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Decision Support within the Criminal Justice System.

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Introduction

There has long been a problem with the process of decision-making within the criminal justice system as regards the selection of cases for prosecution. This was one of the major concerns of the Royal Commission Report on Criminal Procedure (Royal Commission, 1981) which resulted in the recommendation for the establishment of a national independent prosecution organisation. Despite the subsequent establishment of the CPS, the decision as to which cases should be prosecuted remains a problem, attacked by the national media and researchers alike. The central issues remain whether those responsible are making good decisions, and how the consistency of these decisions can be improved. In recent years additional problems have been caused by the imposition of financial constraints by successive governments.

Solutions previously suggested as the means of improving the decision process have focused on improving the existing guidelines. This paper, however, discusses the potential use of decision support systems to achieve this aim. The project is exploratory and still in its early stages, thus any conclusions drawn must be tentative.

The paper is divided into six brief sections discussing;

- criticisms of the CPS and the added problems caused by financial constraints;
- the possibility of using technological decision support;
- artificial intelligence tools that have been developed in the legal domain;
- results of statistical analysis and the initial test of an artificial neural network;
- issues and problems raised by these results, and suggested solutions to them;
- attitudes expressed towards the proposed decision aid by members of the criminal justice system.

Criticisms of the CPS

Since its inception in 1986, there has been widespread criticism of the Crown Prosecution Service. Objections have been raised over the management of the CPS at both a national and local level, and the number and wide variance in the incidence of discontinued cases and cautioning rates between branches (Crisp & Moxon, 1994; McConville & Sanders, 1992). The level of directed and ordered

acquittals by judges in Crown court cases and the extent to which they may be predictable has also caused concern (Baldwin, 1997), since the weeding out of evidentially weak cases was one of the primary objectives in establishing the CPS. The methods by which decisions concerning prosecutions are made have often been isolated for criticism as being too subjective and vulnerable to individual prejudice or bias (Elliman, 1990). One particular claim is that the division of the tests used, into a realistic prospect of conviction followed by a public interest test, cannot in practice be followed by Crown prosecutors as public interest factors enter the consideration of the realistic prospect test (Mansfield & Peay, 1987; Sanders 1994). This is compounded by the different approaches adopted with regard to each test, the first being objective and the second subjective. Those guidelines issued for use by Crown prosecutors (CPS, 1994) have therefore been subject to scrutiny, resulting in concerns that no indication is made of the priority certain factors should assume in the prosecution decision (Sanders, 1994).

One factor often overlooked by critics is the difficulty prosecutors face in evaluating the evidential and public interest tests balanced with demands for greater efficiency. The search for more efficient methods of employing scarce resources has led recent governments to embark on a series of reforms throughout the public sector. The objectives set by the Conservative government for the criminal justice system were increased accountability, a reduction in the number of idiosyncratic decisions and better value for money. Each has considerable merit. However, Raine and Willson (1993; 1995) have long argued that the extremes of the government approach are inappropriate given the nature of the justice system and result in the danger of justice being compromised in the name of effective management. Issues such as the protection of human rights, the independence of the judiciary and the due process of justice should take priority over value for money. The introduction of mechanisms such as performance indicators and cash-limited grants has placed ever increasing pressure on those within the justice system to achieve more, faster. One of the dangers inherent in this approach is a reduction in the consideration given to individual cases making quantity rather than quality of decisions the target for optimisation.

The key measures introduced to assess the quality of prosecution decisions are only one part of the whole. The annual CPS report for the year 1996 to 1997 (CPS, 1997) shows very high performance figures for the organisation. The quality standards for the decision-making process were met in 98.8% and 99.1% respectively of prosecution and advice cases, for example. However, the report only shows the percentage of work reaching the CPS quality standard without detailing what this level of quality entails. The figures appear at odds with the continuing concerns over the performance of the service and raise the question as to whether performance indicators actually measure the relevant factors.

The overall image is one of a service which has suffered from inconsistency at a national, local and individual level, in which the demands for greater efficiency may have been at the expense of the due process of justice and which is in need of measures to revitalise the trust of the general public. However this must be achieved within the financial constraints placed on the criminal justice system by successive governments.

