

RATIONALES FOR THE CONTINUED DEVELOPMENT OF LEGAL EXPERT SYSTEMS

by

by **John Zeleznikow*** and **Daniel Hunter****

Abstract

This article looks at the development and enormous potential of legal expert systems and the problems which often arise due to a suspicious and ill-informed legal fraternity. As most lawyers find themselves uncomfortable with machines generally, and computers specifically, being used to writing, reading and analysing human problems, and have little contact with technology, except where it affects a client or can be used to improve the efficiency of their practices, it is not hard to see that in more advanced uses of computer technology lawyers still struggle to understand fundamental concepts. Such an example is Artificial Intelligence ('AI') and Expert Systems ('ESs'). This article seeks to address some of the misconceptions which the legal profession apparently has about AI and its application to the Law. The area of AI and Law has not been sufficiently explained to legal practitioners and academics, a situation which this article hopes to address, along with providing a useful overview of the field.

Introduction

Computers are a closed book for most lawyers. Lawyers, as a rule, see themselves as part of the fine tradition of humanists; rational humanists, but humanists nonetheless. They deal with social and individual problems, and in this way seek to make a difference, or at least a living. They are used to writing, reading and analysing human problems. They have little contact with technology, except where it affects a client or can be used to improve the efficiency of their practices. Even in relatively low-level technology uses, such as word-processing, online databases and office automation, lawyers have traditionally lagged behind other businesses.

Most lawyers find themselves uncomfortable with machines generally, and computers specifically. With this general trend in mind it is not hard to see that in more advanced uses of computer technology lawyers still struggle to understand fundamental concepts. Such an example is Artificial Intelligence ('AI') and Expert Systems ('ESs'). This article seeks to address some of the misconceptions which the legal profession apparently has about AI and its application to the Law. The area of AI and Law has not

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been sufficiently explained to legal practitioners and academics, a situation which this article hopes to address, along with providing a useful overview of the field.

Some definitions

AI is the body of computer knowledge and current research which '...seeks to understand and implement computer-based technology that can simulate characteristics of human intelligence.'¹ Proponents of AI claim that, in time, it will be possible to create computers which can 'think', or at least mimic human reasoning to a degree that the product of their reasoning is indistinguishable from the product of human reasoning. The term 'AI' refers to both the field of study and to the systems which the researchers say they will create, the Artificial Intelligences themselves.

However, no researcher is close to attaining this 'ideal', and we are still at the incipient stages in AI research. One of the most promising areas of this incipient research in AI is Expert Systems. ESs are computer programs '...capable of functioning at the standard of (and sometimes even at a higher standard than) human experts in given fields.'² ESs work within very narrow domains: for example geology,³ medical diagnosis,⁴ and chemistry.⁵ A number of ESs exist in the legal domain (so-called Legal Expert Systems or LESs), and deal with such disparate areas as the law of

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- 1 Smith, R., *Dictionary of Artificial Intelligence*, (Glasgow: Collins, 1990), p22
 - 2 Susskind, R.E., *Expert systems in law*, (Oxford: Clarendon Press, 1987), p9
 - 3 Duda, R.O., Gaschnig, J.G. and Hart, P.E., "Model Design in the Prospector Consultant System for Mineral Exploration," in Michie, D. (ed.), *Expert Systems in the Microelectronic Age*, (Edinburgh: Edinburgh University Press, 1979) pp153-167
 - 4 For example, Shortliffe, E.H., *Computer Based Medical Consultations: MYCIN*, (New York: Elsevier, 1976)
 - 5 Buchanan, B.G. and Feigenbaum, E.A., "DENDRAL and Meta-DENDRAL: Their Applications Dimensions," *Artificial Intelligence*, Vol 11, 1978, pp 5-24

tax,⁶ trade secrets,⁷ chattel recovery,⁸ workers' compensation,⁹ and social security,¹⁰ to name but a few.

ESs in the legal domain differ markedly in their audience, purpose and implementation. It is vital to understand these differences in order to comprehend the different goals of researchers, and the different methods of implementation. A LES can be built for three main types of users: lawyers, paralegals and the general public. The choice of user type will determine the type of system built and the purpose of the system. A LES built for lawyers, such as for example IKBALS,¹¹ aims to advise lawyers of the relevant rules which apply to workers' compensation. It advises the lawyer of the statute, sections or cases which are relevant to a given problem, and the lawyer is then expected to interpret the sections or cases in the usual way. A LES such as this does not seek to remove the lawyer's involvement, but rather directs the lawyer to relevant information. It is a form of advanced interactive legal textbook, which is accurate and faster than its paper equivalent. Inexperienced lawyers have at their fingertips much of the distilled knowledge of experts in this legal field.

