Using Negotiation Support Systems to Reduce Legal Risk

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Abstract

There has been very little published research on building legal decision support systems to perform risk assessment. Yet, one of the principal goals of the law is to reduce risk through the avoidance of litigation. This paper discusses ongoing research on how to construct decision support systems that can support risk reduction and negotiation. A discussion of various systems (Deus, Split-Up, Family_Winner) which operate in Australian Family Law is given.
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1. Introduction

Ross (1980) states: "The principal institution of the law is not trial; it is settlement out of court". So what influence does judicial decision-making have over the outcome of negotiated settlements? The answer is a major one, since judicial decisions serve as the very basis from which negotiations commence (Williams 1983).

Litigation can be damaging to both parties in a dispute. It is a zero-sum game, in that what one party wins the other loses.[2] Mediation can strive to reduce hostility between the parties, to fashion an agreement about tasks each party is willing to assume and to reach agreement on methods for ensuring certain tasks have been carried out. It can lead to a win-win result.[3]

Chung et al (1997) stress that although dispute resolution is a human problem, computers are already at the bargaining table to transform the negotiation process. The Harvard Negotiation Project (Fisher and Ury 1981) introduced the concept of principled negotiation which advocates separating the problem from the people. Fundamental to the concept of principled negotiation is the notion of *Know your best alternative to a negotiated agreement (ºBATNA)* The reason you negotiate with someone is to produce better results than would otherwise occur. If you are unaware of what results you could obtain if the negotiations are

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2 It is actually worse than a zero-sum game and indeed can often lead to a lose-lose result. This is because of the large legal fees arising from litigation.

3 For example if both parties value the list of items in dispute, it is not uncommon (as long as they do not value the items in an identical manner) for each party to receive 70% of their requested points.

unsuccessful, 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.

Sycara (1998) notes that in developing real-world negotiation support systems one must assume bounded rationality and the presence of incomplete information. 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.

Traditional Negotiation Support Systems have been template-based with little attempt made to provide decision-making support. Little attention is given to the role the system should play in negotiations. Eidelman (1993) discusses two template-based software systems which are available to help lawyers negotiate: NEGOTIATOR PRO and THE ART OF NEGOTIATING. INSPIRE (Kersten 1997) used utility functions to graph offers, while in DEUS (Zeleznikow et al 1995) the goals of parties (and their offers) were set on screen side by side. The primary role of these systems is to provide users with a guide to how close (or far) they are from a negotiated settlement.

Brams and Kilgour (2001) discuss fallback bargaining. Under fallback bargaining, bargainers begin by indicating their preference rankings over alternatives. They then fall back, in lockstep, to less and less preferred alternatives – starting with first choices, then adding second choices, and so on, until an alternative is found on which all bargainers agree.

MEDIATOR (Kolodner and Simpson 1989) used case retrieval and adaptation to propose solutions to international disputes. PERSUADER (Sycara 1990) integrated case-based reasoning and game theory to provide decision support with regard to United States industrial disputes. NEGOPLAN (Matwin et al 1989) was a logic-based expert system shell for negotiation support . GENIE (Wilkenfield et al 1995) integrated rule-based reasoning and multi-attribute analysis to advise upon international disputes.

In this paper we discuss how the development of negotiation support systems can provide valuable support to mediators. Whilst no computer system can replace the human element, negotiation support systems can provide valuable support in structuring mediations, advising upon trade-offs and providing suggested compromises.

2. Risk and Negotiation

The Rand Corporation built numerous expert systems in the early 1980s (Peterson and Waterman 1985) to advise upon risk assessment. One of their early systems, LDS, assisted legal experts in settling product liability cases. LDS's knowledge consisted of legislation, case law and, importantly, informal principles and strategies used by lawyers and claims adjustors in settling cases.

Another Rand Corporation decision support system, SAL (Waterman *et al* 1986), also dealt with claims settlement. SAL helped insurance claims adjusters evaluate claims related to asbestos exposure. SAL used knowledge about damages, defendant liability, plaintiff responsibility and case characteristics such as the type of litigants and skill of the opposing lawyers. These two systems are important for they represent early first steps in recognising the virtue of settlement-oriented decision support systems.

