

A WEB-BASED DECISION SUPPORT SYSTEM FOR DIVORCE LAWYERS

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I. INTRODUCTION

This paper summarises the results of the ESRC-funded project “A Web-based Decision Support System for Divorce Lawyers”. The aim of the project was to build a knowledge based system (a computer program) that could advise on Scots law relating to the allocation of matrimonial property when two people divorce. The system was intended to be comprehensible both to lawyers and lay persons; it would allow a user to go through a step by step consultation, drawing not just on the statutory and expertise rules embedded in the system but also on prior legal cases which can be consulted, and balanced against each other where conflicting. The system was designed to be available on the Web and therefore to run on any computer platform and be accessible to all persons with an Internet connection. The system was developed in two stages, by two different researchers (the first one resigned 9 months into his 12 month contract), using two different software packages. While the use of multiple tools creates

some difficulties in demonstrating an integrated system, it has advantages from the point of view of a prototyping project because it tests out a wider range of software, and enables software to be chosen that models particular areas of law more efficiently.

The system was evaluated by a group of 6 lawyers of differing experience. Although a small group, it represented a useful range of experience. One was a senior partner in a law firm with extensive experience in divorce work; two had substantial experience of several years (one in private practice, the other with a public charity, the Scottish Child Law Centre); two were second year trainee lawyers; and two were first year trainees whose level of experience was substantially the same as newly graduated law students.

II. BACKGROUND

This paper summarises the results of the ESRC-funded project “A Web-based Decision Support System for Divorce Lawyers”. The aim of the project was to build a knowledge based system (a computer program) that could advise on Scots law relating to the allocation of matrimonial property when two people divorce. The system was intended to be comprehensible both to lawyers and lay persons; it would allow a user to go through a step by step consultation, drawing not just on the statutory and expertise rules embedded in the system but also on prior legal cases which can be consulted, and balanced against each other where conflicting. The system was designed to be available on the Web and therefore to run on any computer platform and be accessible to all persons with an Internet connection.

III. FINANCIAL PROVISION ON DIVORCE

In modern Scots family law, issues of financial provision on divorce are governed by the Family Law (Scotland) Act 1985.

Issues of financial provision (*i.e.* allocation of matrimonial property, and associated issues) arise in almost every divorce case, although in many cases they are settled by informal or formal agreements rather than litigated to a judicial conclusion. Indeed, “it is the financial aspects of divorce together with child care arrangements which are overwhelmingly the most crucial and disputed matters in modern divorce” (Edwards and Griffiths, 1997, p. 340). Although the splitting of assets on divorce is often portrayed in the media as highly adversarial, in fact Scottish solicitors (unusually in the world perhaps) have a preference for seeking consensual negotiated settlements, and such agreements are formalised as minutes or joint minutes of agreement in around a quarter of all divorces, with far more informal compromises being rubber stamped by courts at the end of the day (Edwards and Griffiths, 1997, Chapter 15).

The principal philosophy underlying the Act is that divorce should be as far as possible a “clean break” between the parties (Edwards and Griffiths, 1997, p. 341), although periodical allowance orders remain available. Section 8 of the Act provides that the court has discretion on divorce to make a package of orders relating to financial provision, including capital sum orders, property transfer orders, periodical allowance orders and a number of incidental orders. How this discretion should be exercised is crucially guided by the five principles found in section 9. The key section 9 principle is section 9 (1) (a), which states that “the net value of the matrimonial property should be shared fairly between the parties to the marriage”. “Matrimonial property” is defined in section 10 (4) as:

- “...all the property belonging to the parties or either of them at the relevant date which was acquired by them or him (otherwise than by way of gift or succession from a third party)
- (a) before the marriage for use by them as a family home or as furniture or furnishings for such home; or
 - (b) during the marriage but before the relevant date”.

What constitutes “fair sharing” is defined in section 10(1), which states that

“In applying the principle set out in section 9 (1) (a) of this Act, the net value of the matrimonial property shall be taken to be shared fairly between the parties to the marriage when it is shared equally or in such other proportions as are justified by special circumstances”.