Antithetically, LESs for clerks or paralegals cannot rely upon the user's legal training. An example of such a LES is Softlaw's social security

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- 6 McCarty, L.T., "The TAXMAN Project: Towards a Cognitive Theory of Legal Argument," in Niblet, B. (ed.), *Computer Science and Law*, (Cambridge: Cambridge University Press, 1980); McCarty, L.T., 'Reflections on TAXMAN: An experiment in artificial intelligence and legal reasoning', (1977) 90 *Harvard Law Review* 837-93
 - 7 Rissland, E.L. and Ashley, K.D., *HYPO: A Case-Based Reasoning System*, Project Memo 18, The COUNSELOR Project, Department of Computer and Information Science, University of Massachusetts, 1987; Rissland, E.L. and Ashley, K.D., 'A Case-Based System for Trade Secrets Law' in *Proceedings of the First International Conference of Artificial Intelligence and Law*, (New York: Association for Computing Machinery, 1987) p60
 - 8 Tyree, A.L., 'FINDER: An Expert System', in *Proceedings of the Fortieth Annual Conference of the Australasian Universities Law Schools Association*, University of Adelaide 26-29 August 1985.
 - 9 Vossos, G., Dillon, T., Zeleznikow, J., and Taylor, G., 'An Object Oriented System for Legal Reasoning - IKBALS', *Proceedings of the Tenth International Workshop on Expert Systems and their Applications*, (Avignon: France, 1990) pp 741-754; Vossos, G., Zeleznikow, J., and Dillon, T., 'Combining Analogical and Deductive Reasoning in Legal Knowledge Base Systems - IKBALS II', *Proceedings of the Third International Conference of the Dutch Foundation of Legal Knowledge Systems (JURIX-90), Legal Knowledge Based Systems - Aims for Research and Development*, (Koninklijke-Vermande 1991) pp 97-105
 - 10 Johnson, P., Mead, D. (1991), 'Legislative Knowledge Base Systems for Public Administration - Some Practical Issues', *Proceedings of the Third International Conference on Artificial Intelligence and Law*, (Oxford: Association for Computing Machinery Press, 1991) pp 108-117.
 - 11 Vossos, G., Dillon, T., Zeleznikow, J., and Taylor, G., *op.cit.*; Vossos, G., Zeleznikow, J., and Dillon, T., *op.cit.*

ES¹² It is designed to assist clerks at the counters of the Department of Social Security's offices to advise the public of pension and social security entitlements. These entitlements are governed by various statutes, subordinate legislation and departmental guidelines. Wading through this morass of rules is made easier by a computer guidebook. The LES accepts pertinent information and can direct the clerk to the relevant entitlement, while at the same time calculating much of the financial entitlement. It can provide links to a word-processing system so that the clerk can automatically generate all necessary letters.

The social security law LES, like all other LESs of this type, simply steps through the rules applying the relevant ones as it finds them. The system does not answer complex questions of law, and if any are struck simply refers them to a Department of Social Security solicitor.

The final form of LES is the one designed for the general public. As yet no production version of such a LES exists. At our level of sophistication, we cannot produce a LES sufficiently robust to deal with the many different legal questions the general public has. Even if we were to narrow the field of law down to one which we can model in a LES, the knowledge about the world required to form a legally answerable question is well beyond the limits of existing LESs. Take as an example the simple legal question 'Am I entitled to any property and custody of children, now that my de facto spouse has run off?'. Asked this question, a LES would require the ability to parse the sentence into an intelligible form. It must be programmed and therefore 'understand' the principles of cohabitation, property division, and child custody, entitlement. It must deal with the colloquialism 'run off'. These are extremely difficult problems, and at this stage of development, virtually intractable. Yet all these problems are concrete and therefore relatively simple; we have not examined any question of abstract thinking, open texture or the philosophical underpinnings of the law. The task ahead of the researchers is enormous, and they are not yet close to a production system for the general public.

Uses of LESs

The discussion above about LES users has assumed that we are talking about production systems; that is, LESs which the makers intend to be used in real world environments by the targeted users. While this is the eventual aim of most research in the field, there are other purposes for which LESs are built. The three other main purposes are: research into computer science, teaching and examination of jurisprudence.

Computer Science Research

The legal domain is but one domain in which researchers seek to apply AI and ES concepts. Law is of particular interest however since it is a system of readily understood rules,¹³ with procedures for interpreting these

12 Mead and Johnson, *op. cit.*

13 At least to lawyers.

rules and an underlying philosophy which we call jurisprudence.¹⁴ No other field of human endeavour exists which has such a large body of learning concerning rules. Moreover, lawyers have specific experience in decision making, negotiation and reasoning from precedents. All these skills are of interest to computer science researchers wishing to examine the way in which humans think, in order to replicate some features of human reasoning.

One could hardly be surprised therefore when some LESs are built not for legal research but rather computer research. The Imperial College Group in England who have developed a LES examining the British Nationality Act are primarily interested in computer science and not legal research.¹⁵ Some legal commentators¹⁶ have ignored this rationale.

