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Computer-Aided Law Decisions

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COMPUTER-AIDED LAW DECISIONS

by

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The purpose of this article is to describe how microcomputers can aid in making law decisions, including decisions that relate to the judicial process, law practice, and law management.

Those three kinds of law decisions are subdivided into eight examples. The material on the judicial process deals with computer-aided (1) case synthesizing, (2) fact synthesizing, and (3) law evaluation. The law practice material deals with computer-aided (4) counseling, (5) negotiation, and (6) advocacy. The law management material deals with (7) judicial administration, and (8) legal administration. Each of those eight types of computer-aided law decisions is described along with a concrete example and an illustrative visual aid.

The idea of computer-aided law decisions is a law variation on computer-aided manufacturing (CAM) and computer-aided design (CAD), which are becoming increasingly important in the American economy. Computer-aided law decisions have in common a systematic procedure for processing a set of (1) goals to be achieved or predictive criteria, (2) alternatives for achieving the goals or alternative situations, and (3) relations between criteria and alternatives in order to choose a best alternative, combination, allocation, or predictive decision-rule.[1]

Computer-aided decisions thus differ substantially from computer-aided clerical work like word processing, file management, litigation support, document drafting, citation access, or law office bookkeeping.[2] At the other extreme, computer-aided decisions differ from the idea of computers making decisions in place of appellate judges, trial judges, legislators, legal counselors, law negotiators, lawyer advocates, judicial administrators, or law firm administrators.[3] Computerized clerical work is highly possible and useful, but it is

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[1]For general materials on multi-criteria decision-making applied to the legal process, see S. NAGEL, MICROCOMPUTERS AS DECISION AIDS IN LAW PRACTICE (1987). An earlier version is available from the Committee on Continuing Professional Education of the American Law Institute and the American Bar Association. On the general methodology, see S. NAGEL, POLICY ANALYSIS WITH MICROCOMPUTERS (1988), and the *Policy/Goal Percentaging* program, Decision Aids, Inc., 361 Lincoln Hall, University of Illinois, Urbana, Illinois 61801.

[2]For discussions of computer-aided clerical work, see M. MASON, AN INTRODUCTION TO USING COMPUTERS IN THE LAW (1984); and D. REMER, COMPUTER POWER FOR YOUR LAW OFFICE (1983). Relevant software includes *WordStar* (word processing), *DBase II* (file management), *Evidence Master* (litigation support), Matthew Bender (document drafting), *WestLaw* and *Lexis* (access to citations and case excerpts), and *Data Law* (billing and bookkeeping).

[3]For articles that optimistically, pessimistically, or jokingly view computers as partly replacing judges and lawyers, see Bartholomew, *Supreme Court and Modern Objectivity* 33 N.Y. ST.B.J. 157-164 (1961); Gib-

not lawyer work. Computers as decision-makers without judges, lawyers, and other legal personnel is probably not possible and of questionable value if it were possible.

Microcomputers can be helpful in processing goals, alternatives, and relations, especially for indicating what it would take to bring a second-place alternative up to first place, or what it would take to improve a predictive decision-rule. The microcomputer software described in this article belongs in the general categories of multi-criteria decision-making, expert systems, and artificial intelligence. The specific software is called Policy/Goal Percentaging (abbreviated P/G%) because it relates policies or decisions to goals or criteria, and it uses part/whole percentaging to deal with the goals being measured in different ways.

COMPUTER-AIDED JUDICIAL PROCESS (CAJP)

Computer-Aided Case Synthesis (CACS)

Table 1 provides an example of synthesizing a set of appellate cases using the P/G% software. The appellate cases consist of nine cases dealing with legislative redistricting from *Colegrove v. Green* in 1948 to *Baker v. Carr* in 1962. Each case is scored yes with a 2 and no with a 1 on each of the four predictive criteria. The criteria include (1) whether equality is explicitly required by the relevant federal or state constitution, (2) whether a state or federal legislature is involved, (3) whether the degree of equality violation is big or little, and (4) whether a federal or state court is involved. The yes answer is the one that favors a decision for the side that is attacking the existing redistricting system.