The “relevant date” referred to in section 10 (4) acts as a cut-off point for the valuation and assessment of matrimonial property, and according to section 10 (3) two dates may qualify: “(a) ... the date on which the parties ceased to cohabit;” and “(b) the date of service of the summons in the action for divorce”. Items which fall into the “matrimonial property” are valued as at the relevant date. Because equal sharing may be considered inequitable in a number of “special circumstances”, and indeed because parties may no longer own all the assets that once comprised matrimonial property at the actual date of divorce, the courts are granted considerable discretion to distribute the matrimonial property as it exists at the date of divorce in unequal proportions, and indeed to make such awards in general as are (a) justified by the section 9 principles *and* (b) reasonable having regard to the resources of the parties (section 8 [2]). “Special circumstances”, as non-exhaustively defined in section 10 (6) (a-e) include (a) the terms of any agreement; (b) “the source of funds or assets”; (c) destruction or dissipation of property; (d) nature and use of the matrimonial property; and (e) liability for expenses of valuation or transfer. In addition to section 9 (1) (a), the four remaining section 9 principles deal respectively with:

- section 9 (1) (b), economic advantage or disadvantage;
- section 9 (1) (c), economic burden of childcare;
- section 9 (1) (d), dependence by one party on financial support of other party for a limited period;
- section 9 (1) (e), potentially unlimited support based on financial hardship.

These are even more discretionary than the basic structure of section 9 (1) (a). Hence in giving advice about the likely split of property on divorce, and when negotiating a divorce settlement, lawyers draw extensively on the judicial opinions recorded in legal case reports, which show how the rules were applied and discretion exercised in the past. The domain is within tolerable parameters predictable, but only with the assistance of a great deal of case law authority and legal expertise.

IV. TECHNOLOGY AND LAW

Electronic creation and storage of legal documents has evident benefits for such a manifestly textual domain as law. Information retrieval systems, such as Lexis and Westlaw have proved invaluable resources for lawyers. Increasingly, too, documents are being placed on the Web for free and without proprietary restrictions of copyright. Both the British and Irish Legal Information Institute (BAILLI-see <http://www.bailli.org>) and the Scottish Courts Website (<http://www.scotcourts.gov.uk>) provide searchable online access to large amounts of legal cases for free. Convenient as information retrieval databases are, they have particular flaws. Many online resources only have a finite number of cases online usually the most recent. The Scottish Courts Website only posts cases from the Court of Session filed since 1998, for example. Moreover, the full potential of hypertext is rarely exploited in databases, where the documents themselves are frequently structured largely in plain text. A more fundamental issue regards the reliable retrieval of relevant documents to a case. When discussing information retrieval systems, Susskind has noted, “We are a long way from the ideal, that of these systems having total and precise recall, being able, that is to say, to retrieve *all but only* the relevant documents for a user’s particular purposes” (Susskind 1996, p. 109). For a range of reasons, search by keyword can both bring up both too many irrelevant documents, and at the same time can miss certain relevant ones.

This problem often exists even where the user is relatively adept with search strategies.

The legal profession has much to gain from a system that potentially improves the post-law degree education of trainee divorce lawyers, particularly as the body of case law interpreting the 1985 Act is already large and continuously expanding. Moreover, in a climate where most Scottish law firms now have on-line access, and Scottish legal cases are increasingly available electronically, often for free, a web-based system with access to relevant cases in digital form, and possibly other electronic documents such as styles of minutes of agreements, has obvious potential. When working in a relatively well defined domain, knowledge based systems (also known as “expert systems”) can be of great use in guiding users through a set of questions that are necessary and sufficient for their needs. They can also provide explanations of their reasoning, thus providing a training function for users. However, Susskind argues that legally trained users ought to use the system merely as a starting point, employing discretion in interpreting the advice: “it would be (...) unacceptable if the user of an expert system in law did not look beyond, but always accepted without further query, the advice offered during a consultation with his system” (Susskind 1989, p. 62). As much access as possible to primary case sources is necessary if the system is to be both transparent and self-justificatory. Ideally, therefore, the system should not only offer guided advice but should also provide the user with online access to an abstract and also the full text of any sources cited (such as previous cases).