Teaching

LESs, particularly those designed for lawyers, have a largely untapped ability to teach. Junior lawyers or simply those lawyers unpractised in a particular area can learn by experience with a LES's assistance. A LES prompts the lawyer for relevant questions. The lawyer may at each stage ask why the LES asks the question. The LES's response in this way can explain each stage of a consultation in a particular legal field. Learning by doing has long been seen to be more effective than passive learning. LESs clearly have their place in legal teaching, even where they are designed for other purposes. LESs which are specifically designed to teach an area of law are even more useful for pedagogical purposes. Ashley's work¹⁷ has been primarily concerned with building tools to help students understand legal reasoning.

Jurisprudential Examination

Jurisprudence is a contentious field. Whilst people such as H.L.A. Hart claim that law is based on rules¹⁸ many scholars dispute his claim.¹⁹

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- 14 Some would argue that Law is *not* a system of readily understood rules, however this proposition forms the basis for a large and complex jurisprudential debate and beyond the scope of this introductory paper. However, for the purposes of computer scientists Law has more rules and better understood rules than perhaps any other field of human knowledge.
- 15 The work of the Imperial College Group provides the background for a later section in this paper, see 'Logic Programming and Legal Reasoning' below.
- 16 Notably, Moles, R., 'Logic Programming - An Assessment of its Potential for Artificial Intelligence Applications in Law' 2 *Journal of Law and Information Science* 137-164.
- 17 Ashley, K.D. and Alevan, V. 'Towards an intelligent tutoring system for teaching law students to argue with cases', *Proceedings of the Third International Conference on Artificial Intelligence and Law*, (Oxford: Association for Computing Machinery Press, 1991) pp 42-52.
- 18 See Hart, H.L.A., *The Concept of Law*, (Clarendon Press: Oxford, 1961); Hart, H.L.A., 'Separation of Law and Morals', in Dworkin, R. (ed.), *The Philosophy of Law*, (Oxford: Oxford University Press, 1977)
- 19 For a useful and interesting discussion about various jurisprudential issues in AI and Law. see Kowalski, A., 'Leading Law Students to Uncharted

New social movements throw new light on supposedly closed jurisprudential issues. Feminism as a basis for jurisprudential analysis is a recent phenomenon,²⁰ but no less valid for that reason alone. So too the computer and LESs may bring new concepts to light. As an example, Jo Smith and Cal Deedman of the University of British Columbia have created LESs which do not use established legal rules to create the system. Instead they identify relevant factors in an area of law, input a range of relevant cases and let the computer match a given fact situation with the closest existing case.²¹ This approach, which they call 'Deep Structure', does not rely on traditional techniques of jurisprudence. However in certain areas it produces similar answers to a traditional rule based approach. They argue²² that this technique shows that some areas of law are decided on issues not given high priority in legal judgements, but on hidden agendas. This argument is similar to the Critical Legal Theory of Unger and others.²³

It is irrelevant for the purpose of this article whether or not they are correct.²⁴ Rather, it is important to recognise that LESs produce new ways of examining jurisprudence.

Problems

Not even the most proselytising advocate of LESs would claim that LESs are without problems. This introduction forms a convenient place to examine some of these problems, and the means by which researchers propose to eliminate the difficulties.

Waters and Making them Think: Teaching Artificial Intelligence and Law', (1991) 2 *Journal of Law and Information Science* 185 at 192-197

- 20 See for example MacKinnon, C, *Towards a Feminist Theory of the State*, (Cambridge: Harvard University Press, 1989)
- 21 Smith J.C. and Deedman, C., 'The Application of Expert Systems Technology to Case-Based Law', *Proceedings of the First International Conference on Artificial Intelligence and Law*, (New York: Association for Computing Machinery Press, 1987) pp 84-93.
- 22 Smith & Deedman, *op. cit.*, at 88 *et seq.*
- 23 See for example Unger, R.M., 'The Critical Legal Studies Movement', (Cambridge: Harvard University Press, 1986); Singer, J.W., 'The Player and the Cards: Nihilism and Legal Theory', (1984) *Yale Law Journal* 1; Stick, J., 'Can Nihilism be Pragmatic?', (1986) 100 *Harvard Law Review* 332; Boyle, J., 'The Anatomy of a Torts Class', (1985) 34 *American University Law Review* 1003; Williams, J.C., 'Critical Legal Studies: The Death of Transcendence and the Rise of the New Langdells', (1987) 62 *New York University Law Review* 429; Hunt, A., 'Law Confronts Postmodernism', (1990) 35 *McGill Law Journal* 507
- 24 In AI and Law we are forced to enter the jurisprudential debate. It seems to the authors to be somewhat disingenuous to argue the correctness or otherwise of one particular jurisprudential model. In such a non-deterministic study as jurisprudence it would, in the authors' opinion, be foolish to claim that there is one correct answer. Many answers may exist depending upon one's world view. Many of these may conflict but it is possible that they can co-exist.