Williams (1983) notes that whilst the figures may vary in different jurisdictions, of all the cases listed before the courts only about 5% of the cases are ever heard by the court and only 1% of the cases result in judicial decision-making. He quotes the 1980 Annual Report of the Director- Administrative Office of the United States of America Courts, Washington, D.C. (1980) at pages A-28 and A-20 which states that the average percentage of cases reaching trial verdict is 6.5%. The average for districts varies from a low of 2.0% to a high of 16.1%. By circuits, the differences are less extreme, ranging from a low of 4.0% in the District of Columbia Circuit to a high of 8.4% in the Eighth Circuit.

Further, many disagreements are never even listed before courts. Ross (1980) claims that a major study of personal injury/automobile insurance cases in the United States shows that of claimants represented by attorneys who obtained some compensation, 72% filed suit, 6.5% started trial and 2% reached a verdict.[4] Obviously these figures will vary depending on the jurisdiction and type of actions; however, what does not vary is that negotiated settlements account for the vast majority of all legally binding decisions.

Katsh and Rifkin (2001) state that compared to litigation, Alternative Dispute Resolution has the following advantages:

a) Lower cost;
b) Greater speed;
c) More flexibility in outcomes;
d) Less adversarial;
e) More informal;
f) Solution-rather than blame-oriented;
g) Private.

To avoid the risks of extra costs and an unfavourable outcome, disputants often prefer to negotiate rather than litigate.[4] Whilst investigating how disputants evaluate the risks of litigation researchers are faced with a basic hurdle – outcomes are often, indeed usually, kept secret. If the case is litigated, it could be used as a precedent for future cases, which may be a disincentive for one or more of the litigants (Goldring 1976). Publicity of cases and the norms resulting from cases make the public aware of the changing attitudes towards legal issues.[5] The adjudication decision not only leads to the resolution of the dispute between the parties, but it also provides norms for changing community standards (Eisenberg 1976). This latter facet is lost in negotiated settlements.

The secrecy behind negotiated settlements is one of the reasons for the paucity of published material on legal decision support systems dealing with risk. WIRE IQ (Wire Intelligent Quantum) is an Internet delivered decision support system which allows lawyers, insurers and re-insurers access to up-to-the minute quantitative analysis of current claims settlement values for a wide range of personal injuries (Douglas and Toulson 1999). Douglas

4 AUTOMOBILE PERSONAL INJURY CLAIMS, U.S. Department of Transportation, Automobile Insurance and Compensation Study, 1970.

5 In common law countries, changing community values towards issues such as abortion, euthanasia and rape within marriage have been enacted in the legal system through landmark precedents, rather than parliamentary legislation.

and Toulson (1999) state that analysis and price discovery of tort in un-settled personal injury claims has been conducted using rule-based systems. In such systems, the details of the claim (injury type, claimant's age, sex, earnings, etc.) are entered into the system. The system then applies predefined rules to determine the settlement value of the claim.

WIRE IQ uses a database with thousands of records of settled claims and court awards for a range of personal injury claims. It then provides the following analysis services based on the data: trend analysis, comparative analysis, precedent search and forecasts. The forecasts are performed using neural networks.

3. Negotiation Support Systems in Australian Family Law

In our desire to construct decision support systems to support legal negotiation, we realise how much the building of such systems depends upon the domain context. We chose as our domain to model Australian family disputes. In most legal conflicts, once a settlement is reached the parties to the settlement are not required to have an on-going relationship. This is not the case in Australian Family Law. Family Law (Ingleby 1993) varies from other legal domains in that in general:

1. There are no winners or losers – save for exceptional circumstances, following a divorce both parents receive a portion of the property and have defined access to any children.
2. Parties to a family law case often need to communicate after the litigation has concluded. Hence the Family Court encourages negotiation rather than litigation.

We have developed numerous systems to support negotiation in Australian Family Law. We claim all of the techniques developed can be used in other negotiation domains.

3.1 DEUS – a template-based negotiation support system

Our first attempt at building negotiation support systems was to build a template-based system, DEUS (Zeleznikow et al 1995). In building DEUS, we developed a model of family law property negotiation, which relies upon building a goal for each of the litigants, with the goals being supported by their beliefs. Goals can only take real number values, because in simplifying the model it is assumed that the goal of each party is a monetary figure. Beliefs, which support the goals, are expressed in natural language. In the system, which has been implemented using this model, goals are used to indicate the differences between the parties at a given time. The beliefs provided are used to support the goals.