Possible Solutions

Those suggestions put forward thus far as a means of resolving inconsistency include further clarification of the Code for Crown Prosecutors and the prioritisation of criteria to be employed in the public interest test (Sanders, 1994). However, this in itself is fraught with difficulty as part of the skill of the Crown prosecutor is to assess the individual circumstances of each case, and to further remove their discretion would reduce the level of consideration of these circumstances, not to mention the possible adverse effect on morale.

An alternative approach lies in the development and introduction of a decision support system providing an independent assessment of the likelihood of conviction based on statistical analysis. It

is submitted that such a system could be used by Crown prosecutors as an aid in assessing the realistic prospect of conviction. The public interest test would remain at the discretion of the Crown prosecutor to be undertaken as at present only if there is a realistic prospect. This should encourage prosecutors to undertake each test independently. It may also alert the prosecutor to cases which are at present evidentially weak but where the gathering of further evidence by the police would facilitate a successful prosecution. However, it should be emphasised that the system has always been viewed as a potential aid, and not as a replacement for all or any part of the Crown prosecutor's role. Therefore it is not suggested that the system cannot be overruled, but that in assessing why it should be overruled the prosecutor would need to evaluate his or her intended reasons carefully.

The introduction of the system should lead to an improvement in both the quality and consistency of decisions by prosecutors, ensuring only those cases which are strong enough to support a realistic prospect of conviction are taken forward to prosecution. It would be envisaged that this improvement of quality would also lead to improvements in efficiency, in terms of fewer judge ordered and directed acquittals, the cost savings of which could off-set the investment in technology.

Artificial Intelligence Tools Available

Various artificial intelligence tools have thus far been employed by researchers in the legal domain, including expert systems, case based reasoners and artificial neural networks. Other methods, such as the sixth generation programming techniques of genetic algorithms and genetic programs may in the future prove effective in legal problem-solving, but have only very rarely been applied to this domain. Expert systems work best in straightforward statutory domains where there is little argument or ambiguity and as such appear to be better suited to areas of civil rather than criminal law. Both they and case based reasoners experience problems with linguistic indeterminacy and share an inability to deal effectively with "hard" cases, resting on interpretation of ambiguous statutes or precedents (Aikenhead, 1995b; Hobson & Slee, 1993). Although case based reasoners have proven effective in other domains (see Kolodner, 1993 for examples), their level of analogising is too crude to enable contextualisation of complex human situations.

Both expert systems and case based reasoners share a fundamental weakness in terms of the present suggested use which derives from the nature of their approach. Both are symbolic tools, which entails human programming. This is problematic as the way in which the tribunal of fact makes its decisions at trial is not known, indeed their deliberations are protected by section 8 of the Contempt of Court Act 1981. Needless to say, if the decision process is unknown it cannot be recreated by a programmer, however talented. The greatest strength and the main reason behind utilising an artificial neural network is its connectionist approach. A neural network excels at pattern recognition and classification and is, therefore, able to identify relationships between variables which may not otherwise be recognisable. This eliminates the need for the formation of explanatory rules which would not be open to testing. By using various factors retrieved from case files as the input factors and training rather than programming the system, it was anticipated that the process of machine learning would result in the network being able to accurately predict the outcome of cases.

However, this strength includes the network's greatest weakness, that it is unable to justify its conclusions as working steps cannot be recognised or assessed (Aikenhead, 1995a, 1995b; Bench-Capon, 1993; Hobson & Slee, 1993; Hunter, 1994). Attempts have, however, been made to examine the weights of connections between neurons and thus formulate explanatory rules (Bochereau, Bourcier & Bourguine, 1991). An added strength is that neural networks can withstand noise or irrelevant information, without it affecting their accuracy (Bench-Capon, 1993), and this may provide some leeway when attempting to input only the relevant information. All three methods can be criticised in their attempts at simulating legal reasoning from various perspectives and in their inability to deal effectively with novel situations (Aikenhead 1995b). However, it was felt that the connectionist approach offered considerable advantages over symbolic methods in terms of the objectives of the study and was thus selected as the tool to be used.