Difficulties with Rule-Based Systems

The existing LESs are largely confined to 'rule-based' systems. That is, most are comprised of a series of rules placed into a computer understandable form. These rules may be sections from an Act, the 'codification' of Common Law rules, or some other readily explicable system of rules. The computer stores these rules in a form of database which is called, not surprisingly, the rule base. Another part of the LES processes these rules and derives an answer from the rules when given a fact situation. This processor is commonly called the 'inference engine'.

The fundamental problem with such a system is that it needs an explicable series of rules to process. Without a coherent rule base the system cannot work. Unfortunately, Law is not a system which one can distil down to simple 'yes or no' rules. Our 'rule of law' consists of statutory rules, subordinate rules, and rules for interpreting rules; along with precedents and other non-rule-based elements. These non-rule elements do not lend themselves to the usual techniques of ES creation.

This, however, is not necessarily a detriment. When the standard techniques do not work then it is necessary to create new techniques. Some researchers²⁵ are creating systems which use reasoning by deduction and analogy from existing precedent. Although these systems are at best in their incipient stages they promise eventually to use reason in ways similar to lawyers.

The Difficulty with 'Accuracy'

Which brings us to another problem with LESs. Legal ESs are of a different nature to medical ESs. Whilst the accuracy of a medical diagnostic system can be measured, this is not the case with LESs. Unlike medical ESs, LESs can never be totally accurate. Whereas medical ESs primarily offer diagnoses, or at least plans for medical care, LESs are primarily advisory.

25 For example, Vossos, G., Dillon, T., Zeleznikow, J. and Taylor, G. *op.cit.*; Vossos, G., Zeleznikow, J., Dillon, T. and Vossos, V., 'An Example of Integrating Legal Case Based Reasoning with Object Oriented Rule-Based Systems - IKBALS II', *Proceedings of the Third International Conference on Artificial Intelligence and Law* (Oxford: Association for Computing Machinery Press, 1991) pp 91-101; Walker, R.F., Oskamp, A., Schrickx, J.A., Opdorp, G.J., Berg, P.H. van den, 'PROLEXS: Creating Law and Order in a Heterogeneous Domain', to appear *International Journal of Man Machine Studies*; Smith, J.C., Deedman, C., *op.cit.*; Rissland, E.L., Skalak, D.B. 'CABARET: Rule Interpretation in a Hybrid Architecture' to appear in *International Journal of Man Machine Studies*; Ashley, K. D., *Modelling Legal Argument: Reasoning with Cases and Hypotheticals*, (Boston: MIT Press, 1991); Ashley, K.D., and Rissland, E.L., 'A Case-Based Approach to Modelling Expertise', *IEEE Expert*, Fall, pp 70-77. A detailed discussion of some of the current research on case-based reasoning is discussed at Current Research below

By its very nature Law has a subjective element, and each individual case raises difficult issues, such as society's current mores, individual responsibilities and justice. Cases abound where courts and judges have ameliorated strict rules to find a more just decision. A famous example, *R. v Dudley*,²⁶ concerned two sailors charged with the murder of a cabin boy. All three protagonists were stranded without food on a lifeboat after a shipwreck. The sailors eventually killed and ate part of the cabin boy. When rescued, the sailors were brought to trial and found guilty of murder. At the time the mandatory sentence was hanging, and yet due to the extraneous circumstances both sailors eventually served six months in prison. This is but one example of so called 'hard cases', where judges have made new law as a result of a change in social mores or individual circumstance.

No LES can ever hope to take these factors into account. Even if we were able to develop a system which could apply social mores or individual considerations of justice, we cannot hope to codify these mores. What each individual considers 'just' is, in our opinion, a personal decision, based upon one's experience, upbringing and current social values, to name but a few considerations.²⁷ Since we cannot definitively say what is 'just' in the abstract we cannot program an ES to be just.²⁸

However, a LES need not be just, nor need it be capable of resolving hard cases. A LES designed to assist lawyers is in general only capable of answering a reasonable level of legal questioning based upon rules or precedent. After all, at its most fundamental level this is a major part of what a lawyer is required to do. If a case has certain social implications or special considerations then the lawyer can present these factors as part of the case. The LES simply acts as a tool, like any other in the lawyer's kit, to assist the lawyer in presenting a case or advising a client. The LES does not make the value judgements: this is the province of humans.

Research issues

Until recently, most LESs have modelled statutory interpretation by simply normalising sections of the legislation in the form of 'if_then_' rules, and then applying control and heuristic information in order efficiently to guide the logic of the system.²⁹ In consequence, the knowledge in these LESs amounted to nothing more than collection of rules reliant on static

26 (1884) 14 QBD 273. Similar hard cases exist in other jurisdictions, see for example *United States v Holmes*, 26 Federal Cases 360, No. 15383 (1842).