V. OBJECTIVES

The objective of this project was to build a knowledge based system that would help trainee lawyers who are either new to, or rusty on, the nuts and bolts of the matrimonial property and divorce domain, both to understand the structure and content of

the domain, and to access case law available on the web in a systematic fashion. Although the document base in the domain (*i.e.* cases and statutes) is not enormous, it is sufficiently large that access to all and only the relevant documents, at the right time, is very desirable. The division of matrimonial assets requires 3 sorts of tasks: information gathering and storage; arithmetical calculations and the application of legal rules of a “definite” kind; the exercise of considerable amounts of discretion. We believe that a knowledge based system model is more appropriate in this kind of domain than classic question-and-answer type systems, since it is capable of resembling and automating the type of aid typically given by an experienced lawyer to a novice, including an emphasis on taking an advisory, negotiating or mediatory role, rather than an adversarial one.

The reasons for carrying out this project were as follows:

1. to allow for the development of a pilot project in divorce law which may act as a model for the use and integration of expert systems in law into both legal practice, legal education and the public sphere as publicly available advice. This may in turn reduce public funding costs in the form of legal aid, produce more reliable and more consistent legal advice to public benefit and improve the quality and scope of legal education.

2. to contribute to the general state of the art in the field of artificial intelligence and law, in particular to the integration of expert systems with Web based information. It was also intended to help to determine how “best practice” can be represented on the Internet, and whether those representations are of use to legal practitioners.

3. to contribute to the public awareness of how technology can advance and improve the quality of legal advice and help move expert systems in law in the UK on from academe to the “real world”.

4. to potentially improve the quality of mediation in divorce in property matters. This is an important area since current government policy is to further the use of self-regulatory mediation as an alternative to court based litigation both to save public

money and to reduce the adversarial conflict and stress caused by the court setting. However one of the major worries about mediation is that it may fail to support claimants' legal rights e.g. spouses at a power disadvantage may fail to secure a just allocation of matrimonial assets. User-friendly and cheap computer support systems may meet the "justice gap" left open by "all-issues" mediation without the presence of trained lawyers (see Lewis, 1999).

The expected results of this project were:

- A functioning prototype of an expert system in divorce law which will be of use to the legal profession, the training of law students and (possibly) the public e.g. by access in Citizens' Advice Bureaux or Law Centres;
- Novel development work integrating expert systems shell technology with Web based textual authority which will break new ground in the legal domain;
- Research into how legal computerization can be made appealing and more user-friendly both for the profession and for end users (the public as recipients of legal advice);
- Investigation into how computerized expert systems can support informal negotiation and settlement of disputes outwith a court framework (mediation);
- Investigation into the "knowledge management" issues of representing and communicating best practice in a way that is usable, accessible, and useful.

Target User: The tool is intended as a decision support system in the domain of financial provision on divorce in Scots family law. Its purpose is first, to facilitate learning in the domain, and second, to act as an advisory system/*aide memoire* after initial training has been undertaken. The primary intended user is the trainee divorce lawyer, whether at the stage of trainee or student. It is anticipated that the user will have prior general legal training, but residual or incomplete knowledge of the spe-

cific domain modeled in this system, *i.e.* the relevant sections of the Family Law (Scotland) Act 1985 and the surrounding case and statute law.

Aims: Traditional legal computer programs aimed at assisting students in law schools, such as the CALI, TLTP and IOLIS projects of the 90s, tended predominantly to be based around what were essentially question-and-answer models. Many ingenious approaches were used to disguise this fact: learning systems were developed based around Socratic dialogues, textbook chapters, real-world problem based tutorials or fact patterns, flowcharts, concept graphs, or at the most basic level, yes/no questions and multiple choice quizzes. But knowledge based systems represent a very different kind of intellectual activity. Instead of the user being asked to retrieve data from memory, or in more advanced systems, to analyse that data once retrieved, the user is typically shown in detail how a program written with the aid of a domain expert —modeling the expertise of a skilled user— would reach a desired goal given the known factual inputs to the problem domain. The thesis that is advanced in this project (and in previous work undertaken by Edwards (Edwards and Huntley, 1992; Edwards, 1995) is that this kind of informed participation in problem solving, although apparently more passive than “classic” computer assisted problem solving, actually is more helpful in promoting what is termed “active learning” than the more traditional approaches. The provision of access to relevant previous cases is expected to enhance this learning function. A practical and useful future extension to the system would be to permit the drafting of electronic documents resulting from such negotiation, such as minutes or joint minutes of agreement, and we hope to seek further funding to add this functionality in time.