The last column shows how each case was decided in terms of whether the winner was the defender or the attacker of the existing redistricting system. The second-to-last column shows the sum of the raw scores. It leads to a decision rule that says, "if there is a total raw score of 7 or above, then the attacker wins; and if there is a total raw score of 6 or below, then the defender wins." That decision rule, however, has one inconsistency. It is the Grills case, in which there were only 6 points, but the attacker still won.

To eliminate such inconsistencies, one can do a variety of legitimate things, as indicated in the notes below the table. The most meaningful approach is generally to give the predictive criteria different weights to indicate their relative importance. In this context, the most important criteria are the first criterion (which deals with the nature of the law) and the third criterion (which deals with the key facts). Of the two, the equality requirement is the most important since the degree of equality violation would mean little if there

bons, *Using Computers to Analyze Legal Questions* in SYSTEM SCIENCE AND JURISPRUDENCE (T. Rasmusson ed. 1986); and Lawlor, *Stare Decisis and Electronic Computers* in JUDICIAL BEHAVIOR: A READER IN THEORY AND RESEARCH (G. Schubert ed. 1964).

is no equality requirement. Giving the equality requirement a weight of 2 doubles all the numbers in the first column. Doing so changes the summation scores. The new weighted summation scores now lead to a decision rule that says, "if there is a total raw score of 8 or above, then the attacker wins; and if there is a total raw score of 7 or below, then the defender wins." That new decision rule results in no inconsistencies. The set of cases have thus been synthesized into a meaningful decision rule.[4]

TABLE 1

Synthesizing Appellate Cases: Legislative Redistricting[5]

Criteria / *Cases*	*Equality Requirement W = 1 (or 2)*	*State Legislature W = 1*	*Equality Violation W = 1*	*Federal Court W = 1*	*SUM (Weighted)*	*OUTCOME Winner*	*Award*
Colegrove[6]	1 (2)	1	1	2	5 (6)	D	$0
Grills[7]	2 (4)	2	1	1	6 (8)	A	2
Maryland[8]	1 (2)	2	2	1	6 (7)	D	0
Scholle[9]	1 (2)	2	2	1	6 (7)	D	0
WMCA[10]	1 (2)	2	1	2	6 (7)	D	0
Asbury[11]	2 (4)	2	2	1	7 (9)	A	6
Dyer[12]	2 (4)	1	2	2	7 (9)	A	8
Baker[13]	2 (4)	2	2	2	8 (10)	A	9
Magraw[14]	2 (4)	2	2	2	8 (10)	A	10

[4]On applying multi-criteria decision-making to synthesizing sets of appellate cases, see Nagel, *Using Microcomputers and P/G% to Predict Courts Cases* 18 AKRON L. REV. 541-574 (1985); Nagel, *Case Prediction by Staircase Tables and Percentaging,* 25 JURIMETRICS J. 169-196 (1985); and S. NAGEL, CAUSATION, PREDICTION, AND LEGAL ANALYSIS (1986). Also see K. LLEWELLEYN, THE COMMON LAW TRADITION: DECIDING APPEALS (1960) Relevant software for inductively synthesizing appellate cases could include statistical analysis software, such as SPSS-PC, 444 N. Michigan Avenue, Chicago, Illinois 60611.

[5]The above data comes from Nagel, *Applying Correlation Analysis to Case Prediction,* 42 TEX. L. REV. 1006 (1964). Reprinted in Nagel, *Using Microcomputers and P/G% to Predict Court Cases,* 18 AKRON L. REV. 541 (1985).

[6]Colegrove v. Green, 328 U.S. 549 (1946).

[7]Grills v. Anderson, 29 U.S.L.W. 2443 (Ind. 1961).

[8]Maryland Comm. for Fair Representation v. Towes, 377 U.S. 656 (1964).

[9]Scholle v. Hare, 360 Mich. 1, 104 N.W. 2d 63 (1960), *vacated,* 369 U.S. 429 (1962), *reh'g denied,* 370 U.S. 906 (1962), on remark, 367 Mich. 176, 116 N.W. 2d 350 (1962), *cert denied,* Beadle v. Scholle, 377 U.S. 990 (1964).