Testing an Artificial Neural Network

Practical feasibility is being assessed by a simulation of the system. Due to problems associated with the use of hypothetical cases (Hunter, 1996), the data was collected from files of completed cases. Ideally CPS files would have been used but this proved impossible due to the anticipated managerial changes within the organisation, and concerns of senior management regarding the acceptability of the system. The difficulties encountered in gaining access to data from various potential sources reinforced the necessity of examining the response to the system of key organisations within the criminal justice process.

Access to archived files was secured in four magistrates' courts. This presented the opportunity to examine what may be termed as "easier" rather than "harder" cases. It was decided to concentrate solely on theft and burglary cases, as they are relatively common, encompass a range of gravity and warrant a considered decision. Data was collected on as many features as possible from 634 cases in total. It transpired that the data collected was not especially focused on the evidential aspect of the trial and this raised two issues. First, whether the information available was sufficiently rich to enable the system to make accurate predictions incorporating evidential strength; and second, whether it included those features relevant to the prosecutor's initial decision. Decisions regarding some factors such as whether bail was granted and the defendant represented occur subsequently, although they may be found to influence the outcome at trial.

A statistical analysis was undertaken using the SPSS package, in order to assess the linearity of the court decisions and to enable comparisons to be made between attempts to predict outcomes using both linear and non-linear methods. The plea was not included in the analysis as it would not be available to the Crown prosecutor at the time the prosecution decision was made, even though they may be aware that a guilty plea is likely. The analysis included tests for the existence of a linear association between each factor and the outcome and the strength of the association. This was followed by logistic regression and discriminant analysis in order to assess whether the court's decision was predictable using linear methods. The results answered this issue conclusively, as shown in Tables 1 and 2.

Table 1. Logistic Regression Classification Table

(Total of 246 cases used by SPSS package)

Observed	Predicted		% Correct
	Guilty	Not Guilty/Other	
Guilty	225	1	99.56
Not Guilty/Other	15	5	25.00
		Overall	93.50%

The logistic regression, which used those factors with a significant statistical association to the decision produced an accurate prediction in 93.5% of cases overall, but was unable to predict not guilty verdicts or other dispositions in more than 25% of those cases. To utilise a system working on this linear model would therefore not significantly reduce the number of cases going to trial where the defendant is not convicted, as its predictions predominantly reflect the distribution of dispositions.

Table 2. Discriminant Analysis Classification Table

(Total of 505 cases used by SPSS package)

Observed	Predicted		% Correct
	Guilty	Not Guilty/Other	
Guilty	290	155	65.2
Not Guilty/Other	17	43	71.7
		Overall	65.94%

The discriminant analysis both reinforced this view and issued a warning that problems lay ahead in analysing the data. The results obtained indicated that only three factors accounted for 100% of the variance, but the court's decision was only predicted correctly in nearly 66% of the cases examined, a result worse than would be expected of random guessing given the ratio of convictions to other dispositions. This is highly irregular and illustrates the need for non-linear analysis.

The high level of convictions may suggest that decisions as to prosecution are being undertaken very effectively. However, the present research as an exploratory study is dealing with summary trials where the level of dismissed and not guilty dispositions is much lower than in trials on indictment. A system which could accurately predict these cases in the magistrates courts would, if successfully adapted to the Crown courts, have a much greater scope and effect.

The practical tests are being undertaken within the Neural Computing Research Group at Aston University, with the help of Professor David Lowe. Initially eleven features extracted by the statistical analysis were plotted on a sammon map, a non-linear projection of high dimensional data (in this case eleven dimensions) into two dimensional space. A lack of distinct clusters for both classes indicated that the problem is not separable although a general clustering of the incidence of not guilty or other dispositions can be identified. Three of the twenty not guilty or other disposition class were plotted in exactly the same spot as convictions, highlighting cases where the eleven characteristics were identical but the outcomes different. Possible reasons for this occurrence plus those of outlying points warrant further investigation.

These eleven characteristics were then entered in binary code as inputs to a feed forward network. The results as expected were not impressive. The network trained to optimise the most represented class i.e. convictions, and was thus unable to identify alternative dispositions. This illustrates the difficulties encountered when dealing with real-world rather than hypothetical problems. The issues raised have been addressed in work previously undertaken by Lowe and Webb (1990) in the field of medical prognosis where parallels with outcome prediction can easily be identified.

