Administration: Some Practical Issues*, 3 INT'L CONF. ON ARTIFICIAL INTELLIGENCE & L. 108, 108-17 (1991).

30. Argumentation involves a family of concepts that can be grouped into three categories: 1) concepts related to the process of engaging in an argument, 2) procedures or rules adopted to regulate the argument process, and 3) argument as a product or artifact of an argument process. *See generally* Bart Verheij, Rules, Reasons, Arguments: Formal Studies of Argumentation and Defeat (1996) (unpublished Ph.D. dissertation, Universiteit Maastricht) (*available at* http://www.ai.rug.nl/~verheij/publications/proefschrift/dissertation.pdf).

31. In classic systems of logic, the conclusion drawn from an argument cannot be defeated. If the conclusion is that someone is guilty, he remains so in classic logic. Non-monotonic logic aims to model the defeat of conclusions based on new information. For example, the conclusion about the person being guilty might be successfully rebutted by the argument that it was an act of self-defense. *See, e.g.*, HENRY PRAKKEN, LOGICAL TOOLS FOR MODELLING LEGAL ARGUMENT: A STUDY OF DEFEASIBLE REASONING IN LAW 47-49 (1997).

32. Case-based reasoning is the process of using previous experience to analyze or solve a new problem, explain why previous experiences are or are not similar to the present problem, and adapt past solutions to meet the requirements of the present problem. For an example of an AI model that employs case-based reasoning, see generally KEVIN D. ASHLEY, MODELING LEGAL ARGUMENT: REASONING WITH CASES AND HYPOTHETICALS (1990).

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legal databases.[34] The logical tools developed over the past fifteen years for use in modelling legal arguments[35] can assist with under-cutting and rebutting arguments,[36] weighting principles, reasoning about rules,[37] and creating lines of argumentation, commitment, and burden of proof.[38]

Unfortunately, such fundamental research could not easily be translated to practical models of legal reasoning. Consequently, about ten years ago, some AI & Law scholars argued that in order to help produce theoretically founded, useful working systems, those performing fundamental research needed to apply their results in a way that was intelligible to people outside the logically oriented AI & Law community.[39] One of the aims of this article is to do just that, by applying results of AI & Law research to the ODR field. As a consequence, we hope to foster interest in AI & Law from researchers in other fields, particularly ADR/ODR. We believe that a cross-fertilization between ADR/ODR and AI & Law will be useful to both fields.

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33. An ontology is an explicit conceptualization of a domain. Legal ontologies represent legal norms and are critical for developing legal knowledge-based systems on the World Wide Web. *See generally* Laurens Mommers, Applied Legal Epistemology: Building a Knowledge-Based Ontology of the Legal Domain (2002) (unpublished Ph.D. dissertation, Leiden University) (*available at* http://home.planet.nl/~momme107/Onderzoek/applied_legal_epistemology.pdf).

34. Knowledge discovery is the non-trivial extraction of implicit, previously unknown, and potentially useful information from data. *See* Andrew Stranieri & John Zeleznikow, Knowledge Discovery from Legal Databases (2005). *See also* Andrew Stranieri et al., *A Hybrid Rule-Neural Approach for the Automation of Legal Reasoning in the Discretionary Domain of Family Law in Australia*, 7 Artificial Intelligence & L. 153, 153-83 (1999) (applying knowledge discovery from a data set of 103 cases to learn how Australian Family Court judges distribute marital property).

35. For an overview of these results, see Bart Verheij et al., *Logical Tools for Legal Argument: A Practical Assessment in the Domain of Tort*, 6 Int'l Conf. on Artificial Intelligence & L. 243, 243-49 (1997); Trevor J.M. Bench-Capon, *Argument in Artificial Intelligence and Law*, *in* Legal Knowledge Based Systems: Telecommunication and AI and Law 5-14 (1995).

36. A rebutting argument has a conclusion that is the opposite of the argument it rebuts. An undercutting argument attacks the relation between an argument and the conclusion it supports.

37. An example of this type of reasoning is reasoning about the validity of a rule. The argument that a rule is valid or not is different from the application of the rule upon the fulfillment of certain conditions.

38. The aim of the theories and models developed in this research has been to obtain a better understanding of legal reasoning, in particular how it could be represented in computer applications. Such research has not been directed toward practical applications, however. The applications that have resulted have been prototypes as opposed to full-fledged systems.

39. Anja Oskamp et al., *AI and Law: What About the Future?*, 3 Artificial Intelligence & L. 209, 209-15 (1995).

C. *Alternative Dispute Resolution*

It has been asserted that: "The principal institution of the law in action is not trial; it is settlement out of court."[40]

In the United States, only about 10 percent of civil cases go to trial.[41] Recent figures from a survey in the Netherlands demonstrate a similar situation: around 48 percent of all disputes were settled out of court and just 7 percent by litigation.[42]

Most AI & Law research conducted thus far has focused upon judicial decision-making. We believe, however, that AI & Law research also provides valuable uses for dispute resolution outside of the courtroom context.

Unlike litigation, ADR is private dispute resolution. The basic forms of ADR are arbitration,[43] mediation, and negotiation. Arbitration is an adversarial procedure in which an independent third party decides the case.[44] Mediation and negotiation are consensual procedures in which the disputants aim to reach agreement, either on their own or helped by a third party called the mediator or facilitator.[45] This third party does not impose a decision upon the two disputing parties, but merely guides the procedure.[46] Mediation strives to reduce hostility between the parties, to fashion an agreement about what obligations each party will assume, and to reach agreement on methods for ensuring that certain duties have been

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40. H. Laurence Ross, Settled Out of Court: The Social Process of Insurance Claims Adjustment 3 (2d ed. 1980).

41. *See, e.g.,* Marc Galanter & Mia Cahill, *"Most Cases Settle": Judicial Promotion and Regulation of Settlements*, 46 Stan. L. Rev. 1339, 1339-40 (1994).

42. B.C.J. van Velthoven & M.J. ter Voert, Geschilbeslechtingsdelta 2003: Over verloopen afloop van (potentieel) juridische problemen van burgers 197 (2004), *available at* http://www.wodc.nl/onderzoeken/onderzoek_90.asp?loc=/Zoeken.

43. While some do not consider arbitration to be a form of ADR, specifically where ADR is defined as a consensus-driven, non-adversarial type of dispute resolution, we personally view all private dispute resolution as part of ADR and therefore classify arbitration as a form of it.

44. On arbitration generally, see John Tackaberry & Arthur Marriott, Bernstein's Handbook of Arbitration and Dispute Resolution Practice (4th ed. 2003). On arbitration online, see Arno R. Lodder & Gerard A.W. Vreeswijk, *Online Arbitration Services at a Turning Point*, *in* Using Technology to Resolve Business Disputes 35-42 (2004).

45. *See generally* Henry Brown & Arthur Marriott, ADR Principles and Practice (2d ed. 1999).

46. *Id.* at 125-31.

carried out.[47] Through this process, mediation can often lead to a win-win result.[48]

Indeed, Ethan Katsh and Janet Rifkin state that, compared to litigation, ADR has several advantages:[49] lower cost, greater speed, more flexibility in outcomes, less adversarial in nature, more informal, solution rather than blame-oriented, and private.[50]

D. *Online Dispute Resolution*

ADR has moved dispute resolution away from litigation and the courts.[51] Online dispute resolution[52] extends this trend even further.[53] While ADR represents a move from a fixed and formal process to a more flexible one, ODR – by designating cyberspace as a location for dispute resolution – extends this process even further by moving ADR from a physical to a virtual place. Or, as Karamon explains, "while, originally, ADR took the resolution of disputes outside of the courtroom, the Internet has brought ADR directly to each individual's personal computer."[54]

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47. *Id.* at 127-31.

48. For example, if both parties value the list of items in dispute, it is not uncommon for each party to receive 70 percent of their requested points as long as they do not value the items in an identical manner. John Zeleznikow, *Risk, Negotiation and Argumentation – A Decision Support System Based Approach*, 1 L., PROBABILITY & RISK 37, 44 n.10 (2002). Such agreements reached in mediation are commonly referred to as "win-win." The ODR provider SmartSettle claims that its software allows parties to achieve results beyond this win-win scenario. *See* Ernest M. Thiessen & Joseph P. McMahon, Jr., *Beyond Win-Win in Cyberspace*, 15 OHIO ST. J. ON DISP. RESOL. 643, 643-67 (2000). The support offered in SmartSettle is very sophisticated and even includes suggestions for improvements to tentative agreements that already entail a win-win solution. *Id.*

49. ETHAN KATSH & JANET RIFKIN, ONLINE DISPUTE RESOLUTION: RESOLVING CONFLICTS IN CYBERSPACE 25 (2001).

50. *Id.*

51. As Katsh and Rifkin explain, the movement toward non-judicial systems of settling conflict will push mediation and arbitration to the "foreground" and litigation into the "background" of dispute resolution. *See id.* at 26.

52. For a good introduction to ODR, see LUCILLE M. PONTE & THOMAS D. CAVENAGH, CYBERJUSTICE. ONLINE DISPUTE RESOLUTION (ODR) FOR E-COMMERCE (2005). *See also* GABRIELLE KAUFMANN-KOHLER & THOMAS SCHULTZ, ONLINE DISPUTE RESOLUTION: CHALLENGES FOR CONTEMPORARY JUSTICE (2004) (analyzing the evolution and purposes of the ODR movement, as well as the legal framework governing its application).

53. *See generally* Eugene Clark & Arthur Hoyle, *Online Dispute Resolution: Present Realities and Future Prospects*, 17 BILETA CONF. (2002), *available at* http://www.bileta.ac.uk/02papers/hoyle.html (discussing the pros and cons, as well as related regulatory and policy issues, of new ODR technologies).

54. Martin C. Karamon, *ADR on the Internet*, 11 OHIO ST. J. ON DISP. RESOL. 537, 548 (1996).

Consequently, there are many reasons for our interest in ODR. First, we believe that for most conflicts, ADR is a better dispute resolution mechanism than litigation. Second, due to the inherent use of information technology for ODR, the Internet is pre-eminently suited for the use of computer support applications.[55] Third, unlike litigation, there are no legal obstacles to providing mediation online, and only minor obstacles to arbitration.[56]

Before outlining our proposal for an integrated ODR environment, it is helpful to give some examples of existing ODR services. The following websites allow the reader to explore a particular ODR service in more detail. We will not present a comprehensive overview of ODR providers or current projects,[57] but limit ourselves to describing a few relevant ODR sites.

Many of the existing ODR tools have been developed primarily to resolve e-commerce disputes or other Internet-related issues. The major reasons for the popularity of handling e-commerce or Internet-related disputes online are that 1) access to the Internet is not a problem because the parties concerned already had online contact before the dispute arose, and 2) the information crucial to their dispute will usually be available electronically.

One very popular, and probably the most successful, ODR site to date is SquareTrade,[58] which primarily handles conflicts between

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55. Robert Bordone, who has proposed an integrated conflict resolution system for online disputes, avers that "there is a crucial role for ADR specialists and designers of dispute resolution systems to play in the development of a comprehensive and optimal system of dispute resolution for the Internet." Robert C. Bordone, *Electronic Online Dispute Resolution: A Systems Approach – Potential, Problems, and a Proposal*, 3 HARV. NEGOT. L. REV. 175, 177 (1998).

56. *See* Richard Hill, *Online Arbitration: Issues and Solutions*, 15 ARB. INT'L. 199 (1999), *at* http://www.umass.edu/dispute/hill.htm (last visited Oct. 14, 2004) (indicating that "there are no significant legal obstacles to on-line arbitration and. . .no need to modify existing laws or international treaties").

57. For links to current ODR projects and websites, see the Center for Information Technology and Dispute Resolution's compilation at http://www.ombuds.org/center/onlineadr.html (last visited Oct. 14, 2004).