VI. METHODS

We applied two different implementation methods to different parts of the system. Although this was not a part of our original

plan but was rather forced on us by the departure of our researcher late in the project and the recruitment of a second researcher who had different skills, this approach has proved useful in testing out two different approaches to system development and use, along with two different user interfaces.

Method 1: Java and JESS

The first part of the system implemented the collection of data and calculation of the net value of matrimonial assets according to section 9(1)(a) of the Family Law (Scotland) Act. Our three major design requirements were a language that was object-oriented that could model the structure of knowledge required in the domain; a rule-based inference engine to perform the legal reasoning; and a method of building a user interface that was compatible with the World Wide Web¹. We chose to use the Java programming language, which not only has the object-oriented capabilities we required, but also supports a variety of web-related technologies, in conjunction with JESS (the Java Expert System Shell [Friedman-Hill, 1998]), which provided facilities for rule based reasoning that could operate in conjunction with or independently from object-oriented programming.²

The user interface was built using Java Server Pages (JSPs); a server-based approach seemed more appropriate than the limited processing power of Javascript or the poor HTML handling of

¹ As this system was considered to be a prototype, considerations such as licensing cost, ease of installation and ease of maintenance were given lower priority. These issues would be more important for a system that was expected to become a commercial or semi-commercial product.

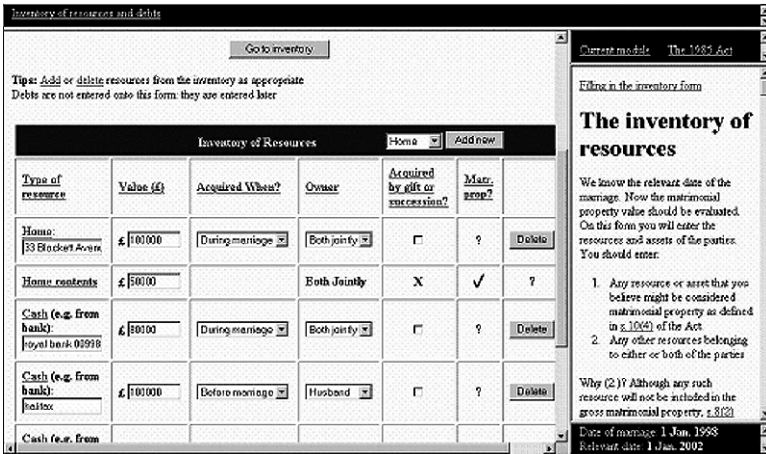
² For those with an interest in the technical details: JESS is a Java implementation of the CLIPS rule-based programming language, details of which are available from www.ghgcorp.com. A JESS rule engine can be embedded into and manipulated by Java code as a “Rete object”. In addition, objects in Java can be replicated in the rule engine as JESS objects. When a Java object is manipulated, its counterpart in JESS changes its properties also, and vice versa.

Java applets. We considered other server-based approaches but felt that servlets were less appropriate for web pages with large amounts of varying information and Perl offered too few facilities for rapid application development. JSP's look like HTML pages, but contain Java code that produces dynamic HTML content. They are also potentially useful for storing data on the server-side, which would allow a user to complete a run of the system over a series of sessions if required, as long as the related security issues could be resolved. Essentially, we have applied an "e-commerce" architecture to a legal knowledge based system.

A. Implementing the user interface

In trying to build a system that was user-friendly, we stuck to a few guiding principles such as prioritising simplicity over information complexity; for example, incomes become relevant only when addressing principles 9 (1) (b) onwards and are irrelevant to section 9 (1) (a) but are useful to gather at an early stage. To keep the interface uncluttered and clear, we felt that the narrative sections of the system, which includes the complete text of the Family Law (Scotland) Act 1985 in bite-sized chunks, had to be separate from the information-gathering forms, while maintaining a close relationship between the two. This was achieved by using juxtaposed frames, one containing the form, and the other with narrative explanations of the statute and other information. Fields on the forms were hyperlinked to explanations in the narrative frame, thus allowing ad hoc exploration of the explanations. Figure 1 shows a typical user interface screen.