[10]W.M.C.A., Inc. v. Simon, 196 F. Supp. 758 (S.D.N.Y. 1961).

[11]Asbury Park Press v. Woolley, 33 N.J. 1, 161 A.2d 705 (1960).

[12]Dyer v. Abe, 138 F. Supp. 220 (D. Hawaii 1956).

[13]Baker v. Carr, 369 U.S. 186 (1962).

[14]Magraw v. Donovan, 163 F. Supp. 184 (D. Minn. 1958).

1. A 1 in column 1-4 means No. A 2 means Yes. An "A" in the outcome column means the attacker wins. A "D" means the defender wins.
2. The decision rule which the above data initially generates is:
   (1) If a redistricting case during the time period covered has a summation score of 7 or above, the attacker wins.
   (2) With a summation score of 6 or below, the defender wins.
3. That decision rule generates one inconsistent case. The inconsistency can be eliminated by:
   (1) Changing the *decision rule* to say a summation score of 6 leads to an unclear outcome.
   (2) Giving the first variable a *weight* of 2, which would be consistent with the importance of requiring equality.
   (3) Adding a fifth *variable* called "Decided After the Maryland Case."
   (4) Eliminating the Grills *case,* but that does not seem justifiable.
   (5) Changing the measurement on the first variable from no-yes to a 1-3 scale and giving Grills a score of 3.
   (6) Finding that Grills really deserves a *relation* score of 2 on the third of fourth variables.
4. Each predicted criterion is initially given an equal weight of 1. If the equality requirement is then given a weight of 2 in view of its substantive importance, then the Grills case would no longer be an inconsistently low-scoring case in which the attacker won. The new predictive decision rule would be:
   (1) If a redistricting case has a weighted summation score of 8 or above, the attacker wins.
   (2) If the weighted summation score is 7 or below, the attacker loses.
5. The dollar amounts in the last column represent hypothetical data showing how many thousands of dollars the successful attacker received in the form of damages. That information is useful for illustrating how the methodology can predict a continuum outcome as contrasted to a dichotomous outcome of winning versus losing.

Computer-Aided Fact Synthesis (CAFS)

Table 2 provides an example of synthesizing a set of facts in a trial decision using the P/G% software. This is a criminal case in which the key question is whether the defendant is guilty or not. For the sake of simplicity, there are two pieces of evidence. One is a defense witness who offers an alibi for the defendant. That witness has an 80% probability of telling the truth, which would favor the defendant being found not guilty. The second piece of evidence is a prosecution witness who claims to have seen the defendant at the scene of the crime. There is a 70% probability that the witness is telling the truth when one just analyzes that witness alone without considering the testimony of related witnesses.

Not all witnesses or pieces of evidence are of equal importance. An alibi

witness is more important than a witness who saw the defendant at the scene of the crime. If the alibi witness is telling the truth, then the defendant could still be innocent, since being at the scene of the crime does not mean that the defendant committed the crime. Therefore, give the alibi statement a weight of 2 or a multiple of 2.

The synthesizing then involves adding .40 to .70 in order to obtain a weighted sum for the alternative that the defendant is not guilty. Those two weighted sums should then be divided by the sum of the weights (which are 2 and 1) in order to obtain probabilities that add to 1.00. The bottom line thus shows there is a .37 probability that the defendant is guilty in light of the analysis and a .63 probability that the defendant is not guilty. It would therefore be appropriate to acquit the defendant since the probability of guilt should be higher than about .90 in order to justify a conviction.[15]

TABLE 2

Synthesizing Trial Facts: A Criminal Case

Criteria / *Alternatives*	*(1) Defense Statement (Alibi) W = 2*		*(2) Prosecution Statement (Scene of Crime) W = 1*	*(3) SUM (1)+(2)*	*(4) SUM N (3)/2*	*(5) Weighted Sum (1.5)+(2)*	*(6) Weighted Sum Sum of Weights (5)/3*
Defendant is Guilty	.20	(.40)	.70	.90	.45	1.10	.37
Defendant is not Guilty	.80	(1.60)	.30	1.10	.55	1.90	.63
	1.00	(2.00)	1.00	2.00	1.00	3.00	1.00