58. http://www.squaretrade.com (last visited Dec. 4, 2004). *See also* Steve Abernethy, *Building Large-Scale Online Dispute Resolution & Trustmark Systems*, 2003 PROC. UNECE F. ON ODR (Ethan Katsh & Daewon Choi eds.), *available at* http://www.odr.info/unece2003/pdf/abernethy.pdf (describing how SquareTrade's integration of ODR mechanisms in its trust program for online small business sellers helps enhance trust and reduces feelings of risks among online consumers).

traders of the online auction site eBay.[59] By 2004, SquareTrade had already dealt with over one million disputes.[60]

SmartSettle, an ODR system that assists parties in overcoming the challenges of conventional negotiation through a range of analytical tools, is designed to clarify interests, identify trade-offs, recognize party satisfaction, and generate optimal solutions.[61] The aim is to better prepare parties for negotiation and support them during the negotiation process.[62]

Under the auspices of the Internet Corporation for Assigned Names and Numbers (ICANN), the Uniform Domain-Name Dispute Resolution Policy (UDRP) was developed as an online procedure to fight domain-name grabbers.[63] An online dispute resolution procedure is offered by several providers appointed by the ICANN, including the World Intellectual Property Organization's (WIPO) Arbitration and Mediation Center, which has handled more than six thousand domain-name disputes over the past five years.[64]

The European Union–funded Electronic Consumer Dispute Resolution (ECODIR) project provides a mechanism similar to SquareTrade where many types of consumer disputes can be filed.[65] In early 2004, a new European Union initiative, CCform, was launched.[66] CCform facilitates the online resolution of standard consumer complaints in all of the official languages of the European

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59. http://www.ebay.com (last visited Dec. 4, 2004).

60. *See* Square Trade, About Us, *at* http://www.squaretrade.com/cnt/jsp/abt/aboutus.jsp;jsessionid=75rkp7cl91?vhostid=chipotle&stmp=squaretrade&cntid=75rkp7e191 (last visited Feb. 17, 2005).

61. http://www.smartsettle.com (last visited Dec. 4, 2004). *See also* Thiessen & McMahon, *supra* note 48, at 645.   **R**

62. *See* Lodder & Thiessen, *supra* note 2.   **R**

63. The claimant has to prove three conjunctive conditions to bring a suit against a domain-name grabber: that the registered domain name is confusingly similar to a name (primarily trademarks) in which the claimant has rights, that the owner of the domain has no legitimate interest in it, and that the domain name has been registered in bad faith. *See* ICANN Uniform Domain Name Dispute Resolution Policy, *at* http://www.icann.org/dndr/udrp/policy.htm (last visited Feb. 16, 2005).

64. WIPO Caseload Summary, *at* http://arbiter.wipo.int/center/caseload.html (last visited Dec. 4, 2004).

65. Electronic Consumer Dispute Resolution, *at* http://www.ecodir.org (last visited Jan. 4, 2004). *See also* Brian Hutchinson, *Online Resolution of Consumer Disputes – An Introduction to ECODIR*: *Electronic Consumer Dispute Resolution* (2002) (paper presented at the 2002 UNECE Forum on ODR).

66. *See* CCForm Online Complaints Platform, *at* http://ccform.interbyte.be/ (last visited Feb. 16, 2005); Federation of European Direct Marketing, CCForm, *at* http://www.fedma.org/code/page.cfm?id_page=259 (last visited Feb. 16, 2005).

Union.[67] These EU-funded projects have not been very successful in attracting consumers and businesses to their services, however. A complicating factor that underlies these EU projects is the difficulty of presenting information in all of the official EU languages. This need for translation probably also has contributed to the lack of success of the European Extra-Judicial Network for cross-border dispute resolution (EEJ-NET), an ADR/ODR general clearing house,[68] and its financial counterpart FIN-NET, which deals with financial disputes.[69]

Although ODR sites have primarily been used for Internet-related disputes, ODR can also facilitate resolution of disputes that have not originated online.[70] For instance, many blind-bidding sites that exist can be used to solve financial disputes, such as insurance claims, that are not necessarily related to e-commerce.[71] There is no reason why offline disputes could not be resolved online. In addition, if we consider the ease with which the younger generation uses online tools,[72] we expect that in the next decade ODR will become a central method of dispute resolution.

II.   Essentials of Our Online Dispute Resolution Environment

A. *Assumptions*

Our ODR environment should be envisioned as a virtual space in which disputants have a variety of dispute resolution tools at their disposal. Participants can select any tool they consider appropriate for the resolution of their conflict and use the tools in any order or

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67. In February 2005 CCform supported eleven languages. *See* http://ccform.interbyte.be/ (last visited Feb. 16, 2005).

68. European Extra-Judician Network for Cross-Border Dispute Resolution, *at* http://www.eejnet.org (last visited Dec. 4, 2004).

69. FinNet, *at* http://finnet.jrc.it/en/ (last visited Feb. 15, 2005).

70. *See, e.g.*, Thomas Schultz, *Online Dispute Resolution: An Overview and Selected Issues* (2002), *at* http://www.online-adr.org/SCHULTZ_ODR_UNECE_DRAFT_site.pdf (paper presented at the 2002 UNECE Forum on ODR).

71. See, for example, the U.S.-based Cybersettle, http://www.cybersettle.com (last visited Dec. 4, 2004).

72. *See* David A. Larson, *Online Dispute Resolution: Do You Know Where Your Children Are?*, 19 Negot. J. 199, 199-205 (2003) (describing how youth build intimacy and trust through on-line relationships). *See also* Erik Roelvink, *The Future Has Begun!*, *at* http://www.emediation.nl/odren.htm (last visited Feb. 17, 2005) ("The younger generation is of course raised with the internet. Chatting and email are a part of every day routine for this generation. Conflicts are of all ages. For younger people it will be natural to solve a conflict online.").

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manner they desire, or they can be guided through the process. Our proposed three-step model is based on a fixed order.

1. *The Three Steps*

In considering the principles and theory underlying our integrated ODR environment, we first evaluated the order in which online disputes are best resolved. The system that we propose conforms to the following sequencing, which in our opinion produces the most effective ODR environment:

1) First, the negotiation support tool should provide feedback on the likely outcome(s) of the dispute if the negotiation were to fail – i.e., the "best alternative to a negotiated agreement" (BATNA).[73]

2) Second, the tool should attempt to resolve any existing conflicts using dialogue techniques.

3) Third, for those issues not resolved in step two, the tool should employ compensation/trade-off strategies in order to facilitate resolution of the dispute.

4) Finally, if the result from step three is not acceptable to the parties, the tool should allow the parties to return to step two and repeat the process recursively until either the dispute is resolved or a stalemate occurs.

2. *Information Technology and Communication*

E-mediation, and ODR more generally, may denote three different concepts:[74]

1) mediation/ODR conducted exclusively online (in cyberspace), or

2) mediation/ODR of e-commerce or technology disputes, or

3) mediation with the use of electronic media, such as video conferencing and e-mail.[75]

We are interested in dispute resolution performed entirely online, whereby, in principle, all information is exchanged electronically. We realize that for purposes of proof, however, some procedures may require confirmation in paper format. Our ODR application does not

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73. ROGER FISHER, WILLIAM URY & BRUCE PATTON, GETTING TO YES: NEGOTIATING AGREEMENT WITHOUT GIVING IN 97-106 (Penguin Books 1991) (1981). *See* discussion *infra* Part III.A.

74. Loukas A. Mistelis, *ADR in England and Wales*, 12 AM. REV. INT'L ARB. 167, 214 (2001).

75. *Id.*

require any paper-based exchange of information, except where information is not available in an electronic format and cannot be reproduced electronically by scanning or other means. A dispute regarding a purchased item that is not delivered or was damaged on arrival is an example where not all information is available electronically. That said, in the latter case electronic evidence, such as a digital picture of the damaged product, might still be of help.

Various means can be used for information exchange, including e-mail, SMS messaging,[76] web-based forms, and special dispute environments created for the very purpose of ODR.[77] We aim to create the last, an environment specifically designed for ODR.

The exchange of information in an ODR environment can be realtime or asynchronous. Our environment supports both types of exchange, leaving it up to the parties to decide whether they desire to be online simultaneously.

Many commentators argue that the most important aspect of ADR is face-to-face communication.[78] There are many circumstances, however, where face-to-face communication is either not feasible or undesirable. Examples include, but are not limited to:

- Parties who have a history of violent conflict, or
- Parties for whom the costs of being in the same room are exorbitant, or
- Parties who are in different time zones, or
- Parties who cannot agree upon a joint meeting time.

ODR's lack of in-person interaction can actually be an advantage for disputes in which the emotional involvement of the parties is so high that it is preferable that they do not see each other.

In addition to providing potential logistical and emotional benefits, ODR also helps parties to be better able to distinguish between the person and the conflict (as is suggested in principled negotiation).[79] In combination, these advantages may outweigh any disadvantages created by a lack of face-to-face contact.

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76. Short Message Service (SMS), or text messaging, allows mobile telephone users to exchange brief communications.

77. *See* COLIN RULE, ONLINE DISPUTE RESOLUTION FOR BUSINESS: B2B, E-COMMERCE, CONSUMER, EMPLOYMENT, INSURANCE, AND OTHER COMMERCIAL CONFLICTS 245-64 (2002).

78. *See, e.g.*, Joel B. Eisen, *Are We Ready for Mediation in Cyberspace?,* 1998 BYU L. REV. 1305, 1322-25.

79. FISHER, URY & PATTON, *supra* note 73, at 17-39. *See also infra* text accompanying note 137.

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3. *A Sample Legal Domain*

Throughout this article we use examples from family law.[80] This does not mean that the ODR environment is exclusively suited to family law mediation. On the contrary, we propose a generic ODR environment that is suitable for any legal domain. Towards the end of this project, once the environment has been fully implemented and is available online, we will run through various test scenarios, evaluating a broad spectrum of conflicts including:

1) Division of joint property in divorces. In this context, the ODR environment could be used as an alternative to legal proceedings. The judiciary could be asked to direct people to this service, as is currently the case with offline mediation in both Australia and the Netherlands.
2) E-commerce disputes between businesses and consumers. Here the environment could be used by consumers all over the world.
3) Granting of construction licenses. In this context, the environment could be used to prevent costly and time-consuming administrative procedures. Online discussion could be used instead of, or preceding, objections to the granting of licenses.

B. *The Argument Tool*

1. *Introduction*

When initiating a two-party dispute, one of the parties introduces her grievances and the remedies she requires. Her opponent responds with counterarguments and her own proposed remedies. Our argument support tool makes explicit how the statements of the parties support their arguments.

The argument support tool makes explicit to the disputants the support relations between the statements put forward by them by representing the entered statements in a graphical, layered manner, whereby each lower layer indicates support for the layer directly

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80. There are several reasons why we use family law as a legal domain: 1) ODR may be a good option for family law disputants who cannot be in the same room; 2) ODR can blunt some of the emotionality that can make family law disputes so contentious; 3) from a theoretical standpoint, family law is a more accessible way to introduce the system to non-lawyers than, say, government benefits law; and 4) other AI & Law programs have been applied in family law, such as Split-Up and Bellucci & Zeleznikow's Family_Winner. *See* John Zeleznikow & Andrew Stranieri, *The Split-up System: Integrating Neural Networks and Rule-Based Reasoning in the Legal Domain*, 5 INT'L CONF. ON ARTIFICIAL INTELLIGENCE & L. 185, 185-94 (1995); STRANIERI & ZELEZNIKOW, *supra* note 34; Bellucci & Zeleznikow, *Representations*, supra note 5. *See also infra* text accompanying notes 112, 130, and Parts II.C.ii, II.C.3.

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above.[81] The tool accordingly forces the parties to enter statements in a sequence that reflects the support relations.

The argument tool used in our proposed ODR environment is based on AI & Law research about dialogical models of legal reasoning, in particular on DiaLaw,[82] a dialogical model of justification.[83] In the AI & Law field, scholars have created a number of models that concentrate on various characteristics of legal reasoning. For example, the Pleadings Game was developed to identify what issues - both legal and factual - exist between disputing parties.[84] The HELIC-II system attempts to represent a unified model of legal reasoning; its creators also provide a portable software tool based on such a model.[85]

The AI & Law scholar Ronald P. Loui stresses unremittingly that argumentation is a process.[86] He is primarily interested in the development of "dialectical protocols," rules that guide this process and that can guarantee that the procedure is fair and the outcome legitimate.[87] Another important element of his work is the study of rationales of rules and cases.[88]

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81. This process is further explained and graphically depicted *infra* Parts II.B.2, II.C.3.