The model calculates the agreement and disagreement between the litigants' beliefs at any given time. The agreement and disagreement are only in relation to the beliefs and hence do not resolve the negotiation. In order to reach a negotiated settlement, it is essential to reduce the difference between the goals to nil.

Having defined the model, it was implemented into DEUS. The system supports the negotiation process by representing the goals and beliefs of the opposing parties to a property conflict arising from a divorce application. It helps mediators understand what issues are in dispute and the extent of the dispute over these issues. Whilst DEUS does not perform belief revision or indeed does not have any intelligent functions, it does inform disputants as to their level of disagreement.

Following an investigation of Fisher and Ury's theory of principled negotiation, we built Split-Up, an argumentation-based knowledge discovery system, to advise upon BATNAs for the dispute.

3.2 Split-Up

In dealing with the distribution of matrimonial property following divorce in Australia, (Stranieri *et al* 1999) determined that the task of determining what property a Family Court of Australia judge may distribute was determined to be rule-based[6]. The section of the Act dealing with the percentage of the matrimonial property each partner receives is highly discretionary. This is because the Family Law Act (1975) lists a number of factors to be considered for a percentage split determination yet provides no guidance on the relative significance of each factor or on how they are to be combined. Ascertaining knowledge about how a judge weighs and combines factors is difficult, in that a guessed numerical weight is unlikely to represent the actual weight of the factor in the context of a large number of interdependent factors.

Fayyad *et al.* (1996) define knowledge discovery in databases (KDD) as the non trivial process of identifying valid, novel, potentially useful understandable patterns in data. The aim of the approach used in developing Split Up was to identify relevant factors in family law with experts and then assemble a dataset of values on these factors from past cases that can be fed to machine learning programs such as neural networks[7]. In this way, the manner that judges weighed factors in past cases could be learnt without the need to advance rules. This approach was inspired by the jurisprudence movement known as legal realism.

For legal realists exemplified by Llewellyn (1962), rules and principles may be invoked after a decision has been reached in order to ensure that a decision is just, moral and legally correct. Rules and principles are invoked to explain a decision but there is no need to assume they are used to reach the decision.

Ninety-four variables were identified as relevant for a determination in consultation with experts. The way the factors combine was not elicited from experts as rules or complex formulas. Rather, values on the 94 variables were to be extracted from cases previously decided, so that a neural network could learn to mimic the way in which judges had combined variables.

In the Split-Up system, the relevant variables were structured as separate arguments following the argument structure advanced by (Toulmin 1958). Toulmin concluded that all arguments, regardless of the domain, have a structure which consists of six basic invariants: claim, data, modality, rebuttal, warrant and backing. Every argument makes an assertion based on some data. The assertion of an argument stands as the claim of the argument. Knowing the data and the claim does not necessarily convince us that the claim follows from

6 A (crisp) rule is of the the form IF <condition(s)> THEN <action>. An example of a rule is if you drink and drive then you lose your licence.

7 A neural network receives its name from the fact that it resembles a nervous system in the brain. It consists of many self-adjusting processing elements cooperating in a densely interconnected network. Each processing element generates a single output signal which is transmitted to the other processing elements. The output signal of a processing element depends on the inputs to the processing element: each input is gated by a weighting factor that determines the amount of influence that the input will have on the output. The strength of the weighting factors is adjusted autonomously by the processing element as data is processed.

the data. A mechanism is required to act as a justification for the claim. 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 a precedent case. The rebuttal component specifies an exception or condition that obviates the claim.