NOTES:

1. The numbers in columns 1 and 2 are probabilities. They indicate the degree of accuracy or truth associated with the statements in the direction of establishing the defendant's guilt. Thus, the .20 probability means that there is a .80 probability that the defense statement is true, and the .20 complement is in the direction of establishing the defendant's guilt. These are probabilities of truth, not probabilities of guilt.
2. The weights indicate the degree of importance of the evidence items. Thus an alibi statement is quite important (if true) in establishing innocence. A statement saying the defendant was at the scene of the crime is less important because even if it is true, it does not establish the defendant's guilt. The numbers in parentheses in column 1 are weighted probabilities.
3. The numbers in column 3 are the sum of the two unweighted probabilities. The numbers in column 5 are the sums of the two weighted probabilities.

[15]On systematic synthesizing of facts in trial decisions, see J. FRANK, COURTS ON TRIAL: MYTH AND REALITY IN AMERICAN JUSTICE (1950); THE TRIAL PROCESS (B. Sales ed. 1981); and THE PSYCHOLOGY OF THE COURTROOM (N.Kerr & R. Bray eds. 1982). Relevant software for calculating probabilities includes the Bayesian probabilities program in the package called "Computer Models for Management Science," Addison-Wesley, Reading, Massachusetts.

4. The numbers in column 4 are unweighted average probabilities. The numbers in column 5 are weighted average probabilities. The numbers in column 6 are an approximation of Bayesian conditional probabilities especially when one only has probabilities of truthfulness and degrees of importance to work with.
5. If the probability in the upper right hand corner is greater than .90, then the judge, juror, or other perceiver of these two items of evidence should vote to convict assuming (1) .90 is accepted as the threshold probability interpretation of beyond a reasonable doubt, and (2) these are the only items of evidence. If the starred probability is .90 or less, then one should vote to acquit.
6. With two alibi witnesses, each might receive a weight of 1.5 if one witness receives a 2. They do not both receive a 2 because they partly reinforce each other.
7. No set of weights will cause the weighted average to exceed .90 with probabilities of .20 and .70. Thus, there is no threshold value for either W1 or W2.
8. The difficulty of obtaining a set of evidence items across the prosecution and the defense that average better than a .90 probability may indicate that jurors and judges generally operate below the .90 threshold, even though judges and commentators say that .90 is roughly the probability translation of "beyond a reasonable doubt."

Computer-Aided Law Evaluation (CALE)

Table 3 provides an example of using the P/G% software to arrive at a conclusion as to what policy ought to be adopted in light of a set of goals to be achieved. The subject matter is how should illegally obtained evidence be treated by the courts in criminal cases. The four alternatives listed consist of (1) the good-faith exception to excluding the evidence, (2) the suspension-dismissal exception to excluding the evidence, (3) the prevailing rule of excluding illegally seized evidence from criminal proceedings, and (4) the previous emphasis on the possibility of damage suits and prosecution to deter illegal searches. The goals to be achieved include (1) decreasing illegal police searches, (2) not encouraging lying by the police, (3) decreasing crime occurrence, and (4) feasibility in being capable of being adopted.

Table 3 also shows how each alternative is scored on each criterion using a 1-3 scale, where 3 = relatively high on the goal, 2 = middling on the goal, and 1 = relatively low on the goal. On the goal of decreasing illegal police searches, the alternatives of suspensions-dismissals and damages-prosecution are the strongest deterrents if applied. On not encouraging lying, the good-faith exception does not do so well compared to the other alternatives. On decreasing crime occurrence, the good-faith exception scores highest because it allows the police the freest hand. On the matter of feasibility, the good-faith exception

may be questionable as to its constitutionality. Suspensions-dismissals lacks legislative feasibility, and damages-prosecution lacks judicial feasibility.