82. *See* Lodder & Herczog, *supra* note 4; LODDER, DIALAW, *supra* note 4. *See also*   **R**
David Brin, *Disputation Arenas: Harnessing Conflict and Competitiveness for Society's Benefit*, 15 OHIO ST. J. ON DISP. RESOL. 597, 597-617 (2000); Joseph B. Stulberg, *Mediation, Democracy and Cyberspace,* 15 OHIO ST. J. ON DISP. RESOL. 619, 619-42 (2000).

83. Legal justification is a specific type of legal reasoning. Some legal statements are self-evident and do not need to be justified. For most legal statements, however, justification is essential. In general, the acceptability of a legal statement depends on the quality of its justification. A classic but simple justification, at least in civil law countries, is to support a statement by the facts of the case and a rule of which the conditions are subsumed by the facts. Dialogical models focus on the *process* of justification: the exchange of information that is introduced step by step in order to justify a statement. A statement is justified if, after a sequence of one or more claims, the other party is convinced of the tenability of the statement being justified.

84. THOMAS F. GORDON, THE PLEADINGS GAME 109-200 (1995).

85. Katsumi Nitta & Masato Shibasaki, *Defeasible Reasoning in Japanese Criminal Jurisprudence*, 5 ARTIFICIAL INTELLIGENCE AND L. 139, 139-76 (1997).

86. *See* Ronald P. Loui et al., *A Design for Reasoning with Policies, Precedents and Rationales*, 4 INT'L CONF. ON ARTIFICIAL INTELLIGENCE & L. 202, 202-11 (1993) [hereinafter Loui et al.]; R.P. Loui, One Hundred Observations About Fair Games, Lecture at the Views on Legal Argumentation Workshop (June 4, 1988) (on file with author) ("Almost all games are social processes, and most social processes are games.") [hereinafter Loui].

87. *See* Loui et al., *supra* note 86; *see also* Loui, *supra* note 86.   **R**

88. R.P. Loui & Jeff Norman, *Rationales and Argument Moves*, 3 ARTIFICIAL INTELLIGENCE & L. 159, 159-89 (1995).

Most of the AI & Law research on dialogical reasoning has roots in legal philosophy. For example, Chaim Perelman's rhetorical theory[89] and Jurgen Habermas's consensus theory of truth[90] are influential. . The legal philosophers Aulis Aarnio, Robert Alexy, and Aleksander Peczenik, who integrated the dialogical theories that they each had developed independently in the 1970s,[91] have also been important to AI & Law research. In fact, the Pleadings Game aimed to refine and formalize the theory of Alexy.[92]

2. *Lodder's Approach to Negotiation and Argumentation*

DiaLaw,[93] developed by Lodder, is a two-player dialogue game designed to establish justified statements. It is a procedural model in which logic and rhetoric are combined. Logic is used to force, under certain circumstances, an opponent to accept a statement.[94] The rhetoric element is represented in that the model defines as justified any statement on which the parties agree.

A dialogue in DiaLaw starts when a player introduces a statement she wants to justify. The dialogue ends if the opponent accepts the statement (justified) or if the statement is withdrawn (not justified). The rules of the game are rigid and the language used in the game is formal. This rigidity and formality help in presenting a clear picture of the relevant arguments. Due to its formal language and

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89. *See generally* CHAIM PERELMAN & L. OLBRECHTS-TYTECA, THE NEW RHETORIC: A TREATISE ON ARGUMENTION (1969). An argument is logically valid if based on a reasoning scheme (e.g., modus ponens: if A then B; A, therefore B, whereby the truth of the premises guarantees the truth of the conclusion). Rather than focusing on the structure of arguments, Perelman concentrates on the effects of argumentation on an audience. *See id.* at 13-62. The procedural, dialogical models developed in AI & Law represent the process in which the opponents aim to convince each other. *Id.*

90. Jürgen Habermas, *Wahrheitstheorien*, *in* WIRKLICHKEIT UND REFLEXION 211-65 (Helmut Fahrenbach ed., 1973). Habermas's work has influenced how we consider whether a statement is true or not. In Habermas's theory, truth can be established on the basis of consensus. Jürgen Habermas, THEORIE DES KOMMUNIKATIVEN HANDELNS (1981). Thus, something is true if we agree it is. The procedural, dialogical models in AI & Law build on this idea, by declaring the outcome of the process true or justified where the parties agree.

91. Aulis Aarnio et al., *The Foundation of Legal Reasoning*, 12 RECHTSTHEORIE 133, 133-58, 257-78, 423-48 (1981).

92. *See* GORDON, *supra* note 84.   **R**

93. LODDER, DIALAW, *supra* note 4. Chapters 3 and 4 describe the formalization,   **R**
and the appendix contains the Prolog Code of DiaLaw.

94. To give a simple example, if someone accepts a reason for a conclusion, he is then forced to accept the conclusion as well unless he can put forward reasons against the conclusion. Note that it is necessary that the reason is accepted. Even if only one reason for a conclusion is adduced and no reasons against, if the reason is not accepted, the opponent cannot be forced to accept the conclusion.

the fact that it was not designed to be used in practice in its prototypical form, DiaLaw is not an easy game to play.[95] That said, the ideas underlying DiaLaw make it well-suited for supporting a natural language exchange.

Lodder and Paul Huygen have been creating an ODR tool they call eADR,[96] based on the principles behind the construction of DiaLaw.[97] Through a careful structuring of the information entered, the tool aims, in particular, to support parties engaged in an arbitration procedure. Nonethless, Lodder and Huygen claim that the tool could also be used for other types of online dispute resolution, such as negotiation and mediation.[98]

The argument tool used in the ODR environment proposed by the authors of this article operates as follows.[99] "Statements" are natural language sentences. A party using the argument tool can enter one of the following three types of statements:

1) Issue: A statement that initiates a discussion. At the moment of introduction, this statement is not connected to any other statement.

2) Supporting statement: Each statement entered by a party that supports statements of the same party.[100]

3) Responding statement: Each statement entered by a party that responds to statements of the other party.

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95. The following natural language dialogue illustrates this inherent difficulty: "(1) It was not permissible to search Tyrell", "(2) Why do you think so?", "(3) Only if someone is a suspect may he be searched, and Tyrell was not a suspect" would be formally represented (where "~" means "not") as (1) (claim, ~search_allowed(Tyrell)), (2) (question, ~search_allowed(Tyrell)), (3) (claim, reason(~suspect(Tyrell), ~search_ allowed(Tyrell)).

96. The parties using this tool can enter natural language statements. The tool asks the user to enter an issue in normal text. Once a party has introduced an issue, which is a statement initiating the discussion, the tool then asks the party to enter a statement supporting the issue, if such a statement exists (which will normally be the case).

97. Lodder & Huygen, *supra* note 4. At this time, the implementation of eADR   **R** has almost been completed. *See* Computer Law Institute, *at* http://cli.vu/test/ onderzoek/odr (last visited Dec. 4, 2004).

98. *See also* Arno R. Lodder, *Online Negotiation and Mediation: Is There Room for Argument Support Tools?*, 17 BILETA Ann. Conf. (2002), *at* http://www.bileta.ac. uk/02papers/lodder.html (in which Lodder further outlines the applicability of the tool for other types of online dispute resolution).

99. Note that the authors' proposed tool improves upon the argument tool described in the text, which is based on the tool presented by Huygen and Lodder.

100. *See* Lodder & Huygen, *supra* note 4. Note that Lodder and Huygen restricted   **R** their definition of supporting statements to issues.

Any statement that is entered by the parties is represented as follows: P(E, Q(C)),[101] where P is the party who adds the statement, E is the entered statement, C is the statement connected to E, and Q is the player who claimed C.[102] If a statement is an issue, then it is represented as P(E, P(E)). From the definition of the other statements above, it follows that:

P(E,Q(C)) is a supporting statement if and only if $P = Q$;
P(E,Q(C)) is a responding statement if and only if $P \neq Q$.

After a party enters a statement (E), the statement is added as an "element" P(E, Q(C)) to a set of elements collectively called the "game board" (G). Because an issue is the only statement not connected to other statements at the moment of introduction, the first statement added to the game board is always an issue.

The tool presented in this article differs from the tool constructed by Lodder and Huygen[103] in that it is no longer a game in which parties take turns.[104] Rather, parties can add statements at any given moment, and even simultaneously. We believe that for negotiation/mediation, this is a more natural way of exchanging information, especially in an online environment.

3. *Using the Argument Tool: An Example Involving Family Law*

When viewed on a computer screen, our implemented argument tool presents issues at the left of the screen, indents supporting statements under the statement they support, and places responding statements to the right side of the statement to which they react. For example, the game board G, with H(usband) and W(ife) as the parties could be described in a linear fashion as follows:

H("I want custody", H("I want custody")).
H("I would take good care", H("I want custody")).
W("I want custody", H("I want custody")).

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101. This is the internal representation, not how the users see it. They are using a graphical interface of which a simple example is depicted *infra* Part II.B.3.

102. One might wonder why P(E) is not simply added to the game board if a party P adds a statement E. The answer is that the additional information is needed in order to structure the information exchange, since it reveals how the statements are connected.

103. Lodder & Huygen, *supra* note 4, at 122-23.   **R**

104. To use this tool during an arbitration, the first party claims issues and provides support; when that party is finished, he or she then hands over the game board to the other party. The second party can, during its turn, add any of the three statement types defined in Part II.B.2, *supra*.

W("I am a better parent", W("I want custody")).

H("In the past I have been good for the children", H("I want custody")).

W("You were working all the time", H("In the past I have been good for the children")).

As implemented in our environment, the same set would be presented roughly as follows:[105]

H: I want custody	W: I want custody
H: I will take good care of the children	W: I am a better parent
H: In the past I have been good to the children	W: You were working all the time

The statement "I want custody" is claimed simultaneously by both H and W. The introduction of identical statements is not unique in negotiation. In existing formal systems, such as DiaLaw, this would be modeled in two different steps: W would first claim that she does not want H to have custody, and then consecutively claim in support that she wants to have custody herself. This sequence might be necessary from a formal point of view, but if natural language is used, one cannot expect that the parties would enter their statements in such an unnatural sequence.

To our knowledge, existing formal systems do not allow the parties to state identical issues as follows:

H: custody(husband)
W: custody(wife)

Our proposed argument tool, however, can handle this sequence of moves, owing to the system's acceptance of natural language (anything can be entered in reaction to a statement by the other party) as opposed to formal language elements. The use of natural language does not detract from the tool's ability to help represent the structure of the dialogue. Thus, the statement of W is clearly a response to the statement of H; both players can provide support for the statements they introduced.

Another statement players can claim is similar to that of the question in dialogue games.[106] The question in a dialogue is used to

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105. When fully implemented, the use of graphics will make the representation more convincing and appealing.

106. In dialogue games, the most common speech acts (called "moves") are "claim," "accept," "withdraw," and "question." Lodder & Huygen, *supra* note 4, at 122. A **R** "claim" introduces a statement. There is an "accept" when one party accepts the

ask for an explanation or a justification.[107] For example, in response to a statement by the husband that he desires custody, the wife might ask the question "why?" Technically, the rules of application for our argument tool require that all inputs be in the form of statements, not questions. Nonetheless, because questions can be structured as statements, players can still functionally ask questions using the tool. For instance, after the husband states that he wants custody, the wife could add the statement "I do not understand why you should have custody." Technically this statement is not a question; it is just a sentence expressing uncertainty. Functionally, however, the wife is asking the question: "Why should you have custody?"[108]

Another possible response the parties can make is "OK" or "I agree." Such responses are problematic for our proposed tool because the system does not interpret them as statements. Consequently, while the parties will notice that agreement has been reached (they recognize "OK" or "I agree"), the tool, by itself, cannot recognize such an agreement. This concern is especially problematic given that the argument tool is merged with a negotiation support system which can only function effectively where it can identify any agreement regarding the issues. As we do not want to restrict the parties by requiring specific formats for the statements they enter, which would be necessary for the tool to automatically recognize agreement, our system provides that each introduced issue will be accompanied by an OK-button. If one party clicks the OK-button in response to the other party's statement, the system recognizes that agreement has been reached. The added element is then:

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statement of the other. A "withdraw" refers to the revocation of a statement. The argument tool proposed by the authors allows only the input of claims in principle. The speech act "withdraw" does not seem necessary to the function of the model, although we might add it if users at the testing stage demand the possibility of withdrawal. For a discussion of "accept" and "question," see the main text.