27 Some might say that Justice is not a personal evaluation, and that it is perfectly objective. If so, then Law must be Justice, an argument which the authors reject.

28 However, we should be able to say what is 'legal' and therefore should be able to program a legal ES accordingly.

29 Kowalski, R.A., *Logic for Problem Solving*, (New York: North Holland, 1979).

necessary and sufficient conditions and meta-rules³⁰ chained together. This 'knowledge' would be used in order to determine if a current case could be classified as belonging to a particular legal category.³¹

Although such rule-based models are both theoretically and practically very powerful, their suitability in reasoning with open textured domains such as law, must be doubted. This is particularly true when we consider a rule-based system's inefficiency in adequately capturing contextual information contained in previously tried cases. Contextual information is vital to consider when reasoning about the merits of a current case.

The books of Gardner³² and Susskind³³ outline the development of LESs. Their approaches tend to be naive, in that they concentrate on rule-based systems, and differentiate between 'easy' and 'hard' legal cases.

Sergot et. al.³⁴ have used the legal domain to promote the use of logic programming as an artificial intelligence tool. Whilst logic programming is valuable in the area of automated theorem proving, it has had little success in providing solutions for problems involving much qualitative work. Their original LES modelled the British Nationality Act of 1981. They assumed that it would be sufficient for a LES to merely interpret statutes using mathematical logic. The authors of this paper believe that Sergot et. al. were more interested in finding an application for logic programming, than in modelling legal reasoning.³⁵

Researchers have developed second generation expert systems to meet the aforementioned inadequacy of traditional production rule based expert systems. They have included the following techniques:

- **temporal reasoning** - the ability to reason with time;

30 Heuristic information used to control the system

31 Skalak, D.B., 'Taking Advantage of Models for Legal Classification', *Proceedings of the Second International Conference on Artificial Intelligence and Law*, (New York, Association for Computing Machinery Press, 1989) pp 234-241.

32 Gardner, A., *An Artificial Intelligence Approach to Legal Reasoning*, (Cambridge, Ma.: Bradford/MIT Press, 1987).

33 Susskind, R.E., *Expert Systems in Law, (A Jurisprudential Inquiry)*, (Oxford: Clarendon Press, 1987)

34 Sergot, M.J., Sadri, F., Kowalski, R.A., Kriwaczek, F., Hammond, P. and Cory, H.T., 'The British Nationality Act as a Logic Program', *Communications of the ACM*, Volume 29 No 5, pp 370-386. See discussion by Moles, *op,cit.*, and criticism in this article at Logic Programming and Legal Reasoning below.

35 As Richard Susskind notes (and Bob Moles quotes) "The goal of some of [the workers on PROLOG projects]...was to represent legislation in PROLOG come what may", Susskind, R.E., *Expert Systems in Law*, (Oxford: Oxford University Press, 1987) p24

- **fuzzy reasoning** - the ability to attach a probability that a certain line of reasoning will prove successful;
- **case based reasoning** - the ability to reason from past cases or experience;
- **qualitative reasoning** - the ability to reason with vague non-numerical concepts;

Current AI work in the legal domain has focused on how to deal with cases, and how to develop LESs which use cases and perform case-based reasoning, as well as perform statutory interpretation using rule-based reasoning.

Unfortunately most legal practitioners seem to equate LESs with rule-based systems. Susskind³⁶ classifies LESs as either diagnostic systems, procedural guides, intelligent checklists or document modelling systems.³⁷ Nevertheless, the books of Riesbeck and Schank³⁸ and Ashley³⁹ detail how arguing with cases can be incorporated into LESs. Rissland and Skalak⁴⁰ and Vossos et. al.⁴¹ discuss how to integrate reasoning with both cases and statutes in LESs.

Logic Programming and Legal Reasoning

One of the more vociferous critics of the use of logic programming in Law is Bob Moles of the Faculty of Law, Australian National University. In a recent article in this journal⁴² Mr Moles attacks one particular group of researchers based at Imperial College, University of London ('the ICG'). Unfortunately, his article fails to mention other important work in LESs which are not based upon logic programming. Whilst the authors agree in general with his critique of the ICG, they are disappointed in his failure to detail other important LES work. They would therefore like to complement Moles' article by noting some of the other work in the field, and by pointing out some of the more contentious arguments. Some of his arguments are valid, but others display the kind of misconceptions which lawyers have about AI and law. It is therefore worthwhile to answer his criticisms in order to make several points about the fundamental value of this area of research.