Potential for Development

The main problem results from the much higher proportion of convictions than of other dispositions, roughly speaking at around 90% of the total. As the neural network is a general classifier, it achieves the highest overall accuracy. This is often at the expense of the least represented class, which tends to be ignored by the network. The inability to predict not guilty or other dispositions, despite a high overall accuracy rate illustrates this particular problem. A larger set of the least represented class is needed to obtain train and test sets of sufficient size which will enable the network to classify them. The class will be enlarged by using those cases where one or more of the extracted features was unavailable. Following the collection of the larger class, the problem can be further addressed by exploiting the a priori probabilities (Lowe & Webb, 1990), which will result in the network optimising the correct classification for the least rather than the most represented class.

Uneven class importance is a related issue and to some extent depends on the objectives in using the network. In attempting to reduce the number of cases reaching court resulting in not guilty or other dispositions, such as judge ordered acquittals, the class of most importance will be these other dispositions. If the data set is biased against predicting these dispositions correctly by virtue of their

small distribution within the total data set, the priors associated with that class should be increased artificially.

Missing data is also a problem. In 386 cases one or more of the extracted features was unavailable and were dismissed leaving a data set of 248. Had these missing features been available the network would be able to produce a more realistic model. A solution to counteract this problem is the random assignment of values to the missing data in proportion to their distribution within the total number of cases. This will generate a complete set of data where each variable still reflects its original distribution.

A final issue to be mentioned is the possibility of introducing cross-class penalties, enabling the network to reflect the degrees of gravity associated with making a wrong decision. This in itself is a complex task, not least due to the subjectivity involved in balancing the costs to the individuals concerned with those to the public and the abstract notion of justice. A cost matrix can, however, be used as the prototype target within the network reflecting the priorities required.

While these methods have previously been found to improve the predictive potential of a neural network, it is anticipated that the suggested practical implementation of any system incorporating them would result in grave concerns being aired within the criminal justice system regarding the acceptability of an artificially enhanced data set.

Attitudes Towards the System - the Acceptability Criteria

The assessment of the system's acceptability involves correspondence and interviews with members of key groups involved in the criminal justice process. This was seen as imperative, as serious moral or philosophical concerns must be addressed. It was also important to assess whether potential problems envisaged were real or perceived. Those individuals interviewed represent a cross-section of representatives for the CPS, the police force, the judiciary and magistracy, criminal solicitors and barristers and academics working in related fields.

The interviews conducted so far reveal a number of interesting opinions. On the whole, the idea of using technological support in these complex human decisions was welcomed, although all parties stressed the necessity that any such system should be "a servant and not a master". Crown prosecutors were seen as being in an unenviable position given the need to increase cost efficiency and productivity and public pressure to prosecute cases. With only isolated exceptions it was these factors that were blamed for perceived poor performance and not the prosecutors themselves. Many interviewees felt that any method which could aid prosecutors in their difficult task should be welcomed.

The major practical problems foreseen were the difficulties in gaining the detailed level of data required and the subsequent assignment of code values, the inability to gain both funding for the development of any such system, and support from the higher management of the CPS, the expected refusal of experienced prosecutors to utilise the system if implemented, and the potential for abuse of the system by prosecutors as a short-cut to decision-making.

Most interviewees agreed that as long as the system were used as a decision aid and not as a decision maker, there were few or no philosophical or ethical objections. Where these issues were highlighted it was in respect of the desirability of using technology to aid what is seen as a human decision, and associated concerns that technology might replace human judgement. One key issue that became evident during the course of the interviews was that the majority of those within the criminal justice system are not technologically minded. It was no surprise that many found the concept of a neural network hard to grasp and the philosophy it represents alien. As a result the general perception was that there is no substitute for human experience and reasoning. Fear of the results of implementing technology was also evident, due presumably to a lack of knowledge concerning the potential of

computer support .