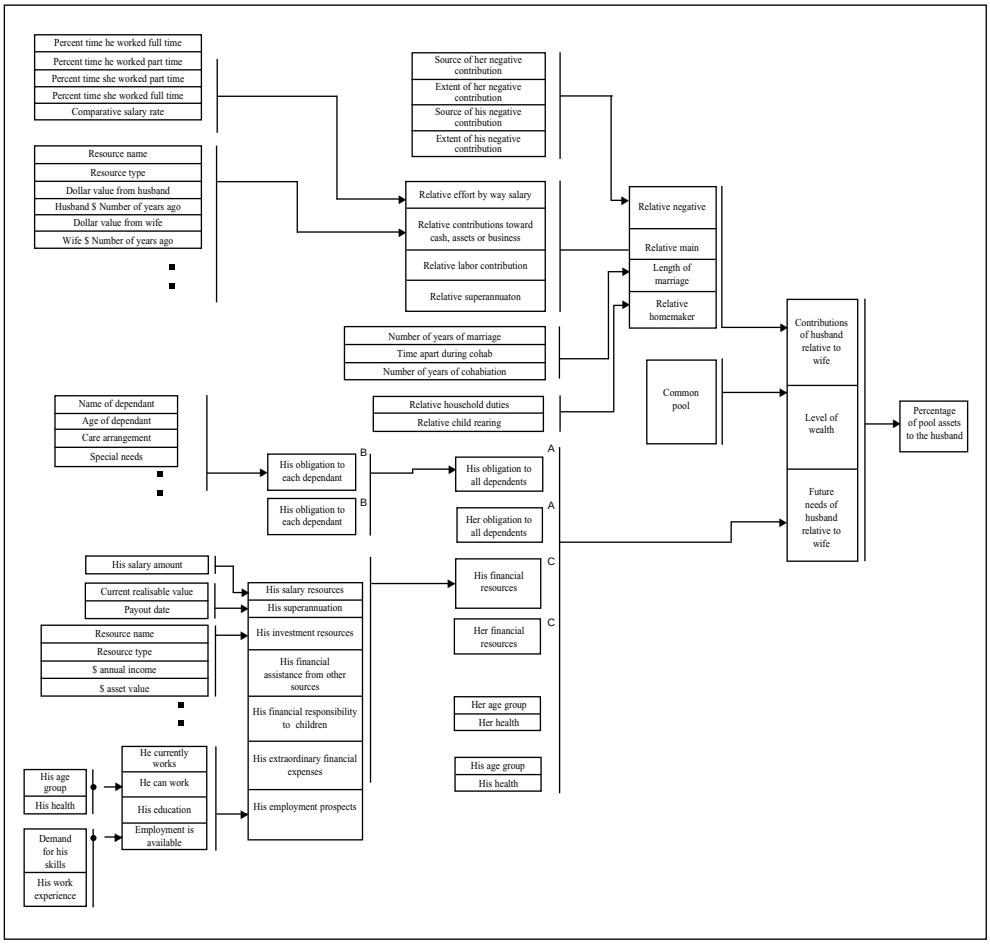

Figure 1. Tree of actual arguments for Split-Up

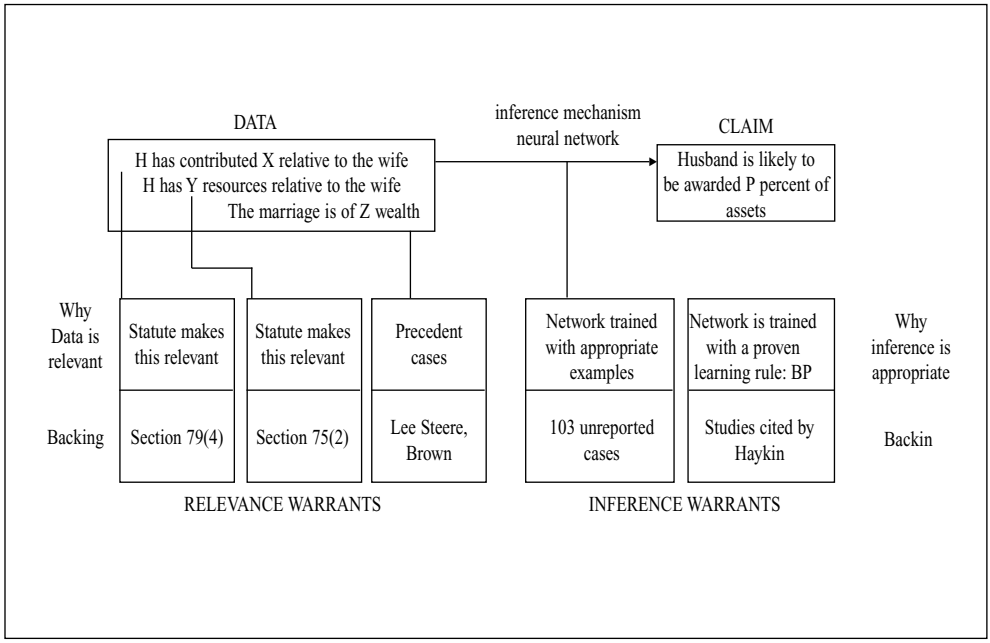

Figure 2. Toulmin argument structure for one of the Split Up argument

Split-Up can be used to determine one's BATNA for a negotiation. It first shows both litigants what they would be expected to be awarded by a court if their relative claims were accepted. It gives them relevant advice as to what would happen if some or all of their claims were rejected. Users are then able to have dialogues with the system to explore hypothetical situations to establish clear ideas about the strengths and weaknesses of their claims.

Suppose the disputants' goals are entered into the system to determine the asset distributions for both W and H in a hypothetical example. For the example taken from Bellucci and Zeleznikow (2001), the Split-Up system provided the following answers as to the percentages of the marital assets received by each party:

	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

Figure 3. Use of Split-Up to provide negotiation advice

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% of the common pool (otherwise he would also risk paying large legal fees and having on-going conflict).

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

3.3 Family_Winner and game theory based approaches for developing negotiation support systems

Jennings et al (2001) developed a generic framework for classifying and viewing automated negotiations. This framework was then used to analyse the three main methods of approach that have been adopted to automated negotiation, namely:

1) Game theory
2) Heuristics
3) Argumentation-based approaches.

Bellucci and Zeleznikow (2001) have used all three techniques in building negotiation support systems. Family_Negotiator Bellucci and Zeleznikow (1997) is a hybrid rule-based and case-based system which attempts to model Australian family law. The system models the different stages of negotiation (according to Principled Negotiation Theory) by asking individuals for their positions and reasons behind these.

Game theoretic techniques and decision theory were the basis for AdjustedWinner Bellucci and Zeleznikow (1998), which implemented the procedure of Brams and Taylor (1996). AdjustedWinner is a point-allocation procedure that distributes items or issues to people on the premise of whoever values the item or issue more. The two players are required to explicitly indicate how much they value each of the different issues by distributing 100 points across the range of issues in dispute. The AdjustedWinner paradigm is a fair and equitable procedure. At the end of allocation of assets, each party accrues the same number of points. It often leads to a win-win situation. Although the system suggests a suitable allocation of items or issues, it is up to the human negotiators to finalise the agreement acceptable to both parties.