36 Susskind, R.E, *op.cit.*

37 See also Wright, R., 'The Cybernaughts have landed', (1991) 17 *Computers & Law* 1

38 Riesbeck, C. K. and Schank, R. C., *Inside Case Based Reasoning*, (Hillsdale, N.J.: Lawrence Erlbaum Associates Publishers, 1989)

39 Ashley, K, *op.cit.*

40 *Ibid.*

41 Vossos, G., Zeleznikow, J., Dillon, T. and Vossos, V., *op.cit.*

42 Moles, R., *op.cit.*

Moles' arguments

The Moles' article focuses on the work of one group in the AI & Law field, the Logic Programming Group of the Imperial College of Science and Technology in London. The Imperial College Group is comprised of specialists in logic programming, a technique used to represent rules in a formalised computer-comprehensible format. This technique has several limitations, not least of which is that it can only represent explicit rules, and only those rules capable of a limited form of representation. The ICG is one of the few research groups which believe that logic programming is suitable for use in the legal domain.⁴³

Moles' basic argument is that the ICG's work is flawed. His article raises six main points of contention:

1. The ICG's reformulation of the statute is not 'isomorphic' as defined by the ICG;
2. Law is not based on rules; one of ICG's fundamental premises. Moles argues this assumption undermines the ICG's work;
3. Rules cannot be applied mechanically, as the ICG does;
4. Words do not have an unambiguous meaning
5. Rules are not atomistic;
6. The ICG has no legal expertise;

This article will look at each one of these arguments. Whilst they demonstrate the shortcomings of the ICG approach, the reader should not be misled into thinking that all LESs have the same problems.

1. Isomorphism

Moles writes that the ICG researchers must reformulate their statutes to place the rules embodied in the statute into a computer comprehensible form. The ICG claims that the computer comprehensible format is isomorphic, that is carries the same structure as the legislation it seeks to model. It is clear from Moles' description that the ICG does not necessarily keep the same structure in the rule-base as the in the statute. The ICG asserts that the reformulation does not affect the statutory meaning. Moles' has another view; 'When we see what this reformulation can involve, it is clear that we must treat this claim with considerable scepticism.'⁴⁴

Moles then describes the long and involved way in which the ICG reformulates the statutory material. However, his argument does not seem to be with the outcome of their reformulation, but rather that this is not 'isomorphic' as the ICG claim. It is one thing to claim that the ICG are

43 Sergot et al, *op.cit.*

44 Moles, R., *op.cit*

misleading people by their choice of the term 'isomorphic; however this misses the point. It is surely irrelevant when the statute is reformulated into a computer representation whether it be isomorphic or otherwise. The important point is rather whether this reformulation accurately embodies the same rules as in the statute. The statute is a legal English version of rules which have been enacted by Parliament. Our system requires courts to interpret these rules with due regard to the words of the statute itself, and to other extrinsic materials which help to show the intention of Parliament.⁴⁵ Therefore, the rules are not just contained in the words of the statute, but come from a number of sources. A LES does not have to be isomorphic, that is follow exactly the form of the statutory words, in order for it to be an accurate representation of the rules which Parliament intended to be contained in the statute. Only the most naive would think that statutes are written in a way which could be simply thrown into a computer and then expect an accurate result. The only question of any import is whether the LES reflects the rules which it seeks to model.

2. Jurisprudential Basis

Moles then spends considerable time attacking the ICG for assuming that law is based on rules. He argues that legislation is linked to other legislation and the Common Law. This, he argues, puts paid to a rule-based system. However, his argument relies upon the assumption that researchers only seek to create a LES from one statute. It is true that the ICG seek only to model the British Nationality Act, but this does not invalidate the entire line of research.

If for example we sought to create a 'Murder Law LES' we could not just rely on the statute, for the Common Law provides an enormous body of rules to interpret the area. However, a quick perusal of the standard texts on the area will present the researcher with an adequate structure of the rules necessary (for example, the death must be of a human, must be with malice aforethought, etc). This simple rule structure could provide a LES which will be of use to a novice lawyer examining the area for the first time. We can insert as many of these rules, and at as high a level of detail, as a (human) expert can write down.

Moles' argument that each rule is intertwined with other laws and social considerations ignores two features. First, that human experts can extract these laws, and secondly, where the question is a value judgement or a social question then the LES can have the human decide. Moles ignores a fundamental principle that LESs cannot and should not take over from humans; they should merely act as tools for the various human users.

45 For example, section 15AB of the *Acts Interpretation Act 1901* (Commonwealth) and section 32 of the *Interpretation of Legislation Act 1984* (Victoria) allows courts to examine Parliamentary debates, explanatory memoranda and other such material to determine the intent of Parliament in passing the Act.

3. Mechanistic Application of Rules

Moles continues that we cannot separate the law from a particular application of law. As a result of this contention, he argues that we cannot create rules which apply to each fact situation and therefore we cannot represent rules in a LES.

His argument is, it seems, not just with creators of LESs. It must also apply to legal academics and the authors of legal scholarly textbooks. If Moles cannot separate law from its application to each fact situation then academics cannot teach would-be lawyers what the 'law' is. The law could therefore not exist separately from fact.⁴⁶ Authors up until this time have written their tomes secure in the knowledge that they are expressing an abstract series of rules, which can be applied to most, if not all, facts situations. If Moles' argument is correct, then their work has all been for nought.