Conclusions

This study shows that although there may be a need for the development of technological aids within the criminal justice system, they are a long way from the fruition of implementation and acceptance. The aim of this research is to assess the potential of developing a system that can accurately predict the outcomes of cases and which could be utilised by the CPS. It may be practically possible, but access and use of the more detailed files of the CPS would be necessary to extract the relevant information. It also appears likely that a neural network would require artificial enhancement of the data set, and very unlikely that the criminal justice system as a whole would accept the use of an artificially enhanced tool.

The remaining barrier to progress appears to be the lack of understanding of developing technology and associated fears of its effects on the legal system. It is this lack of understanding and the entrenched general feeling against the use of technology in this sphere that would primarily need to be addressed in order for any such system to be implemented and accepted by the members of the legal community it purports to serve.

References

- **Aikenhead, M.**(1995) "The Uses and Abuses of Neural Networks in Law" Santa Clara Computer and High Technology Law Journal, 12, pp 31-70.
- **Aikenhead, M.** (1995) "Legal Knowledge Based Systems: Some Observations on the Future" Web Journal of Current Legal Issues, <http://www.ncl.ac.uk/~n...s2/aiken2.html#contents>
- **Baldwin, J.** (1997) "Understanding Judge Ordered and Judge Directed Acquittals in the Crown Court" Criminal Law Review, pp 536-555.
- **Bench-Capon, T.** (1993) "Neural Networks and Open Texture" In Proceedings of the Fourth International Conference on AI and Law, Amsterdam, 1993. ACM Press, pp 292-297.
- **Bochereau, L., Bourcier, D. and Bourgine, P.** (1991) "Extracting Legal Knowledge by Means of a Multilayer Neural Network Application to Municipal Jurisprudence" In Proceedings of the Third International Conference on AI and Law, Oxford, 1991. ACM Press, pp 297-306.
- **Crisp, D. and Moxon, D.** (1994) "Case Screening by the Crown Prosecution Service: How and Why Cases Are Terminated" Home Office Research Study, 137, HMSO.
- **Crown Prosecution Service** (1997) Annual Report for the Period April 1996 - March 1997 From the Director of Public Prosecutions to the Attorney General, HMSO.
- **Crown Prosecution Service** (1994) Code for Crown Prosecutors, HMSO.
- **Elliman, S.** (1990) "Inadequate Guidance" New Law Journal, 12/01/90, Volume 140, Part 6438, p 14.
- **Hobson, J.B. and Slee, D.** (1993) "Rules, Cases and Networks in a Legal Domain" Law, Computers and Artificial Intelligence, 2, Number 2, pp 119-134.
- **Hunter, D.** (1996) "Commercialising Legal Neural Networks" The Journal of Information, Law and Technology, [>](http://elj.warwick.ac.uk/elj/jilt/artifint/2hunter/)
- **Hunter, D.** (1994) "Looking For Law in All The Wrong Places: Legal Theory and Legal Neural Networks" In Prakken, H., Muntjewerff, A.J., Soeteman, A. and Winkels, R. (eds.) Legal Knowledge Based Systems: The Relation With Legal Theory, Lelystad: Koninklijke Vermande, pp 55-64.
- **Kolodner, J.** (1993) Case-Based Reasoning, Morgan Kaufmann Publishers Inc.
- **Lowe, D and Webb, A.R.** "Exploiting Prior Knowledge in Network Optimization: An Illustration from Medical Prognosis" Network 1, pp 299- 323.
- **McConville, M. and Sanders, A.** (1992) "Fairness and the CPS" New Law Journal, 31/01/92, Volume 142, Number 6537, p 120.

- **Mansfield, G. and Peay, J.** (1987) The Director of Public Prosecutions. Principles and Practices for the Crown Prosecutor, London, Tavistock.
- **Raine, J.W. and Willson, M.J.** (1995) "New Public Management and Criminal Justice" Public Money and Management, Volume 15, No 1, pp 35 -40.
- **Raine J.W. and Willson, M.J.** (1993) Managing Criminal Justice, Harvester Wheatsheaf, Hemel Hempstead.
- **Royal Commission** (Chairman; Sir Cyril Philips), (1981) Royal Commission Report on Criminal Procedure, HMSO.
- **Sanders, A.** (1994) "The Silent Code" New Law Journal, 08/07/94, Volume 144, Number 6655, p946.