Figure 1: User Interface for the Java / JESS method



B. Implementing the procedural flow

The procedural flow of the system, based on and adapted from previous diagrams in the proof-of-concept system developed by (Dale, 2000), is implemented as a series of modules. The first module represents section 9 (1) (a). It consists of four sub-modules, which compile a comprehensive inventory both of “matrimonial property” and overall assets not qualifying as matrimonial property owned by the parties (e.g. a house inherited from an aunt). Sub-module 1A requests general information about the parties relevant to the case. Sub-module 1B seeks to establish the date of marriage and relevant date. Sub-module 1C asks for a complete inventory of the resources belonging to the parties, and Sub-Module 1D asks about any debts (in order to establish the *net* matrimonial property).³ Discretionary issues relating to “special

³ Sub Module 1C was the most complicated part of the 9 (1) (a) module to implement, because the inventory of resources can list an unlimited number of each type of item—homes, home contents, cash & investments, pensions & life

circumstances” and sections 9 (1) (b)-(e) were not implemented in the time available. The end result is a complete list of resources, split up into matrimonial and non-matrimonial property, and with debts deducted, with explanations for each decision available.

Further actions that would have been useful if time had allowed would have included provision of a final module that could provide insight into the “package” of orders that the court might make in the case to implement the division of assets, and a further document drafting module to generate an appropriate minute of agreement.

Method 2: Webshell

After the departure of our first researcher, a second researcher, J. was recruited; she had significant experience in building models for software engineering and in general programming but had little experience as a programmer of AI software. She was familiar with an academically developed Web-enabled software tool called Webshell (Stranieri, Zeleznikow & Yearwood, 2002), however, which provides a decision tree representation based on an exception table, and is able to use a factor-based AI algorithm when no exceptions can be specified. Because of the short remaining time on the project, and because JESS’ license had become more restrictive since the start of the project, it was decided that the remainder of the project would be implemented using Webshell. J. generated models of knowledge using a directed graph format for the principles and rules and a custom format (Zeleznikow & Hunter, 2002) for discretionary knowledge, until she had modeled all the relevant sections of the Family Law Act; see Figure 2 for an example. She discussed and repeatedly revised these models with the domain expert; and she implemented the resulting models (except for the parts that S

assurance policies, and “foreseeable resources” such as damages claims, redundancy payments and the like. The system was therefore devised so that each item—including disputed valued items— could have a line created on the form for it.

had already implemented) in Webshell. This provided a method of implementing all the remaining sections of the Family Law (Scotland) Act relating to various special circumstances in the short time left on the project. However, the user interface was less smooth than with method 1, and the method of user interaction—a top-down approach to the Act—was also rather different from that used in method 1.

It was hoped that the two packages could be made to communicate with each other, so that the output of module 1, which dealt with the rule based parts of section 9 (1) (a), and had been satisfactorily implemented, would be used as an input by the Webshell-based system for the discretionary task of determining special circumstances and their impact under section 10 (6). Unfortunately, Webshell's database-based design allows users to provide answers to multiple choice questions but precludes users from entering numerical values or other dynamically defined data. This not only prevented us from implementing communication between the two systems, but also forced us to work around areas in the domain that required numerical inputs, by asking questions such as "On balance, did one partner suffer a greater economic disadvantage?" Our prototyping exercise thus made it clear that Webshell, at least in its current version, may be a good tool for reasoning about legislation that is subdivided into many levels of sub-clauses, but it is not an adequate software tool for reasoning about financial issues in law. In particular it fell down severely in terms of user interface and understandability, and reporting abilities, by not being able either to hold, store or output input values such as dates, names and figures.