Arising from our work on the AdjustedWinner algorithm, we noted that:

1) The more issues and sub-issues in dispute, the easier it is to form trade-offs and hence reach a negotiated agreement;
2) We choose as the first issue to resolve, the issue on which the disputants are furthest apart – one wants it greatly, the other considerably less so.

Instead of using points as in AdjustedWinner, we use influence diagrams in Family_Winner. We then reformulate the influence diagrams with the aim of eventually reaching equality.

Family_Winner (Bellucci and Zeleznikow 2001) uses both game theory and heuristics. It supports the process of negotiation by introducing importance values to indicate the degree to which each party desires to be awarded the issue being considered. The system uses this information to form trade-off rules. The trade-off rules are used to allocate issues according to the logrolling strategy. The system makes this analysis by transforming user input into trade-off values, used directly on trade-off maps, which show the effect of an issue's allocation on all unallocated issues.

Users of the Family_Winner system enter information such as the issues disputed, indications of their importance to the respective parties and how the issues relate to each other. An analysis of the aforementioned information is compiled, which is then translated into graphical trade-off maps. The maps illustrate the relevant issues, their importance to each party and trade-off capabilities of each issue. The system takes into account the dynamics of negotiation by representing the relations that exist between issues. Maps are developed by the system to show a negotiator's preferences and relation strengths between issues. It is from these maps that trade-offs and compromises can be enacted, resulting in changes to the initial values placed on issues.

The user is asked if the issue can be resolved in its current form. If so, the system then proceeds to allocate the issue as desired by the parties. Otherwise, the user is asked to decompose an issue chosen by the system as the least contentious. Essentially the issue on which there is the least disagreement (one party requires it greatly whilst the other party expresses little interest in the issue) is chosen to be the issue first considered. Users are asked to enter sub-issues. As issues are decomposed, they are stored in a decomposition hierarchy, with all links intact. This structure has been put in place to recognise there may be sub-issues within issues on which agreement can be attained. It is important to note that the greater the number of issues in dispute, the easier it may be to allocate issues, as the possibility of trade-offs increases. This may seem counter intuitive, but if only one issue needs to be resolved, then suggesting trade-offs is not possible.