107. In philosophy and argumentation theory, the distinction between explanation and justification is an important one. *See* Douglas Walton, *A New Dialectical Theory of Explanation*, 7 PHIL. EXPLORATIONS 71, 71-89 (2004). For example, you cannot attack someone who is merely explaining that he is arguing in a wrong or fallacious way. This is because fallacies are considered faults in argumentation, and it is not fair to accuse someone of an argumentation fault where such person is not actually arguing (e.g., because he or she is explaining).

108. Note that because the proposed system does not check the format of what the parties enter, in principle they could enter a genuine question even though that would technically violate the rule requiring statements. A possible solution is to make a question icon available to the parties (similar to the OK-button proposed to represent agreement, as discussed in the text). Parties could attach the icon to statements that are not yet supported by the opponent, or that, even if supported, are not fully understood.

P(OK, Q(C)), given that Q(C, Q(C))[109] is an element of G.

C. *The Negotiation Support System Approach*

1. *Introduction*

We often know what criteria are important in making a decision but are unsure how best to evaluate these criteria. This is particularly true when important criteria appear to be in conflict. As an example, for a husband involved in divorce proceedings, the knowledge that the chance of his retaining primary custody of the children is low might compel him to give the criterion of primary custody a low weight. However, if the husband wants to maintain the family home, he might give this criterion a higher weight. In such situations, using a multi-criteria decision support tool could help highlight possible *best* alternatives.

Zeleznikow and others have previously used the multi-criteria decision-making approach.[110] The most typical approach requires the user to directly assign values to each alternative for a given criterion. Under an alternative approach known as the Analytical Hierarchy Process,[111] the user responds to a series of pair-wise comparisons: given two alternatives, the user is asked to express her preference for one over the other. An application of the Analytical Hierarchy Process is demonstrated in the Family_Winner application, which uses the concept of hierarchical decomposition to determine the order by which allocation is to occur, and to enable the formation of sub-issues or items.[112] After setting forth the issues, the disputants must decompose such issues into sub-issues until their positions are reflected in the sub-issues. Each issue is broken down so that allocation issues are binary in form: each issue is allocated to either the Husband or the Wife. Family_Winner uses a theory of pair-wise comparisons to determine whether the Husband or Wife is allocated an item or an issue. Upon reaching the lowest level in the hierarchy (as specified by the disputants), the system mathematically calculates the value of each sub-issue or item with respect to the relative super-issues or items. It does so for each party. Once completed,

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109. The reason this element is not simply Q(C) is that it is formally more elegant for all elements in the set to have the same form.

110. John Zeleznikow et al., *Building Decision Support Systems to Support Legal Negotiation*, 2002 IASTED Int'l Conf. on L. and Tech. 112, 112-17.

111. *See* Thomas L. Saaty, *How to Make a Decision: The Analytic Hierarchy Process*, Interfaces 19, 19-43 (1994).

112. Family_Winner was developed by Zeleznikow and Emilia Bellucci. *See supra* text accompanying note 80 and discussion *infra* Parts II.C.2, II.C.3.   **R**

the system calculates which party is allocated particular sub-issues or items through pair-wise comparisons over the derived values from both parties.[113]

Although there is an argument that one should assume bounded rationality and the presence of incomplete information in developing real-world negotiation support systems,[114] our model of legal negotiation assumes that all actors behave rationally. The model is predicated on economic bases, that is, it assumes that the protagonists act in their own economic best interests. While much human negotiation is not necessarily based upon rational economic behavior, the goal of negotiation support systems is to provide rational advice. The environment that we are developing therefore assumes the existence of rational actors.

Traditionally, negotiation support systems have been template-based, with little attention given to the role the system itself should play in negotiations and decision-making support. James Eidelman discusses two template-based software systems that are available to help lawyers negotiate: "Negotiator Pro" and "The Art of Negotiating."[115] Other template-based negotiation support systems include INSPIRE,[116] which used utility functions to graph offers, and DEUS,[117] in which the goals of the parties (and their offers) were set on screen side by side. The primary role of these systems has been to demonstrate to users how close (or far) they are from a negotiated settlement. The systems do not specifically suggest solutions to users. However, by informing users of the issues in dispute and a measure of the level of the disagreement, they provide some decision support.

The earliest negotiation support system that used artificial intelligence in order to provide decision-making support was LDS,[118] which assisted legal experts in settling product liability cases. Another early system, SAL,[119] helped insurance claims adjusters evaluate claims related to asbestos exposure. These two systems

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113. *See* Bellucci & Zeleznikow, *Representations*, *supra* note 5.   **R**

114. Katia P. Sycara, *Multiagent Systems*, 19 AI Mag. 79, 85 (1998).

115. James A. Eidelman, *Software for Negotiations*, 19 L. Prac. Mgmt. 50, 50-55 (1993).

116. Gregory E. Kersten, *Support for Group Decisions and Negotiations: An Overview*, *in* Multicriteria Analysis 332-46 (J. Climaco ed., 1997).

117. *See* Zeleznikow et al., *supra* note 3.   **R**

118. *See* D.A. Waterman & Mark A. Peterson, Models of Legal Decisionmaking 14-21 (1981).

119. *See* D.A. Waterman et al., *Expert Systems for Legal Decision Making*, 3 Expert Systems 369, 369-91 (1986).

represented the first steps in recognizing the virtue of settlement-oriented decision support systems. Other examples of negotiation support systems include MEDIATOR,[120] PERSUADER,[121] NEGOPLAN,[122] and GENIE.[123]

There has been much recent research on building web-based negotiation support systems.[124] For instance, Zeleznikow and others are modeling arbitration in the United Kingdom construction industry.[125] Modeling legal reasoning derived from existing case law and unreported decisions, they are creating a software tool to support the adjudication process and to assist all of its stakeholders.[126] Such a web-based decision support system will advise users/adjudicators as to likely outcomes of the dispute. A joint project in Victoria, Australia between Victoria University, La Trobe University, JUSTSYS,[127] and Victoria Legal Aid[128] is developing an online plea bargaining system to allow prosecutors and defense barristers to negotiate pleas

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120. The MEDIATOR used case retrieval and adaptation to propose solutions to international disputes. *See* Janet L. Kolodner & Robert L. Simpson, *The MEDIATOR: Analysis of an Early Case-Based Problem Solver*, 13 COGNITIVE SCI. 507, 507-49 (1989).

121. PERSUADER integrated case-based reasoning and game theory to provide decision support with regard to U.S. labor disputes. *See* Katia P. Sycara, *Negotiation Planning: An AI Approach*, 46 EUR. J. OF OPERATIONAL RES. 216, 216-234 (1990).

122. NEGOPLAN was a logic-based expert system shell for negotiation support. *See* Stan Matwin et al., *NEGOPLAN: An Expert System Shell for Negotiation Support*, 4 IEEE EXPERT 50, 50-62 (1989).

123. GENIE integrates rule-based reasoning and multi-attribute analysis to advise on international disputes. *See* Jonathan Wilkenfeld et al., *GENIE: A Decision Support System for Crisis Negotiations*, 14 DECISION SUPPORT SYSTEMS 369, 369-91 (1995).

124. See, for example, Electronic Negotiation Research, *at* http://interneg.org/interneg/research/projects/enegotiation/index.html (last visited Jan. 27, 2005) for a look at the E-Negotiation Project at Concordia University in Montreal.

125. While the arbitration itself is not being performed online, the results of the project will be provided as an online repository of knowledge concerning arbitration in the UK construction industry.

126. This is work in progress for which no paper has yet been written.

127. JUSTSYS is a Ballarat, Victoria, Australia start-up company devoted to building web-based decision support systems based on Toulmin's theory of argumentation. *See* JUSTSYS, *at* http://www.justsys.com.au (last visited Jan. 27, 2005). *See also infra* note 178.   **R**

128. Victoria Legal Aid is an Australian government-funded provider of legal services for disadvantaged clients. Its goals include providing legal aid in the most effective, economic and efficient manner and pursuing innovative means of providing legal services in the community. *See* Victoria Legal Aid, *at* http://www.legalaid.vic.gov.au (last visited Jan. 27, 2005).

and sentences with regard to criminal offenses. A model of sentencing has been developed using knowledge discovery from database techniques.[129]

2. *Zeleznikow's Approach to Building Negotiation Support Systems*

Influenced by John Nash's significant research on game theory[130] and Raiffa's work on using game theory for negotiation support,[131] Zeleznikow wished to integrate artificial intelligence and game theory techniques to develop intelligent negotiation support systems. Given his previous research on developing negotiation support systems in Australian family law, he decided to develop systems in that domain.[132] He saw that an important way in which mediators encouraged disputants to resolve their conflicts was through the use of compromise and trade-offs.[133] Once the trade-offs have been identified, other decision-making mechanisms must be employed to resolve the dispute.[134] From efforts to build negotiation support systems, he noted that while it appears counterintuitive:

- The more issues and sub-issues in dispute, the easier it is to form trade-offs and hence reach a negotiated agreement,[135] and

- We choose as the first issue to resolve the one on which the disputants are furthest apart – one party wants it greatly, the other considerably less so.[136]

Zeleznikow's negotiation support systems reflect these two principles. Family_Negotiator, developed by Bellucci and Zeleznikow, is a hybrid

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129. M.J. Hall et al., *Supporting Discretionary Decision-Making with Information Technology: A Case Study in the Criminal Sentencing Jurisdiction*, U. Ottawa L. & Tech. J. (forthcoming 2005). *See also supra* note 34.   **R**

130. John F. Nash, *Two Person Cooperative Games*, 21 Econometrica 128, 128-40 (1953).

131. Raiffa, *supra* note 5.   **R**

132. Zeleznikow & Stranieri, *supra* note 80.   **R**

133. Emilia Bellucci & John Zeleznikow, *Trade-off Manipulations in the Development of Negotiation Decision Support Systems*, 38 Hawaii Int'l Conf. on Systems Sciences (forthcoming 2005) [hereinafter Bellucci & Zeleznikow, *Trade-off*].

134. *Id*.

135. John Zeleznikow & Emilia Bellucci, *Family_Winner: Integrating Game Theory and Heuristics to Provide Negotiation Support*, 16 Int'l Conf. on Legal Knowledge Based Systems, 21, 21-30 (2003) [hereinafter Zeleznikow & Bellucci, *Family_Winner*].

136. *Id*.

rule-based[137] and case-based system[138] that attempts to model Australian family law.[139] The system models the different stages of negotiation, according to principled negotiation theory,[140] by asking individuals for their positions and their reasons for taking such positions.[141]

Bellucci and Zeleznikow have developed negotiation support software[142] based upon game theory techniques developed by Brams and Taylor.[143] The system uses a point-allocation procedure to distribute items or issues to people on the basis of whoever values the item or issue more.[144] Although the system suggests a suitable allocation of items or issues, it is up to the human negotiators to finalize an agreement acceptable to both parties.[145]

Family_Winner was also developed by Belluci and Zeleznikow and uses both game theory and heuristics.[146] In assisting the resolution of a dispute, Family_Winner asks the disputants to list the items in dispute and to attach importance values to indicate how significant it is that the disputants be awarded each of the items.[147] The system uses this information to form trade-off rules. The trade-off rules are then used to allocate issues according to a "logrolling" strategy.[148] Family_Winner accepts as input a list of issues and importance ratings that represent a concise evaluation of a disputant's preferences.[149] In forming these ratings, the system assumes that the disputants have conducted a comparison of the issues.[150] As noted by

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137. *See supra* note 23. A rule-based system consists of a sequence of rules.   **R**

138. *See supra* note 32.

139. Emilia Bellucci & John Zeleznikow, *Family-Negotiator: An Intelligent Decision Support System for Negotiation in Australian Family Law*, 4 CONF. INT'L SOC'Y FOR DECISION SUPPORT SYSTEMS, 359, 359-73 (1997) [hereinafter Bellucci & Zeleznikow, *Family-Negotiator*].

140. *See infra* Part III.A.

141. Bellucci & Zeleznikow, *Family Negotiator*, *supra* note 139.   **R**

142. Emilia Bellucci & John Zeleznikow, *A Comparative Study of Negotiation Decision Support Systems*, 31 HAWAII INT'L CONF. ON SYSTEMS SCIENCES 254, 254-62 (1998) [hereinafter Bellucci & Zeleznikow, *Comparative*].