VII. RESULTS

1. *Evaluation*

The systems were evaluated using a short questionnaire that focused on usability, completeness, and usefulness for a variety

of users. The results are curious. All the lawyers polled reported interest in (and indeed surprise at) the *useability* of the system. In terms of legal *completeness and accuracy* of knowledge representation, furthermore, there was also consensus that both modules were a reasonable representation of the law and practice in the area. The place the system fell down was in the crucial area of *usefulness*. Of the six evaluators, only the two most inexperienced lawyers, with almost no knowledge of the area, expressed interest in having such a system to use in their ordinary office environment, at least as currently implemented. Even one of those wrote that “For lawyers at present, I don’t think the system is particularly useful, except for providing a very crude numerical basis for negotiation.” The other most inexperienced user added that “I find it useful a trainee who hasn’t studied family law for some time.” This seems to indicate as a preliminary finding that the system (or others like it) may be useful in a training or revision capacity; but adds little to the expertise or convenience of the lawyer who has even basic knowledge of the area. The most senior lawyer was however intrigued by the system and asked to use it further. His main interest seemed to be in the system as a way of gaining quick and relevant access to the case law both in full text and abstract form. This reflects previous findings (Leith, 1998) that lawyers normally have little time to find and research primary legal materials even in dynamically changing fields like divorce law and are more attracted to methods which give such access by shortcuts, than to full text databases such as LEXIS. It seems that the most useful part of knowledge based systems for at least semi-sophisticated lawyers may be as “intelligent casebases” rather than for the legal and procedural knowledge represented in the rule base proper.

2. *Original objectives and system results*

In terms of the original objectives, this project has indeed completed a pilot project in divorce law that may act as a model

for the use and integration of expert systems into legal practice, legal education and the public sphere. The project has also highlighted problems in the building of legal knowledge based systems which may be usefully passed on to future implementers of these systems. The investigative prototyping activities of the project have contributed to the general state of the art in the field of artificial intelligence and law, with emphasis on how legislation and “best practice” can be translated into a form that lawyers can use. The main contributions to public awareness will appear as/when the systems are used and/or demonstrated in future. It is not yet clear whether the system actually improves the quality of divorce negotiations, as there was insufficient time to carry out a fuller evaluation; but the response of those who evaluated the system suggests that it may certainly help trainee lawyers to refresh their memory as to all the relevant information when giving advice.

The system definitely appears to have promise as a means of training and review for law students.

If further work is carried out to make the system integrated and widely usable, it should also be of use for training newer members of the legal profession. Evaluation again indicated as a preliminary finding that the system would not be suitable for lay users *e.g.* the public at Citizen’s Advice Bureaux, as they lack sufficient basic grounding in law (see Susskind, 1989).

In terms of technology, the system does integrate expert systems shell technology with Web mounted textual authority (cases), as intended, and that part of it appears to be the most promising in terms of future demands from the legal profession. However significant disparities were noticeable in the usefulness of the end results for module 1 and 2 of the system. All those evaluated except one indicated a preference for module 1 over module 2, but they also indicated orally that it did little they could not do themselves using pencil and paper. The rule based domain is relatively easy to implement, and works satisfactorily, but adds little to human legal expertise; the discretionary domain

is, by contrast, extremely difficult to implement and the end result is largely unhelpful because it does not fundamentally do anything other than list discretionary factors in a tree structure. A system that could perform true discretionary reasoning would be extremely useful; but the current technology that is available cheaply and which works within a Web environment does not seem to supply this. If it had been possible to synthesize modules 1 and 2, so that issues raised by information gathered in module 1 could have been “flagged” as problems in module 2 (e.g., the fact that the matrimonial home was bought by one spouse before the marriage and so was not matrimonial property) then something of more value might have emerged. This is definitely an area for further research.

Finally some investigation into the “knowledge management” issues of representing and communicating best practice in a way that is usable, accessible, and useful was also achieved, particularly in respect to the guidance given by the domain expert to the researchers.

A fully detailed study on how expert systems can support informal negotiation has not been carried out, but comments made during the evaluation process suggest that bodies such as Scottish Legal Aid Board would find this system very useful. This is a significant future customer for legal knowledge based systems. Indeed such systems are already in use by legal aid boards in Australia.

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