The creators of LESs are like the authors of those works. They seek to embody the currently existing abstract rules. If these LESs do not embody all possible fact situations, and occasionally a case like *R. v. Dudley and Stevens*⁴⁷ arises, then what of it? Textbooks cannot take these considerations into account either. They, like LESs, are a useful guide to the lawyers who must take the rules and interpret them in light of the facts presented in each case.

4. Words' unambiguous meaning

Moles criticises the ICG for stating that words have an unambiguous meaning. Here his criticisms are justified. The ICG sent a questionnaire to various people to determine the meaning of words. This shows a lack of understanding on the part of the researchers at the ICG, and is not part of the standard methodology of ES builders.⁴⁸

Their mistake, however, does not invalidate the creation and use of ESs within the legal domain. Most words in a statute, precedent or rule if taken within context are unambiguous. A human expert can determine whether a word has a number of meanings and the ES builder can allow for these varying meanings. This can be done by providing alternate rules which the user can choose, depending on the user's opinion. Once again it is apparent that there must be significant human user involvement in all LESs.

46 Interestingly, one of the major researchers in AI and Law is Kevin Ashley whose work concentrates on building LESs to assist law students to develop legal reasoning skills and to explain to them how the legal system works. Students are able to query the LES to determine why the ES has come to the conclusion which it has. See Ashley, K, et al *op.cit.*

47 See above at footnote 26 and associated text.

48 Winston, P.H. , *Artificial Intelligence*, (Reading, Ma.: Addison Wesley, 1984) , Luger, G.F. and Stubblefield, W.A. *Artificial Intelligence and the Design of Expert Systems*, (Redwood City, Ca.: Benjamin Cummings, 1989).

5. Rules are not atomistic

Moles then argues that rules are not 'atomistic', that is they are related to the rules around them, and to other rules often contained in separate legislation. This repeats his assertions that law is not based on rules, and rather on a holistic grouping of law and fact. This article has already examined these points.⁴⁹

6. The ICG's personnel

Moles attacks the ICG's lack of legal knowledge. He is justified to a degree. It is standard methodology⁵⁰ to include a domain expert when building an ES. This makes sense, since a computer programmer or so-called 'knowledge engineer' cannot hope to have the skills necessary in the ES's domain. It seems that the ICG seeks to build LESs without legal experts, and if this is so then it is overstepping their area of expertise. As such, the ICG researchers must accept Moles' criticism.

It should be clear then, that much of what Moles says has merit, whereas other points he raises are in the authors opinion misconceived and inapplicable to the field as a whole. The ICG is not the exemplar of current research. It is useful to examine those who are exemplars of the current thinking in AI and law.

Current Research

Production rule based systems have proven invaluable in constructing LESs which determine the relevant legal domain, and whether an applicant is entitled to certain benefits. Such LESs include the work of Mead and Johnson⁵¹, Bench-Capon and Coenen⁵² and Sergot et. al.⁵³. Whilst such systems may be sufficient for paralegals and clerks, they do not provide intelligent legal advice. Both AI researchers and lawyers are interested in providing intelligent legal tools. Since legal practitioners reason primarily with both statutes and precedents, LESs must do likewise. There are other social and moral values which legal practitioners use, which no automated system could ever hope to model.

49 See '2. Jurisprudential Basis' above

50 See Luger and Stubblefield, *op. cit.*

51 Mead and Johnson, *op. cit.*

52 Bench-Capon, T., Coenen, F., 'Exploiting Isomorphism: Development of a KBS to support British Coal Insurance Claims', *Proceedings of the Third International Conference on Artificial Intelligence and Law*, (Oxford: Association for Computing Machinery Press, 1991) pp 62-68.

53 Sergot et. al., *op. cit.*

Case based reasoning (CBR) is an approach to problem solving based on retrieving and applying stored cases.⁵⁴ It uses past cases, or precedents, to find an interpretation of a current input case based on

- (a) the point of view of the user and
- (b) the intersection of 'similar' features occurring between the set of features present in the input case and the sets of features present in precedent cases.

From a set of most relevant cases retrieved, a smaller subset of most promising cases is selected by focusing on the importance of shared, relevant similarities. A case based reasoner would then proceed to justify the line of argument by explaining its interpretation.

This problem solving methodology brings up a variety of research issues, which researchers are currently addressing. For example, given a set of cases, how is the most relevant one selected? What happens if the chosen case fails to accomplish the goal? What knowledge is needed to adapt a case to a new problem? How should case memory be organised for efficient retrieval?