If one adds across each alternative without giving different weights to the goals, then the scores of the laternatives are 5 for the good-faith exceptions and a three-way tie for the other three alternatives. Even with different weights for the goals to consider the liberal, neutral, and conservative positions, there is still a three-way tie between suspension-dismissal, the exclusionary rule, and damages-prosecution. The bottom line conclusion is that the exclusionary rule is the best of the tied alternatives because it is the only one that passes the feasibility constraint. It is feasible in the sense that it has been widely adopted across the 50 states. The other three alternatives have not been widely adopted, and there is considerable doubt as to whether they ever could be.[16]

TABLE 3

Law Evaluation: Evidence Illegally Obtained

	Goals to be Achieved (Y's)				*Overall Scores*			
Alternative Policies (X's)	*Decreasing Illegal police searches (L)*	*Not encouraging lying by police (N)*	*Decreasing crime occurrence (C)*	*Feasibility (N)*	*Liberal Score*	*Neutral Score*	*Conservative Score*	*Total Score*
1. Allow the evidence in if the police testify they did not intend to engage in illegal behavior (Reagan)	1	1	3	1	10	12	14	36
2. Allow the evidence in if the state adopts a system of suspensions on the first offense and dismissals on the second offense (Burger)	3	2	2	1	17	16	15	48
3. Exclude illegally seized evidence from criminal proceedings (Clark)	2	2	1	3	17	16	15	48
4. Emphasize damage suits and prosecution to deter illegal searches (Frankfurter)	3	7	8	6	17	16	15	48
TOTALS								

[16]On legal policy evaluation, see R. POSNER, ECONOMIC ANALYSIS OF LAW (1977); LAW AND THE BEHAVIORAL SCIENCES (L. Friedman and S. Macaulay eds. 1977); S. NAGEL, POLICY EVALUATION: MAKING OPTIMUM DECISIONS (1982); and S. NAGEL, LAW, POLICY, AND OPTIMIZING ANALYSIS (1986). Relevant software for evaluating policies in light of given goals includes those packages discussed in Radcliff, *Multi-Criteria Decision Making: A Survey of Software,* 4 SOC.SCI.MICROCOMPUTER REV. 38-55 (1986), such as *Expert Choice,* Decision Support Software, 1300 Vincent Place, McLean, Virginia 22101.

NOTES:

1. Conservatives are considered as giving the relatively conservative goals a weight of 3, neutral goals a weight of 2, and liberal goals a weight of 1. Liberals are considered as giving the conservative goals a weight of 1, neutral goals a weight of 2, and liberal goals a weight of 3. Neutrals are considered as giving all the goals a weight of 2.
2. An overall score is calculated by summing the products of the relation scores multiplied by the weights across each row or policy. For example, the liberal score of 10 is arrived at by summing (1 times 3) plus (1 times 2) plus (3 times 1), plus (1 times 2), or 3 + 2 + 3 + 2 = 10.

COMPUTER-AIDED LAW PRACTICE (CALP)

Computer-Aided Counseling (CAC)

Table 4 provides an example of computer-aided counseling in the field of will drafting. There are computer programs available that will convert decisions concerning estate allocation into the proper legal form to serve as a valid will, such as the WillWriter program. Those programs, however, are not for helping the testator decide how to divide his or her estate. They assume such decisions have already been made. They are useful in providing checklists as to what decisions should have been made or need to be made.

In this example, the testator is trying to decide among three possible beneficiaries, namely his son, daughter, and wife. In using the P/G% program to aid in making such decisions, the lawyer and the testator together can list the possible beneficiaries. The testator with the aid of the lawyer can tentatively decide on a set of criteria for evaluating the potential beneficiaries. In this case, there are two criteria. One is need, and the other is deservingness.

Need is scored on a 1-5 scale. A 5 in this context means highly needy, and a 4 means mildly needy. At the other extreme, a 1 means highly well-off or the opposite of highly needy, and a 2 means mildly well-off or the opposite of mildly needy. A 3 thus means neither needy nor well-off, but somewhere in the middle. On such a scale, the wife scores a 5. The daughter scores a 4, and the son scores a 2. Deservingness is also scored on a 1-5 scale. A 5 in this context means highly deserving; a 4 means mildly deserving; a 3 means neither deserving nor underserving; a 2 means mildly undeserving; and a 1 means highly undeserving. Deservingness can especially refer to how nice the potential beneficiary has been to the testator, or refer to the good the beneficiary might do with the bequest, although those could be two separate criteria. On the deservingness scale, the son scores a 4. The wife scores a 3, and the daughter scores a 2.