This process of decomposition continues through the one issue, until the users decide the current level is the lowest decomposition possible. At this point, the system calculates which issue to allocate to which party, then removes this issue from the parties respective trade-off maps, and makes appropriate numerical adjustments to remaining issues linked to the issue just allocated. The resulting trade-off maps are displayed to the users, so they can see what trade-offs are made in the allocation of issues. When all issues are allocated at the one level, then decomposition of issues continues, re-commencing from the top level in a sequential manner.

The algorithms implemented in the system support the process of negotiation by introducing importance values to indicate the degree to which each party desires to be awarded each issue. It is assumed that the importance value of an issue is directly related to how much the disputant wants the issue to be awarded to her. The system uses this information to form trade-off rules. Systems such as Family_Winner offer far more negotiation support than decision support systems that advise upon BATNAs.

4. Future Work and Conclusion

At Glasgow Caledonian University we are about to commence a project on the development and testing of a United Kingdom web-based decision support system for use in improving the consistency and predictability of adjudicators' decisions in building construction disputes. In this project we aim to build a web-based decision support system by:

(a) combining the records of project partners (The Adjudication Reporting Centre; James R Knowles plc, Construction Contracts Consultants; MacRoberts, Solicitors; and Bishops, Solicitors); electronically publishing these records; creating a standard hub where stakeholders can record adjudication data; and data mining the records;
(b) decision modeling of the domain of building industry dispute resolution by developing a web-based model of legal reasoning in adjudication;
(c) commissioning a tool for predicting the course of building dispute adjudications.

The project has as objectives:

1. The data mining of adjudication records. The decisions of adjudicators will be examined for coherence. The major impact of this will be to replace the largely anecdotal experience of adjudication to a systematic and transparent analysis. Data will be collated into categories that will serve for statistical analysis, much as is currently done by the Adjudication Reporting Centre, but will also be collated from the point of view of the legal issues concerned and how these were dealt with by the adjudicator.
2. The development of new web-based, analytical tools to identify the predictability of decisions involving many variables, some of which will depend on legal reasoning, and some on purely statistical analysis. Accordingly, a decision model will be created based on a legalistic approach (rule based and case based) to adjudication, as derived from over one hundred decisions that have been made by the UK courts. This will enable stakeholders to access the model to anticipate likely outcomes in an adjudication, and for adjudicators to test their decisions. In addition, a model of knowledge discovery will be developed from statistical data, quite apart from the supposed paramountcy of legal reasoning, to identify areas which are likely to affect settlement.
3. Testing the decision model against new adjudications which are being handled by project partners, and the identification of issues where the model aids predictability, and which may be used to facilitate settlement and reduce conflict.

The impact of the achieving of these objectives will be to have greater transparency as to the cause of disputes which go to adjudication and the likely result of such disputes. Predictability should serve to remove part of the expense of projects which is as a result of legal wrangling. The beneficiaries will be all stakeholders in the construction industry, but particularly smaller companies whom adjudication was designed to help in the first place, thereby helping smaller companies to adopt business improvement measures. There are also

teaching and self-help training applications, and the web site would provide a one-stop source of trend data on adjudications.

The project will also provide an easily accessed, one-stop decision support system with information on procedure and case law and is capable of being used by adjudicators to test reasoning before publishing a decision. The opportunities it will bring include: (1) Ability to test reasoning; (2) Ability to test likelihood of success; (3) Information and guidance on procedure, thereby reducing the danger of procedural error by adjudicators; (4) Up-to-date information and guidance on matters that frequently come to adjudication; (5) Up-to-date information and guidance on case law; (6) Training tool; (7) Reporter on trends.

There are national and international markets for such a tool (especially British Commonwealth markets), and the software, the web-based legal modeling concepts, and the overall service offered should have scope for generic re-applications in different jurisdictions.

This paper has considered how negotiation decision support systems can provide useful advice re the reduction of risk in legal disputes. The use of techniques such as argumentation, game theory and heuristics can be of significant assistance. We have provided examples of such systems in the building industry and family law disputes.

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