143. STEVEN J. BRAMS & ALAN D. TAYLOR, FAIR DIVISION: FROM CAKE CUTTING TO DISPUTE RESOLUTION (1996).

144. Bellucci & Zeleznikow, *Comparative*, *supra* note 142.   **R**

145. *Id*.

146. *See supra* note 112 and accompanying text.   **R**

147. *See* Bellucci & Zeleznikow, *Representations*, *supra* note 5, at 467-68.   **R**

148. Logrolling is a process in which participants look collectively at multiple issues to find issues that one party considers more important than does the opposing party. Logrolling is successful if the parties concede issues to which they give low importance values. *See* DEAN G. PRUITT, NEGOTIATION BEHAVIOR 153-55 (1981).

149. Bellucci & Zeleznikow, *Representations*, *supra* note 5.   **R**

150. *Id.*

Katia Sycara, bargainers are constantly asked if they prefer one set of outcomes to another.[151] The system Sycara suggests is to consider two issues at a time, assuming all others are fixed.[152] Family_Winner uses a similar system in which pair-wise comparisons are used to form trade-off strategies between two issues.

The trade-offs pertaining to a disputant are graphically displayed through a series of trade-off "maps."[153] Their incorporation into the system enables disputants to visually understand trade-off opportunities relevant to their side of the dispute. A trade-off is formed after the system conducts a comparison between the ratings of two issues.[154] The value of a trade-off relationship is determined by analyzing the differences between the parties, as suggested by Mnookin and others.[155] Consider as an example a family law dispute in which the wife is awarded the marital home[156] and the husband awarded the holiday house. Depending on how the husband and wife rated various issues, one might be compensated following the allocation of property. Compensation is considered as an external reward, one that is not related to the issues on the table.[157] Family_Winner awards compensation to parties that have either lost an issue they regard as valuable, or have been allocated an issue of little importance.[158] The system implements compensation by either increasing or decreasing a party's rating.[159] It is then expected that changes made to a rating will influence the decision of a future allocation.[160] The amount of any compensation resulting from the triggering of a trade-off has been empirically determined from an analysis of data.[161]

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151.   Katia P. Sycara, *Machine Learning for Intelligent Support of Conflict Resolution*, 10 DECISION SUPPORT SYSTEMS, 121, 121-136 (1993).

152.   *Id*.

153.   John Zeleznikow & Emilia Bellucci. *Building Negotiation Decision Support Systems by Integrating Game Theory and Heuristics*, 2004 IFIP INT'L CONF. ON DECISION SUPPORT SYSTEMS (2004), available at http://vishnu.sims.monash.edu.au:16080/dss2004/proceedings/pdf/85_zeleznikow_bellucci.pdf.

154.   *Id*.

155.   *See* ROBERT H. MNOOKIN ET AL., BEYOND WINNING: NEGOTIATING TO CREATE VALUE IN DEALS AND DISPUTES 14-15 (2000).

156.   This is because she is to have primary care of the children.

157.   *See* Emilia Bellucci, Developing Compensation Strategies for the Construction of Negotiation Decision Support Systems 105-17 (2004) (unpublished Ph.D. dissertation, La Trobe University, Australia) (on file with author) [hereinafter Bellucci, Developing Compensation Strategies].

158.   *Id*.

159.   *Id*.

160.   *Id*.

161.   Bellucci, Developing Compensation Strategies, *supra* note 157. Bellucci examined 650 negotiated and litigated cases provided by the Australian Institute of   **R**

3. *Using the Negotiation Support System*

We illustrate how Family_Winner operates through the use of a hypothetical case. Suppose Cassandra (Wife) and Paul (Husband) Jones have been married for fifteen years and have two sons aged thirteen and eleven. Cassandra wants a divorce and an immediate property settlement. She believes that although she received income from employment throughout her marriage, her principal role was as a homemaker and a nurturer. Both parties agree to the distribution of the joint marital property consisting of a house, his Mitsubishi car, and her Holden car. In addition, she believes she is entitled to a portion of her husband's share in his stock portfolio and his superannuation entitlements.[162] She wishes to retain the house and the Holden car, while Paul wishes to retain his Mitsubishi car and agrees that they should share equally the portfolio and entitlements. Cassandra believes she should receive primary custody of the children. She consults a lawyer who advises her that as the parent with current primary custody of the children, she should seek sixty percent of the marital property and adequate child support. The sixty percent mainly consists of the matrimonial home and the holiday house. She wishes to retain both of these properties.

Disputants enter the issues in no particular order. Since the issues will be stored in a hierarchy, it is important that issues on the same level of decomposition be entered at the same time. Equally important is that the parties indicate the value of each issue to themselves, represented in the form of a numerical rating between zero and 100 inclusive. The case is presented to Family_Winner using the following data as input:

TABLE 1. INITIAL INPUT OF ISSUES AND RATINGS FOR USE IN THE
HYPOTHETICAL CASE.

Issue	Husband's Ratings	Wife's Ratings
Child-related Issues	70	50
Property Issues	20	15
Monetary Issues	10	35

Family Studies. *Id*. Analyzing the data, she assigned values for each issue and position pair and then developed trade-off rules. *Id*. *See also* Bellucci & Zeleznikow, *Trade-off*, *supra* note 133.

162. Superannuation entitlements (also known as pension benefits) are salaries paid to workers on retirement. Contributions are made by employers and often by employees.

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This information is then analyzed by a number of functions, including the translation of data into Trade-off Maps, the relaying of information to the database, the formation of issue allocations, and the modification of issue ratings to reflect allocations. Once the user has entered the data appropriately, the next screen displays Trade-off Maps generated by the system. The elements of a Trade-off Map are the nodes (or issues in this case), the strength of connections between these nodes (reflective of the trade-off opportunities), and a rating figure for each issue. The issues and their ratings are retrieved directly from user input. Figures One and Two are the Trade-off Maps displayed to disputants following the input of issues listed in Table One.

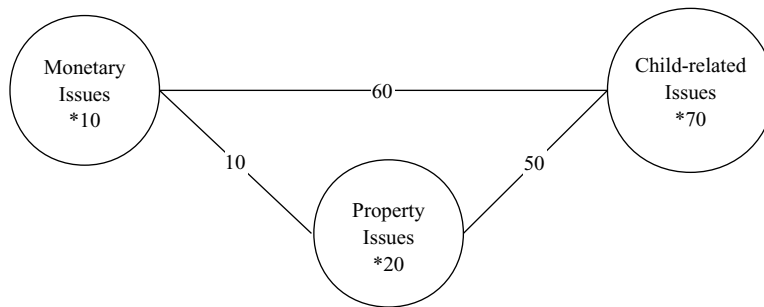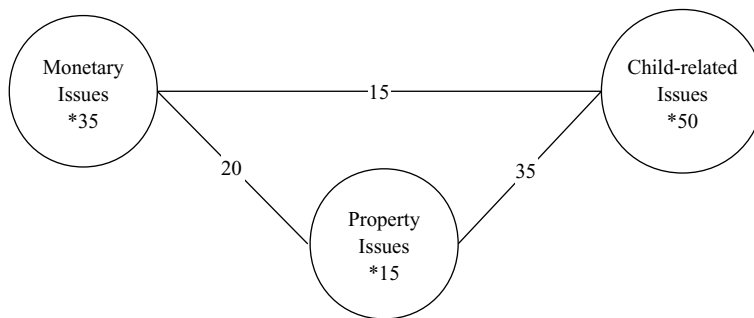FIGURE 1. THE HUSBAND'S TRADE-OFF MAP AFTER THE INITIAL INPUT OF THE PRIMARY ISSUES.

FIGURE 2. THE WIFE'S TRADE-OFF MAP AFTER THE INITIAL INPUT OF THE PRIMARY ISSUES.

The disputants are asked to decompose each issue into smaller sub-issues. Sub-issues are then incorporated into the dispute

through the formation of an "issue decomposition hierarchy."[163] *Child-related Issues* will be the first to be considered for decomposition or allocation as a result of a heuristic implemented in the Family_Winner system.[164] Nevertheless, disputants have the option to change the order by which issues are discussed if they feel that the system's suggestions do not adequately suit their needs.

It should be noted that in contrast to the Family Winner system, our proposed online dispute resolution environment does not suggest inserting user heuristics.[165]

Table Two lists the point allocations (ratings) given to each issue by the Husband and the Wife, and the ratings used in the dispute (p-ratings), which represent the influence of *Child-related Issues* on the sub-issue's initial point allocation. P-ratings are calculated as a ratio of the parent issue's rating according to the following equation:[166]

> Suppose $X = \{ X_{D1}, \ldots, X_{Dn}\}$ is the set of issues in dispute. The ratings are defined by $\{x_{D1}, \ldots, x_{Dn}\}$. Each issue can be decomposed into sub-issues $X_{di} = \{X_{di,1}, \ldots, X_{di,m}\}$. Further, each sub-issue is given a p-rating $\{x_{di,1}, \ldots, x_{di,m}\}$.
>
> If $\sum_{k=1}^{m} x_{di,k} = 100$ then the p-rating for $X_{di,k}$ is $x_{di} * x_{di,k}/100$.

For instance, as depicted in Table Two, if the Husband valued *Child-related Issues* at seventy out of 100, his p-ratings for sub-issues of *Child-related Issues* will reflect the ratio 70/100. Similarly, because the Wife valued *Child-related Issues* at fifty, her p-ratings will reflect the ratio 50/100.

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163. The "issue decomposition hierarchy" embedded in the system allows for the incorporation of sub-issues, which represents our attempt to increase the number of issues in dispute.

164. Based on their discussions with family law mediators, Bellucci and Zeleznikow empirically derived a heuristic that requires child-related issues to be dealt with before all other issues in family law disputes. The mediators interviewed by Bellucci and Zeleznikow stated that they preferred to deal with child-related issues before consideration of other matters on the grounds that it is much easier to distribute property once child custody has been decided.

165. For example, considering child-related issues first would be such a heuristic.

166. A more detailed explanation of how we perform our calculations can be found *infra* in Part III.C.

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TABLE 2. RATINGS AND p-RATINGS FOR THE SUB-ISSUES OF
CHILD-RELATED ISSUES.

| Sub-Issue of Child-related Issues	Husband's Ratings and p-Ratings	Wife's Ratings and p-Ratings
Residency	25 17.5	60 30
Visitation Rights	50 35	10 5
Child support	25 17.5	30 15

The Trade-off Map is now altered to include the sub-issues of the primary issues. The modified Trade-off Maps of both parties are depicted in Figures Three and Four. Family_Winner allocates an issue to a parent through the allocation of its sub-issues. In this example, all of the sub-issues of Child-related Issues will be allocated before the negotiation moves to consider other issues.

FIGURE 3. THE HUSBAND'S TRADE-OFF MAP INCORPORATING THE SUB-ISSUES OF *CHILD-RELATED ISSUES.*
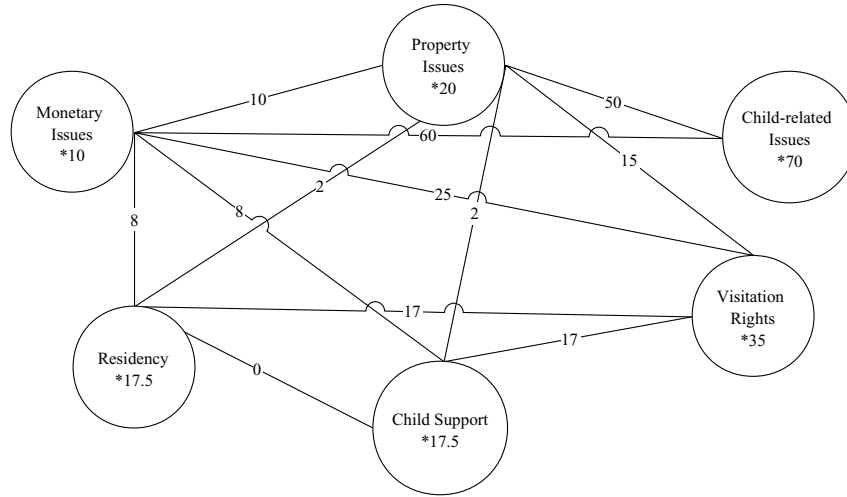
The party whose rating is highest for a particular sub-issue is allocated such sub-issue. If the sub-issue is valued equally by the disputants, then the system skips such sub-issue for the time being, moving to the next sub-issue in dispute. The sub-issue valued equally by the disputants is finally considered once all other issues have been allocated. At this point, if the ratings of this issue are not dissimilar, then it is allocated to the party with fewer allocated issues.