Although CBR is still a research paradigm, it has been shown to offer significant advantages over conventional rule-based expert systems when attempting to reason with previously tried cases. Research issues still confronting CBR include the representation of episodic knowledge, memory organisation, indexing, case modification and learning.⁵⁵ Despite these technical issues, CBR has been moderately successful in dealing with the subtlety and complexity inherent in legal reasoning problems. The books of Riesbeck and Schank⁵⁶ and Kolodner⁵⁷ describe numerous legal case based reasoning systems. JUDGE⁵⁸ works in the domain of criminal sentencing by modelling a judge who is determining sentences for people convicted of crimes. HYPO⁵⁹ performs case based reasoning in the area of trade secrets law, generating plausible arguments for the prosecution or the defence.

A legal case based reasoner essentially reasons from previously tried cases, comparing the contextual information in the current input case with

54 Ashley and Rissland, *op.cit.*; Tyree et al, *op.cit.*; Popple, J. 'Legal Expert Systems: The inadequacy of rule-based approach', *The Australian Computer Journal*, Vol 23 No 1 (February) pp 11-16; Vossos, Zeleznikow, Dillon and Vossos, *op.cit.*; Walker et al, *op.cit.*

55 Slade, S. 'Case-Based Reasoning: A Research Paradigm', *AI Magazine*, Vol. 12, No. 1, Spring 1991, pp 42-55.

56 Riesbeck and Schank, *op.cit.*.

57 Kolodner, J. , *Proceedings of a Workshop on Case Based Reasoning*, May 1988, Clearwater Beach, Florida.

58 Bain, W. M., 'Case Based Reasoning: A Computer Model of Subjective Assessment', Doctor of Philosophy Thesis, Yale University.

59 Ashley and Rissland *op.cit.*; Ashley, *op.cit.*

that of cases previously tried and entered into the system. Legal classification of the current case is achieved by:

- (a) drawing analogies between the facts and circumstances of the current case and those in the case knowledge base.
- (b) applying similarity metrics in order to retrieve the most 'on-point' cases. Precedent cases in the knowledge base are organised so that the features of the current case can be used to index them.

After the best match has been determined, the lawyer can then engage in constructing a sound case that he will present before the court in favour of his client. This is achieved by allowing the lawyer to strengthen his argument or weaken his opponent's argument by investigating the consequences of adding/subtracting or strengthening/weakening key attribute values of his input case that will affect the subset of applicable dimensions retrieved.

Conclusion

The development of legal expert systems offers tremendous potential for the legal fraternity. Because legal practitioners are constantly involved in the retrieval of large amounts of data (primarily in the form of recorded judgments) they need tools which efficiently and quickly locate the desired data. Unfortunately much work in the area of Legal Expert Systems has involved non-lawyers developing systems which naively attempt to mechanistically interpret statutes. They fail to use current developments in Case Based Reasoning and Qualitative Reasoning. Whilst the aforementioned production rule systems are of great use in judicial decision making, they are inadequate as a litigation support tools.

Legal case based reasoning has been developed to allow lawyers to argue with precedents. LESs using case based reasoning have tended to use two different techniques.

- (a) They have retrieved cases which match on certain features⁶⁰. Such an approach is appropriate when there is little or no statute law, but much case law. The area of trade secret law, for which Ashley and Rissland built their HYPO system, is one such example.
- (b) They have been based on the concept of 'deep structure', which involves drawing conclusions (or rules) from precedent cases.⁶¹ These 'rules are then given the same weight as statutory legislation.

It is the belief of the authors that neither rule-based reasoning nor case based reasoning will be of much benefit to lawyers undertaking litigation. What is required is a system that reasons with both statutes and cases. A lawyer may not work this way but any automated system must, because computers require formal, rigid rules. Lawyers and LESs will work in

60 Ashley and Rissland *op. cit.*

61 Smith and Deedman *op. cit.*

different ways, but hopefully come to the same result. Initially the system would perform statutory interpretation. When the statutes become insufficient, ambiguous or contradictory, the system would revert to searching for precedent cases which would help interpret the statutes. Such a system would more accurately model the way legal practitioners reason. Indeed, such systems are currently being developed. They include:

PROLEXS - developed at Vrije Universiteit, Amsterdam⁶²

CABARET - developed at University of Massachusetts, Amherst⁶³

IKBALS - developed at La Trobe University, Bundoora, Australia⁶⁴

It should be emphasised that all three systems use the object-oriented approach which allows for handling of precedents and exceptions, while logic programming is primarily designed for automated mathematical theorem proving; a mechanistic application of rules. It is interesting to note that the previously mentioned systems have categorically rejected the concept of using logic programming to build Legal Expert Systems.

Eventually we will have LESs which are of real value to practitioners. We have taken our first tentative steps, but we are still children and will fall down many times before we can walk with confidence. One day we may be able to run.

62 Walker et al., *op. cit.*

63 Rissland and Skalak., *op. cit.*

64 Vossos, Zeleznikow, Dillon and Vossos, *op. cit.*