TABLE 4

Computer-Aided Counseling: Estate Allocation

A. Scoring the Beneficiaries on Need and Deservingness

	Need	*Deservingness*
Son	2.00	4.00
Daughter	4.00	2.00
Spouse	5.00	3.00

B. Total Scores and Allocation Percentages

Alternative	*Combined Rawscores*	*%*
1. Son	6.00	30.00
2. Daughter	6.00	30.00
3. Spouse	8.00	40.00

C. What It Would Take To Bring a Second Place Alternative Up To First Place

	Son	*Spouse*	*Weight*
Need	4.00	3.00	0.333
Deservingness	6.00	1.00	3.000

NOTES:

1. Each beneficiary is scored on each allocation criterion on a 1-5 scale. A 5 means highly conducive to the criterion. A 4 means mildly conducive. A 3 means neither conducive nor adverse. A 2 means mildly adverse, and a 1 means highly adverse.
2. The total scores shown are based on treating need and deservingness as having equal weight. One can give different weights to the criteria.
3. One can also specify minimum allocations for each beneficiary. If a beneficiary fails to receive the minimum percentage in step 1B, then give the beneficiary that minimum, and reallocate the remainder to the other beneficiaries.
4. Step 1C shows what scores the son or spouse would have to receive on each criterion to justify the son receiving the same allocation as the spouse. It also shows that would occur if need were considered one third as important as deservingness, or if deservingness were considered three times as important as need.
5. Step 1C can be helpful to someone who is advocating an increased percentage to one of the beneficiaries. It can also be helpful to the will-maker in deciding that he or she really wants a certain beneficiary to have more or less than another beneficiary.

The object now is to use that jointly-determined information to derive meaningful allocation percentages for each of the three beneficiaries. A simple

way to do that is to add each person's two scores in order to arrive at an overall score for each person. Doing so gives the wife an overall score of 8. Both the son and the daughter receive overall scores of 6 apiece. The sum of those three scores is 6 + 6 + 8, or 20. With a total evaluative pie of 20, the son and daughter should logically receive 6/20 or 30% apiece. The wife should receive 8/20, or 40%.

Those allocations, however, are only tentative. They represent a first cut or initial analysis, subject to change depending on what is revealed as a result of making changes in the inputs. An appropriate change to experiment with might involve additional beneficiaries, such as other relatives, friends, or charities. Doing so might suggest additional criteria, such as the extent to which the bequest might be appreciated, or might result in the testator receiving favorable publicity. One might also experiment with other ways of measuring need or deservingness besides a 1-5 scale, although the methodology changes if the two criteria are measured on two different scales.

An especially useful tool for analyzing the effects of changes in the scores is the threshold analysis shown in Table 4C. It shows the changes in the scores that would have to occur to bring the son or daughter up to the allocation level of the wife, or to bring the wife down to the level of the son or daughter. This is useful where the testator is having doubts as to whether the beneficiaries should receive equal or different amounts. Table 4C shows that for the son to share equally with the wife, one of four scores or a combination would have to change, namely (1) the son's 2 on need would have to be a 4, (2) the son's 4 on deservingness would have to be 6 which is impossible on a 1-5 scale, (3) the wife's 5 on need would have to drop to a 3 or be mis-estimated by that much, or (4) the wife's deservingness would have to be a 1 instead of a 3. If all those possibilities seem unrealistic, then one can feel more confident in giving the extra allocation to one's wife. The analysis also shows that the son should be given the same allocation as the wife if the testator values deservingness as being 3 times as important as need, or if need is considered 1/3 as important as deservingness. The same kind of analysis can be applied in determining what it would take to bring the daughter up to the same allocation as the wife.