FIGURE 4. THE WIFE'S TRADE-OFF MAP INCORPORATING THE SUB-ISSUES OF *CHILD-RELATED ISSUES.*
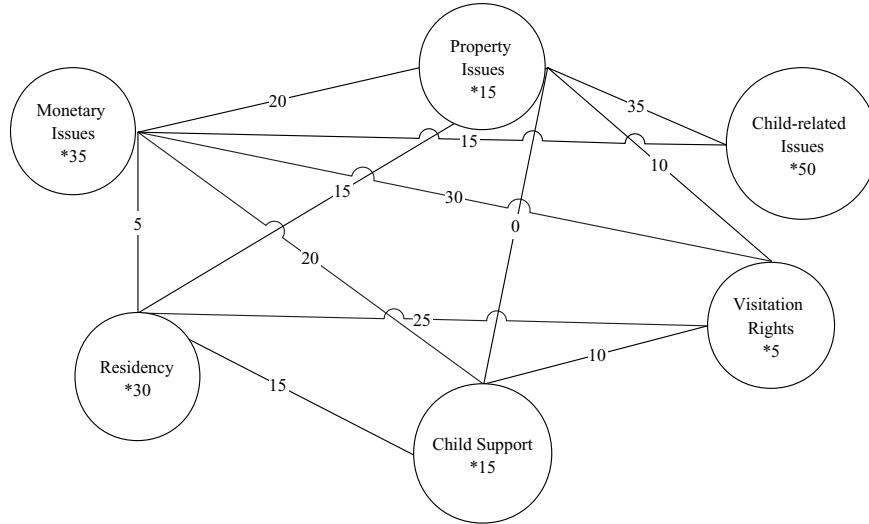
After each sub-issue is allocated, the current ratings of remaining sub-issues connecting to the allocated sub-issue are revised, based on mathematical functions derived empirically from data used in the Bellucci and Zeleznikow study.[167] The allocation of an issue or sub-issue involves removal of the issue or sub-issue from the Trade-off Maps, and making appropriate changes to the ratings of affected issues.

The first sub-issue in this example to be allocated is *Visitation Rights* because the disputants' respective valuations of such issue are the furthest apart. It is awarded to the Husband, as his p-rating of thirty-five is greater than the Wife's p-rating of five. As a result of the Husband's allocation, the ratings of remaining sub-issues are changed. Table Three lists all remaining sub-issues, their updated ratings, and the percentage change resulting from the allocation of *Visitation Rights* to the Husband.

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167. Bellucci has detailed the source of this data and subsequent functions used in Family_Winner. *See* Bellucci, Developing Compensation Strategies, *supra* note 157.   **R**

TABLE 3. THE CHANGES MADE TO THE RATINGS OF ISSUES FOLLOWING THE ALLOCATION OF *VISITATION RIGHTS* TO THE HUSBAND.

Sub-Issue Name	Husband's Ratings	Wife's Ratings
Child Support	18.375 (5% change)	15 (0% change)
Residency	18.375 (5% change)	41.25 (37.5% change)
Monetary Issues	10.5 (5% change)	52.5 (50% change)
Property Issues	21 (5% change)	15 (0% change)

As a result of the Husband's allocation of an issue he considered important (valued at thirty-five points), his ratings did not change considerably. The Wife was duly compensated for her loss of *Visitation Rights*, valued relatively unimportant at five points. The relative Trade-off Maps of each party, shown in Figures Five and Six, depict the amount of change each rating experienced as a result of the allocation. The Husband's ratings experienced little change as the issue's rating was considered by the system to be of great importance to the Husband. All of the Husband's ratings experienced an increase of five percent, as the relationship figures between *Visitation Rights* and the other sub-issues were all similar in number. Their relationship figures were seventeen between *Visitation Rights* and *Child Support*, seventeen between *Visitation Rights* and *Residency*, twenty-five between *Visitation Rights* and *Monetary Issues,* and fifteen between *Visitation Rights* and *Property*. The Wife was compensated for her loss of *Visitation Rights* (valued at five points) through those issues whose relationship with *Visitation Rights* was of relatively greater significance: the trade-offs between *Visitation Rights* and *Monetary Issues*, and *Visitation Rights* and *Residency,* held relationship values of thirty and twenty-five respectively. These issues were the only ones whose ratings increased, with increases of fifty percent and thirty-seven and one-half percent respectively. *Property Issues* and *Residency* did not change their ratings, as their relationships with *Visitation Rights* were valued at only ten points each.

Trade-off maps display the trade-offs currently applicable to the dispute. Once an issue is removed from a dispute through allocation, the Trade-off Map is modified to reflect this change. The issue is removed from the map, and the ratings of the remaining issues are recalculated according to the values dictated by the applicable trade-off relationships. The resulting Trade-off Maps following the allocation of *Visitation Rights* are demonstrated in Figures Five and Six.

FIGURE 5. HUSBAND'S TRADE-OFF MAP AFTER THE ALLOCATION OF
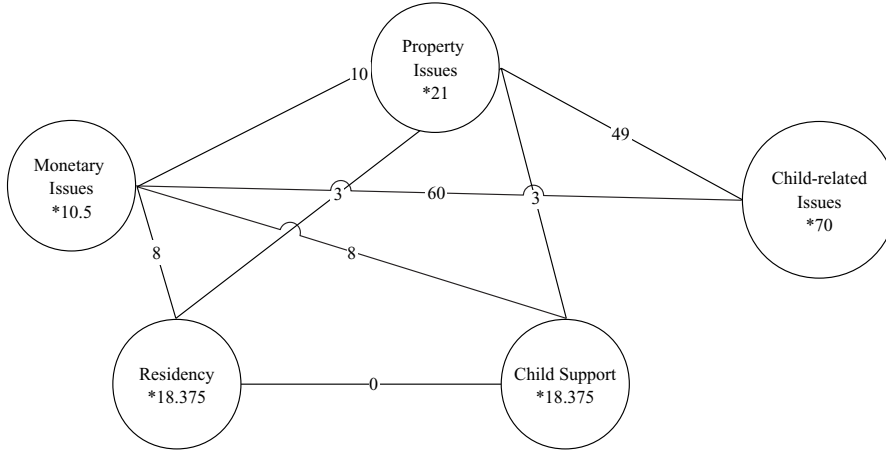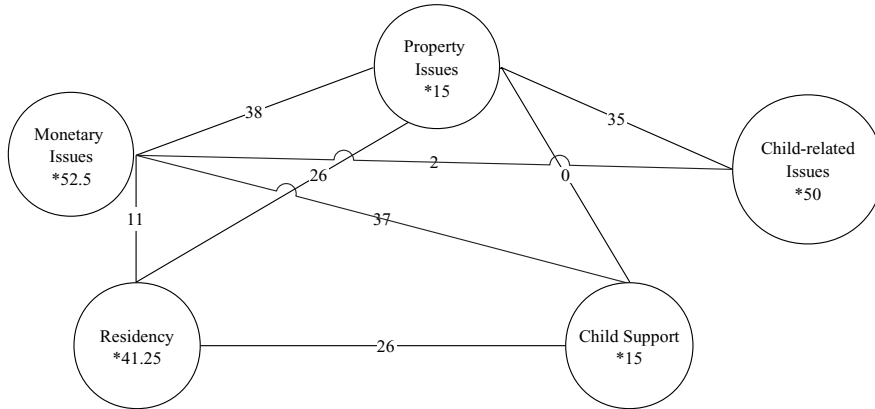*VISITATION RIGHTS.*

FIGURE 6. WIFE'S TRADE-OFF MAP AFTER THE ALLOCATION OF
VISITATION RIGHTS.

The system continues to traverse the hierarchy, by either allocating or decomposing issues, until all issues have been allocated. A summary of subsequent allocations is found in Table Four.

TABLE 4. ALLOCATION TABLE FOR THE HYPOTHETICAL FAMILY
LAW DISPUTE.

Husband's Allocations	Wife's Allocations
Visitation Rights	Custody
Shares	Superannuation Benefits
Child Support	Matrimonial Home
Investment Unit	Holiday House
Mitsubishi Car	Holden Car
Boat	

In order to use Family Winner, we must assume that:

1) The dispute can be modeled using "principled negotiation";[168]
2) Weights can be assigned to each of the issues in dispute; and
3) Sufficient issues are in contention to allow each side to be compensated for losing an issue.

The algorithms implemented in the system support the process of negotiation by introducing importance values that indicate the degree to which each party desires to be awarded each issue. The system assumes that the importance value of an issue corresponds directly to how much the disputant wants the issue to be awarded to her. The system also uses this information to form trade-off rules.

D. *How the Argument Tool and Negotiation Support System Work Together*

In our three-step model we suggest that the parties commence with the argument tool. If the parties do not reach agreement on all issues through use of the argument tool, they can then use the negotiation support system. If the proposal suggested by the negotiation support system is not acceptable, then the argument tool can be used again to provide additional support or a response. In fact, the parties can at any point go back to the argument tool in order to discuss further issues introduced during use of the negotiation support system.

We could have recommended that the parties begin with the negotiation support system phase, moving to the argument tool to discuss one or more (sub-)issues if the negotiation support system failed to suggest an acceptable proposal. If agreement was not reached on

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168. *See infra* Part III.A.

one or more (sub-)issues, the parties could further consult the negotiation support system.

We recommend commencing with the use of the argument tool because the use of a negotiation support tool first might discourage the parties from conducting a dialogue. It is important that the parties discuss the issues in dispute and become aware of the opposing side's arguments prior to trade-offs being suggested. An important task of a mediator is to have the parties communicate with each other. This task is hindered if a decision support system automatically suggests trade-offs before any attempt at communication or conciliation occurs.

Another problem with beginning with the negotiation support system as opposed to the argument tool is that the parties would then need to assign values to the issues before discussing them.[169] Following a dialogue, the disputants might realize they wish to reallocate points – perhaps because their opponent was awarded an issue which, on reflection, they realize they greatly desired. Consider the family law example described above in Part II.C.3. In that example the negotiation support system suggested that the wife be awarded Custody, Superannuation Benefits, Matrimonial Home, Holiday House, and Holden Car while the husband be awarded Visitation Rights, Shares, Child Support, Investment Unit, Mitsubishi Car, and the Boat. Suppose the wife realizes upon reflection that while she may have primary custody, both the marital and the holiday home, and the family car, she does not have the resources to support her family to enjoy such a lifestyle. So although she and her husband might have the same number of points, she is not happy with the solution and wishes to reassign numbers to the issues. We believe that it is better to agree on some issues (e.g., custody of children and marital home to the wife and shares to the husband) and then use the negotiation support system to offer a solution with regard to the unresolved issues. By beginning with the dialogue, the parties are more likely to consider *why* they desire particular outcomes before they assign values to such outcomes.

In addition, we believe that it is best to assign points only after the dialogue has been concluded, as such a sequence makes inequities less likely to occur. For example, if the wife is desperate to be

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169. The family law example, described in detail above, indicated how disputants award values to issues. As described in this example, the system assumes that each disputant can award 100 points to the range of issues (with the sub-issues of each issue also totaling 100 points). If more or fewer than 100 points are awarded, then we merely use a scale to ensure that the sum is indeed 100.

awarded custody, she may value it at eighty points. In this case, the negotiation support system would award the husband all the other issues. Nonetheless, he might still have fewer points than the wife. One could attempt to overcome this problem by allowing for the possibility of retracting agreements reached on certain issues in the dialogue.

Notwithstanding the concerns we have raised, should parties choose to begin with the negotiation support system, we believe that the above examples of potential problems are exceptional cases. Generally, the combination of the negotiation support system and the dialogue tool will lead to satisfactory results. Parties simply will not cede issues that are very important to them. Also, the party who wins issues in the dialogue worth sixty points to her would be wise to accept the proposal of the negotiation support system. Otherwise, her eventual return may be less than sixty points, or include issues less important to her.

Consensus remains the leading principle of our ODR environment. No party will be confronted with an undesired outcome. For example, assume that the wife is awarded several issues in the dialogue, and that, while using the negotiation support system, the husband gets only half of the remaining issues. If the husband accepts this proposal, so be it. The conflict is solved with mutual satisfaction. If not, the dialogue tool would be used again, and it would be wise for the wife to accept that the husband receive at least some of the issues desired by him. Nonetheless, if a party does not like a (partial) outcome, he or she has the right not to accept it.

We imagine that ultimately both the negotiation support system and the argument tool will be offered in the online environment, and the parties will be left to decide in which order to use them.

III.   THE THREE-STEP MODEL: A WALK-THROUGH

A.   *The First Step: Calculating BATNAs*

The Harvard Program on Negotiation introduced the concept of principled negotiation, which advocates "separating the people from the problem."[170] Fundamental to the concept of principled negotiation is the notion of knowing your "best alternative to a negotiated agreement" (BATNA). The reason you negotiate with someone is to produce better results than would occur without negotiation. If you

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170.   FISHER, URY & PATTON, *supra* note 73, at 17.   **R**

are unaware of the potential results of an unsuccessful negotiation, you run the risk of:

    1) entering into an agreement that you would be better off rejecting; or

    2) rejecting an agreement you would be better off entering into.[171]

Some proponents of mediation consider ADR superior to litigation.[172] On the other hand, some opponents of mediation believe parties should litigate because only then can fundamental rights such as a fair trial be truly guaranteed.[173] We do not consider mediation superior to litigation. Rather, we believe that litigation is the best procedure for some disputes while mediation is desirable for most conflicts. The challenge is to develop systems that can advise people on what is the most effective procedure given their dispute type, their intentions, and their background, among other issues.

Calculating one's BATNA is an important step in the decision whether to go to court or to mediate. Ideally, such a decision is based on a well-informed choice, although unfortunately, the information necessary to make such a decision is often lacking. One of our aims is to employ AI & Law research to provide litigants with information about the expected outcome of court proceedings. For example, data mining techniques[174] or semantic web technology[175] can be used to determine a BATNA.

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171. In the words of Fisher, Ury, and Patton, one's BATNA "is the only standard which can protect you both from accepting terms that are too unfavorable and from rejecting terms it would be in your interest to accept." *Id.* at 100.

172. For example, in the Netherlands there is a book series on mediation called EFFECTIEVE GESCHILLENOPLOSSING that expresses the general idea that mediation is more effective than litigation. Similarly, the Centre for Effective Dispute Resolution (CEDR) promotes ADR/mediation as being more effective than litigation. *See* http://cedr.co.uk/ (last visited Feb. 21, 2005).

173. Attorneys, for instance, are often quite skeptical about mediation.

174. Data mining is a problem-solving methodology that finds a logical or mathematical description, eventually of a complex nature, of patterns and regularities in a set of data.

175. Semantic web technology allows one to add meaning to documents. For example, a verdict can be stored in a format that not only displays the unstructured or semi-structured text, but meta-data could indicate that the document presents a verdict, on what date the verdict was ruled, and so forth. If information is stored in this way, for which a richer language than HTML, such as DAML+OIL, is used, the problem of finding relevant case law in order to determine a BATNA can be reduced to the problem of finding closely related documents in a large, semi-structured collection. A research grant has been awarded to Lodder and the semantic web group of Frank van Harmelen for the period 2005-08. This so-called BEST-project (BATNA Establishment using Semantic web Technology) aims to explore the intelligent disclosure of case law using semantic web technology to determine BATNAs in damages disputes.

At the moment, there is no generic tool available for determining BATNAs. As an example of how an existing ODR tool may be used to help determine one's BATNA, we will describe a software tool currently used in the Australian family law arena, Split-Up.[176] Split-Up is a hybrid rule-based/neural network system that facilitates property distribution following divorce in Australia.[177] A separate system of justification, using Toulmin argument structures, augments the Split-Up system.[178] While Split-Up is not a negotiation support system, it can be used to determine one's BATNA and hence provides an important starting point for negotiations. Split-Up first shows both litigants what they would likely be awarded by a court if their relative claims were accepted.[179] It then calculates what would happen if some or all of their claims were rejected.[180] Users are then able, through dialogues with the system, to explore hypothetical situations that assist them in recognizing the strengths and weaknesses of their claims.

As a hypothetical example, suppose the disputants' goals are entered into the system to determine the asset distributions for both W(ife) and H(usband). In an example taken from research by Bellucci and Zelenikow,[181] the Split-Up system provided the following answers as the percentages of the marital assets likely to be received by each party:

The aim is to develop an ontology for damages disputes and to use the paradigm of ontology-based search and navigation. For information on this and other projects, see Center for Electronic Dispute Resolution, *at* http://cedire.org (last visited Feb. 21, 2005).

176. *See* Bellucci & Zeleznikow, *Representations*, *supra* note 5, at 457-58; Stranieri **R** et al., *supra* note 80. **R**

177. Stranieri et al., *supra* note 34 (applying Split-up to property distribution deci- **R** sions in Australian family law).

178. STEPHEN E. TOULMIN, THE USES OF ARGUMENT (1958). Toulmin stated that all arguments, regardless of the domain, have a structure which consists of four basic invariants: claim, data, warrant and backing. *See id*. at 11-12, 97-107. Every argument makes an assertion. The assertion of an argument stands as the claim of the argument. A mechanism is required to act as a justification for the claim, given the data. This justification is known as the warrant. The backing supports the warrant and in a legal argument is typically a reference to a statute or precedent case.

179. Bellucci & Zeleznikow, *Representations*, *supra* note 5. **R**

180. *Id*.

181. *Id.* at 457-58.

	W's %	H's %
Given one accepts W's beliefs	65	35
Given one accepts H's beliefs	42	58
Given one accepts H's beliefs but gives W custody of the children	60	40

Clearly, custody of the children is very significant in determining the husband's property distribution. If he were unlikely to win custody of the children, the husband would be well advised to accept 40 percent of the common pool (otherwise he would also risk paying large legal fees and having ongoing conflict).

While Split-Up is a *decision* support system rather than a *negotiation* support system, it does provide disputants with their respective BATNAs and hence provides an important starting point for negotiations. However, more than a BATNA calculation is required of negotiation support systems. Namely, a negotiation support system should model the structure of an argument, provide advice on how to sequence the negotiation, and propose solutions.

B.   *The Second Step: Resolving Disputes by a Dialogue*

Ideally, after determining one's BATNA, the starting point for the mediation in our proposed system is to form the set of issues in dispute, formally denoted as:

$D = X \cup Y$[182] where

$X = \{X_1, X_2, \ldots, X_n\}$ is the set of issues that H sees as in dispute and

$Y = \{Y_1, Y_2, \ldots, Y_m\}$ is the set of issues that W sees as in dispute.

So, D is the set of all items in dispute.

The disputants can discuss any of the issues in D. The first statement added to games board is always an issue:[183]

$G_1 = \{H(D_1, H(D_1))\}$ or

$G_1 = \{W(D_1, W(D_1))\}$.

Following the dialogue, the disputants will agree on some issues, say

$A = \{D_1, D_2, \ldots, D_r\}$

and disagree on others:

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182.   For two sets X and Y, $X \cup Y$ consists of all elements that are in at least one of the two sets X, Y.

183.   Recall that an issue has the general form P(E,P(E)). *See supra* Part II.B.2.

$N = D \backslash A = \{D_{r+1}, D_{r+2}, \ldots, D_k\}$.[184]
So, if
$H(OK, W(D))$[185] or $W(OK, H(D))$ is an element of G,
then D is added to A.

Based on research by Bellucci and Zeleznikow, here is an example of a dialogue in which agreement is reached.[186] Tom and Mary have decided to divorce. They have two children. The relevant issues in dispute can be divided into child-related issues and financial issues. The child-related issues are split into the following sub-issues:

1) private school,
2) residency of the children,
3) religion, and
4) visitation rights.

Tom starts the discussion by introducing the private school issue. Mary does not understand why the children should go to a private school and therefore asks Tom why this issue is so important to him. Tom explains that he wants the children to be well educated, and that he is afraid that public schools provide an inferior education to private schools. After hearing Tom's explanation, Mary says that it is okay if the children attend a private school. The current state of the negotiation is as follows, with the sequence of the information exchange being indicated in parentheses.

Tom: Children should go to a private school (1)	Mary: I do not understand why they should (2)
	Mary: OK (5)
Tom: Children should be well educated (3)	
Tom: Public schools provide an inferior education (4)	

Note that Tom introduced support for his position only after Mary asked him to do so because Tom expected Mary would automatically accept his position. The dialogue also illustrates that Tom did not wait for Mary's reaction after introducing the first supporting

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184. N is the set of issues about which the disputants disagree. In general, $D \backslash A$ is the set of elements that are in the set D and not in the set A. In this case, it is the set of issues on which the disputants cannot agree.

185. Recall that agreement on a statement after using the OK-button is presented as $P(OK, Q(C))$. *See supra* Part II.B.3.

186. *See* Bellucci & Zeleznikow, *AI Techniques*, *supra* note 3.   **R**

statement. Instead, he introduced the two supporting statements consecutively.

The issue concerning private schools can now be placed in the resolution set A. Any other issues that Tom and Mary resolve using the dialogue tool are also added to set A. Unresolved issues, in set N, are then addressed in the third step, use of the negotiation support system.

C.   *The Third Step: Negotiation Support Through the Use of Compensation Strategies and Trade-offs*

The strategy that we advocate, which was described in the discussion of Belluci and Zeleznikow's Family_Winner above,[187] involves developing: 1) a hierarchy, 2) a trade-off strategy, 3) a compensation strategy based on fairness and equity principles, and 4) an allocation strategy. If use of the argument tool is not entirely successful, H and W are then asked to give a significance value to each of the issues in

$D = \{D_1, D_2, \ldots, D_k\}$ where

$m, n \leq k \leq m + n$[188] and the sum of significance values for each of H and W is 100.

We therefore have two sets:

$X_D = \{X_{D1}, X_{D2}, \ldots, X_{Dk}\}$ and

$Y_D = \{Y_{D1}, Y_{D2}, \ldots, Y_{Dk}\}$ where[189]

$\Sigma X_{Di} = \Sigma Y_{Di} = 100.$[190]

This information is necessary to initiate the negotiation part of our system.

In their Family_Winner model, Bellucci and Zeleznikow used the "Adjusted Winner"[191] point-allocation model, a procedure whereby items/issues are allocated to the disputants on the basis of whoever values the item/issue more. The disputants are required to indicate

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187.   Bellucci & Zeleznikow, *Representations*, *supra* note 5.   **R**

188.   "m" is the number of issues that H views are in dispute, "n" is the number of issues that W views are in dispute, and "k" is the number of issues that are in dispute. Thus $k \leq m + n$.

189.   The reader should note that the set X_D is the set of values that H gives to the issues in dispute and Y_D is the set of values that W gives to the issues in dispute. It may appear simpler to use H for X_D and W for Y_D. But this would cause confusion when discussing the games board in Part III.B.

190.   This means that for each disputant the sum of their importance values for the issues is 100.

191.   BRAMS & TAYLOR, *supra* note 143, at 66-75. Bellucci & Zeleznikow, *Represen-*   **R**
tations, *supra* note 5, at 458-61.   **R**

explicitly how much they value each of the different issues by distributing 100 points across the range of issues in dispute. The Adjusted Winner paradigm is a fair and equitable procedure because at the end of allocation, each party will have accrued the same number of points. If, as is generally the case, the disputants do not have directly opposing goals, it is likely that each disputant will receive more than fifty points. This is thus an improvement on any strategy that is based on the zero-sum game philosophy – where each party wins what the other loses. Where giving an issue/item to one party will lead to an inequality of points among the disputants, a form of proportional representation is used for the final issue in dispute. The final proposed solution might involve sharing some issues (such as selling a piece of property and distributing the money received from it or sharing custody of the children) to ensure that each of the disputants receives an equal number of points for the issues in N.

Our proposed environment differs slightly from the Adjusted Winner model in that it does not require the points to be equally distributed over A. An equal distribution of points is not the major goal of our system. Rather, our aim is to have both parties reasonably satisfied, or at least "equally dissatisfied" with the proposed resolution of the dispute. Thus, if both parties agree after the dialogue step, then points need not be allocated. Similarly, if the negotiation support stage is used, then the points may not be equal. One may speculate that there is a potential problem in that someone who wins an issue using the argument tool will be more likely to give such issue a lower point value in the negotiation support process. However, once an issue is resolved under the argument tool, the issue is recorded as resolved and taken off the dispute board. Hence it is not considered at the negotiation support step.