The P/G% program has other useful features for estate allocation or for any kind of allocation. It can deal with negative criteria such as keeping administrative costs down. It can work with 1-5 scales, dollars, percentages, years of service, or other measurement dimensions. It can show at what weight a criterion becomes strong enough that the bottom-line allocations are within five percentage points of what the allocations would be if that were the only criterion. The program can be used to help allocate partnership profits among the members of a law firm, to allocate time or money to various activities or places, and to allocate taxes to various governmental programs.[17]

[17]On allocating money or other resources to activities, places, or people, see Nagel, *Optimally Allocating Money to Places and Activities* in HIGH LEVEL DECISION SUPPORT: LESSONS FROM CASE STUDIES (P. Hum-

Computer-Aided Negotiation (CAN)

Table 5 provides the data for an example of computer-aided negotiation in a damages case. The alternatives basically are either to go to trial or to settle out of court. This example is presented from a plaintiff's perspective although it could have also been presented from a defense perspective. The example involves a contingency fee arrangement, although it could have been shown with an hourly rate or a flat fee. Table 5B shows the criteria for deciding between trial and settlement from both the lawyer's perspective (L) and the client's perspective (C). The lawyer here happens to be a female, and the client is a male. The criteria can also be classified as those which involve benefits (positive weights) and those which involve costs (negative weights). They can also be classified in terms of whether the criteria relate to the trial alternative (1-4) or the settlement alternative (5-8).

The weights in Table 5B indicate the following:

1. The .22 shows that there is an estimated .65 probability of winning and that the lawyer gets .33 of what is won. That probability could also be discounted for time, using the time-discounting provisions of the P/G% program.
2. The .43 shows there is an estimated .65 probability of winning, and the client gets .67 of what is won.
3. The $30 indicates the lawyer feels her litigation hours are worth $30 an hour to her.
4. The -1 shows the client has litigation costs that are figured as a lump amount, not by the hour.
5. The .20 indicates the lawyer retains 20% of the settlement.
6. The .80 indicates the client retains 80% of the settlement.
7. The $20 indicates the lawyer feels her settlement hours are worth $20 an hour to her.
8. The -1 shows the client has settlement costs (if any) that are figured as a lump amount, not by the hour.

Table 5C and 5D show how each alternative scores on each criterion as follows:

1. The damages if won are estimated at $3,000.
2. The lawyer's litigation hours are estimated at 20 hours.
3. The client's litigation costs are estimated at $400.
4. The settlement offer thus far is $1,000.
5. The lawyer's settlement hours are estimated at 5.
6. The client's settlement costs are nothing.

phreys & J. Vecsenyi eds. 1986). Microcomputer programs relevant to estate allocation include *WillWriter* of Nolo Press, 950 Parker St. Berkeley, CA 94710; and *Estate Tax Planner,* of Aardvark-McGraw-Hill, 1020 North Broadway, Milwaukee, Wisconsin 53202. None of the three specifically deal with how to divide an estate. The first one converts allocation decisions into a will. The second aids in probating and administering a will. The third makes tax calculations for various decisions.

TABLE 5

Computer-Aided Negotiation: A Damages Case

A. The Alternatives of Trial Versus Settlement

Alternative
1 Go to Trial
2 Settle

B. The Criteria and Weights of the Benefits and Costs

Criterion	*Meas. Unit*	*Weight*
1 (L)Dams. if Won	$	0.22
2 (C)Dams. if Won		0.43
3 (L)Lit.Hours		-30.00
4 (C)Lit.Costs		-1.00
5 (L)Set.Offer		0.20
6 (C)Set.Offer		0.80
7 (L)Set.Hours		-20.00
8 (C)Set.Costs		-1.00

C. Scoring the Alternatives on the Criteria for Trial

	(L)Dams.	*(C)Dams.*	*(L)Lit.H*	*(C)Lit.C*
Go to Trial	3000.00	3000.00	20.00	400.00
Settle	0.00	0.00	0.00	0.00

D. Scoring the Alternatives on the Criteria for Settlement

	(L)Set.O	*(C)Set.O*	*(L)Set.H*	*(C)Set.C*
Go to Trial	0.00	0.00	0.00	0.00
Settle	1000.00	1000.00	5.00	0.00

E. The Overall Results From the Lawyer's Perspective

	(L)Dams.	*(L)Lit.H*	*(L)Set.O*	*(L)Set.H*	*Combined Rawscores*
Go to Trial	650.00	-600.00	0.00	-0.00	50.00
Settle	0.00	-0.00	200.00	-100.00	100.00