For example, using as an example the three disputed issues set forth in Table One – Child-related Issues (Di2), Property Issues (Di3), and Monetary Issues (Di1) – we can summarize our technique for distributing points in the following way:[192]

We first calculate

$d_1 = \max \{ — X_{Di} - Y_{Di} — \}$[193]

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192. This algorithm is an adaptation of the Adjusted Winner algorithm of Brams and Taylor, who proved the algorithm's validity. *See* BRAMS & TAYLOR, *supra* note 143, at 68-75, 85-93.   **R**

193. For the first issue, we choose to distribute that which one party values much more highly than the other. In Table One, the issue would be Visitation Rights where the difference is 25 (the other differences are 20 and five). Here $W_{monetary} > H_{monetary}$ so therefore W gets the issue. d_2 is then Child-Related Issues and is awarded to the husband. Consequently, he has 70 points and the wife has 35.

Let us say this value i1 occurs where
$X_{Di1} >= Y_{Di1}$ so that
X receives the item to be distributed.[194]

Then
$X^* = X_{Di1}$ and
$Y^* = 0$[195]

Choose
$d_2 = \max \{(Y_{Di} - X_{Di}) : i \text{ not equal to i1}\}$,[196]
the issue (D_{i2}) goes to Y and
$X^* = X_{Di1}$ and
$Y^* = Y_{Di2}$

Now,
If $X^* >= Y^*$
then choose
$d_3 = \max \{(Y_{Di} - X_{Di}) : i \text{ not equal to i1 or i2}\}$,
the issue (D_{i3}) goes to Y and
$X^* = X_{Di1}$ and
$Y^* = Y_{Di2} + Y_{Di3}$
ELSE
choose
$d_3 = \max \{(X_{Di} - Y_{Di}) : i \text{ not equal to i1 or i2}\}$,
the issue (D_{i3}) goes to X and
$X^* = X_{Di1} + Y_{Di3}$ and
$Y^* = Y_{Di2}$

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194. Because X awarded the most points to the issue where the parties were furthest apart, he is awarded such issue. The next issue should be awarded to Y.

195. We use X^* and Y^* to denote the number of points that H (X) and W (Y) have at any stage, while X and Y indicate the set of issues that H and W (respectively) view as in dispute. Thus, in our example based on Table One, the first issue to be distributed is *Monetary Issues*, which is awarded to the Wife since $d_1 = 25$. Thus $X^* = 0$ and $Y^* = 35$. Note that we are using our algorithm and not the Bellucci and Zeleznikow heuristic of dealing with child welfare issues first. *See* Emilia Bellucci et al., *Integrating Artificial Intelligence, Argumentation and Game Theory to Develop an Online Dispute Resolution Environment*, 16 IEEE INT'L CONF. ON TOOLS WITH ARTIFICIAL INTELLIGENCE 749, 749-54 (2004). We then calculate $d_2 = 20$, and the second issue to be distributed is *Child-related Issues*. This is awarded to the Husband so that now $X^* = 70$ and $Y^* = 35$. At this stage, $X^* = Y^*$. We next calculate $d_3 = 5$. The third and final issue distributed is *Property Issues*. This is awarded to the Wife so $X^* = 70$ and $Y^* = 35 + 15 = 50$. The last issue to be distributed has now been reached. In our system, we do not require an equal allocation of points.

196. To guarantee that the second issue is decided in favor of Y, the system searches for the issue where the difference is greatest between the points assigned by X and Y.

This procedure is repeated recursively until the last issue to be distributed is reached. If we were to desire that each party have an equal number of points, then the last issue would be distributed so that $X^* = Y^*$.[197] We do not require our system to necessitate an equal allocation of points. While we have illustrated our discussion with a family law example, the theory is generic.

D. *The Consecutive Steps and the Outcome of the Dispute Resolution Process*

The parties in dispute may reach agreement after using only the dialogue tool, or after using both the dialogue tool and the negotiation tool. If after using both procedures in sequence not all issues have been resolved, the parties may return to the dialogue tool in order to re-address the remaining issues in dispute.

This process continues until either all issues are resolved or a stalemate is reached. A stalemate occurs when no further issues are resolved on moving from the argumentation tool to the negotiation support system, or vice versa.

In brief, use of our online dispute resolution environment will result in one of the following scenarios:

1) No issues are resolved after use of either the argumentation tool or the negotiation support system and total failure is reported.
2) Some issues are resolved, but a stalemate occurs. One of two scenarios can then occur:
   a) either the parties do not agree to accept the partial resolution of the issues resolved during the process and no progress is reported, or
   b) the parties agree to some or all of the issues resolved during the process and partial success is reported.
3) The dispute is resolved and success is reported.

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197. To simplify the explanations in this paper, we have included only three disputed issues in Table One. Our algorithm suggests that monetary and property issues be awarded to W and child-related issues be awarded to H. Thus, H would have 70 points and W only 50. This occurs because there are only three issues in dispute. If the issues can be divided into sub-issues, then more trade-offs and a more equitable outcome could be suggested.

IV. FINAL CONSIDERATIONS REGARDING OUR ONLINE DISPUTE
RESOLUTION ENVIRONMENT

A. *Adding Issues to the Dispute*

A point we want to highlight concerns the situation in which parties realize during the negotiation that there is yet another issue in dispute. Although the set D can be extended, doing so would imply that the total value of disputed issues goes beyond 100. We propose to solve this problem by proportionally recalculating all of the values of the attributes in dispute, i.e., D.
For example, say
X^d = {40,40,10,10}
Y^d = {20,20,30,30}
and suddenly a fifth issue arises.

If X values it as ten, and Y as twenty-five, the sets would change as follows:
X^d = {40,40,10,10,10} would be recalculated (the points for each item in X^d are multiplied by 10/11 as the items in X^d now sum to a total of 110) to
$X^{\#d}$ = {36.5, 36.5, 9, 9, 9}.[198]
Y^d = {20,20,30,30,25} would be recalculated (the points for each item in Y^d are multiplied by 4/5 as the items in Y^d now sum to a total of 125) to
$Y^{\#d}$ = {16,16,24,24,20}.[199]

B. *Disagreement About Which Issues Are in Dispute*

What happens if parties disagree about what issues are in dispute? In our description of the negotiation, the set of issues in dispute is the union of the set of issues provided by each party. Thus, if either side says an issue is in dispute, then it is in dispute. However, this approach is not optimal under all circumstances. For instance, in an e-commerce dispute, a seller might say that a book was in good condition. The buyer disagrees and wants either some of his money back or to be able to return the book. Possible issues include the following:
- the condition of the book;
- whether the buyer will be refunded the money she spent on the book;
- who will pay for the eventual return of the book.

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198. The sum in the new $X^{\#d}$ is now 100.
199. The sum in the new $Y^{\#d}$ is now 100.

In this example, the parties will need first to establish what the actual condition of the book was. Only after this has occurred will the other issues become relevant. Neither the negotiation support system nor the argument tool is particularly helpful in the case of such factual differences of opinion. To build computer software to help resolve this problem, we need to investigate how to build computer systems to analyze evidence. This is a major strand of current research in AI & Law.[200]

C. *Negotiation and Justice*

We would be remiss in not raising a serious shortcoming of the ODR approach and, indeed, of any proposed negotiation support system. A fundamental issue arises whenever anyone builds a negotiation support system for use in legal domains: is the system being developed concerned with supporting mediation or providing justice? When issues of justice are not reflected in the outcome of the mediation process, bargaining theory has its limitations.

One lesson learned from the evaluation of family law disputes is that suggested compromises might conflict with law and justice. This problem can arise where a fully automated ODR environment is used in which resolution is based on consensus. Alexander's *Mediation, Violence, and Family Law* demonstrated that women tend to be more reluctant than men to continue conflict and are more likely to waive their legal rights in a mediation session.[201] This fact may result in women reaching settlements that, though acceptable to them, are patently unjust. For example, a woman whose major goal was to keep her children might give her husband the bulk of the property in return for her being granted custody. While such an arrangement may meet the goals of both parents, it does not necessarily meet the paramount interests of the children, who could be deprived of subsequent financial resources. Family law is therefore one domain in which mediation can conflict with notions of distributive justice. In such domains, the use of negotiation support systems that attempt to equally satisfy both parties is limited. Nevertheless, we believe that our

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200. *See, e.g.*, Henry Prakken et al., *Argumentation Schemes and Generalisations in Reasoning About Evidence*, 9 INT'L CONF. ON ARTIFICIAL INTELLIGENCE & L. 32, 32-41 (2003); G.C. Oatley et al., *Matching and Predicting Crimes*, 24 SGAI INT'L CONF. ON INNOVATIVE TECHNIQUES AND APPLICATIONS OF ARTIFICIAL INTELLIGENCE 19, 19-32 (2004).

201. Renata Alexander, *Mediation, Violence and the Family*, 17 ALTERNATIVE L. J. 271, 271-73 (1992).

ODR environment may still play a positive role in the family-law setting.[202] One safeguard for use of ODR in fields such as family law may be required certification of the result by a legal professional.

Notwithstanding issues related to the use of ODR in family law, as Zeleznikow and Bellucci have shown, numerous negotiation domains including international disputes, enterprise bargaining, and company mergers are amenable to being modeled using integrated game theory and knowledge-based systems to advise upon trade-offs.[203] Our online dispute resolution environment has similar benefits.

V. Conclusion

In this article, we have investigated how to provide decision support for disputes that parties attempt to resolve in cyberspace. Recent research has revolved around developing systems that allow disputants to communicate online. Our approach has been to merge techniques developed from argumentation, artificial intelligence, and game theory to provide decision support in an online environment.

To construct our environment, we have set forth three basic stages for the effective resolution of online disputes:

1) determining a BATNA, which helps the disputing parties determine what will happen if the dispute is not resolved (This task is context-dependent.);[204]

2) allowing parties to communicate among themselves using dialogue techniques (This task is generic.); and

3) using game theory techniques that employ compensation/trade-off strategies to attempt to resolve remaining issues in dispute (This task is generic.).

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202. Zeleznikow and Bellucci noted that when they met with a number of family law solicitors to evaluate the Family_Winner system, the solicitors were very impressed with how Family_Winner suggested trade-offs and compromises. *See* Zeleznikow & Bellucci, *Family_Winner*, *supra* note 135. Nonetheless, the solicitors voiced one major concern – that Family_Winner's focus on mediation had ignored issues of justice. *Id.*   **R**

203. *See id.*

204. We cannot build a generic decision support system that advises upon BATNAs in all negotiation domains because, for example, family law disputes are very different from disputes about international treaties. Knowing about the context of the dispute is essential. It is possible, however, to build systems that allow disputants to communicate with each other and to build systems that advise upon trade-offs.

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It should be noted that while step one is domain-dependent and must occur first, the other stages can occur in any order and can be repeated until success is reported or the disputants declare that the conflict is not resolvable.

The basis for the development of our online environment follows from the research on argumentation and artificial intelligence by Lodder and others, and the work on artificial intelligence and game theory by Zeleznikow and others. To our knowledge, this is the first time that an online dispute resolution environment has been proposed in which a negotiation support system is merged with an argument tool.

We are doing additional research to construct various tools that will support our proposed environment. In particular, we are undertaking a major project to investigate how decision support systems can advise upon BATNAs. In addition, at Victoria University, in conjunction with Victoria Legal Aid and JUSTSYS, we are developing a Family Law ODR environment using Toulmin's theory of argumentation.[205]

ODR combines the effectiveness of ADR with the comfort of the Internet. We believe our proposed online dispute resolution environment delivers both ease and effectiveness, and that the participants will consider the outcomes fair. It is likely that in the not-too-far future, online environments will surpass offline dispute resolution, even if face-to-face communication is not supported. As long as the humans remain in control, the supporting power of technology is infinite.[206]

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205. *See supra* note 127; TOULMIN, *supra* note 178.   **R**
206. Stephanie H. Bol & Arno R. Lodder, *Mediation online: over de kracht van de techniek en haar beperkingen*, TIJDSCHRIFT VOOR MEDIATION 94, 94-100 (2003).