F. The Overall Results From the Client's Perspective

	(C)Dams.	*(C)Lit.C*	*(C)Set.O*	*(C)Set.C*	*Combined Rawscores*
Go to Trial	1300.00	-400.00	0.00	-0.00	900.00
Settle	0.00	-0.00	800.00	-0.00	800.00

G. What It Would Take To Get the Client to Settle

	Go to Tria	*Settle*	*Weight*
(C)Dams. if Won	2769.23		0.400
(C)Lit.Costs	500.00		-1.250
(C)Set.Offer		1125.00	0.900
(C)Set.Costs		-100.00	??

H. What It Would Take to Get the Lawyer to Trial

	Go to Tria	*Settle*	*Weight*
(L)Dams. if Won	3230.77		0.233
(L)Lit.Hours	18.33		-27.500
(L)Set.Offer		750.00	0.150
(L)Set.Hours		7.50	-30.000

In light of the above data, Table 5E shows the lawyer would do better to settle, rather than go to trial. For the lawyer, the $3,000 damages income (discounted by the .65 probability of victory and the .33 contingency fee rate) becomes $650. If she subtracts $600 in litigation costs ($30 times 20 hours), there is a net profit of $50. On the other hand, a $1,000 settlement means $200 income at 20%. If she subtracts $100 in settlement costs ($20 times 5 hours), there is a net profit of $100 for settling. Table 5F, however, shows the client would be better off going to trial, rather than settling. For the client, the $3,000 damages income (discounted by the .65 probability and the .67 complement of the contingency fee rate) is $1,300. If he subtracts $400 in litigation costs, there is a net profit of $900. On the other hand, a $1,000 settlement means $800 income at 80%. If he subtracts nothing in settlement costs, there is a net profit for settling that is $100 less than the estimated trial net profit.

The P/G% program is especially useful for computer-aided negotiation because it can so conveniently indicate what it would take to bring a second-place alternative up to first place. Table 5G, for example, shows that settlement would become more profitable to both the client and the lawyer than going to trial if the lawyer can get the insurance company to raise its offer from $1,000 to anything higher than $1,125. If the insurance company is unwilling to go higher than $1,125, then the lawyer has an ethical obligation to go to trial, assuming the estimated inputs are reasonably accurate. If, however, the estimated damages amount is as low as $2,769, then the lawyer should settle in the client's best interests, or if the client's litigation costs are more than $500. The lawyer should also accept the $1,000 settlement if the combination of victory probability and contingency complement are as low as .40 rather than .43, or if the client is allowed to keep 90% of the settlement rather than 80%, although then the lawyer may not be so enthusiastic about settling.

Table 5H shows from the lawyer's perspective what it would take to make going to trial more profitable than settling. There are eight answers plus combinations of them, as indicated by the eight breakeven values shown in Table 5H. If any of the original scores change to the scores shown in Table 5H, then going to trial becomes more profitable. Those changes include increased damages, decreased litigation hours, decreased settlement, increased settlement hours, increased probability of victory, increased contingency fee, decreased litigation hourly rate, decreased settlement percentage, or increased settlement hourly rate. The table shows exactly what increase or decrease will generate a tie between the profitability of going to trial and the profitability of settling.

With that kind of information, the lawyer can negotiate better with the insurance company over the settlement offer and possibly with the client over the contingency fee. The lawyer can also see from these figures what margin of error there is on the estimates. Thus, if it is better for the client's interests to go to trial with an estimated damages higher than $2,769, then the lawyer need not anguish over whether the damages are likely to be $3,000 or $5,000, since either figure is over $2,769, and likewise with the other estimates.[18]

Computer-Aided Advocacy (CAA)

Table 6 provides an example of a case brief using the P/G% software. The case is *San Antonio v. Rodriguez,* 411 U.S. Supreme Court 1 (1973). The case dealt with the extent to which a state is required to help equalize expenditures per student across school districts within the state. The first part of the brief shows that the Supreme Court was faced with the four basic alternatives of (1) no equality required, (2) equal expenditures per student, (3) a minimum amount of expenditures per student, but otherwise allowing for inequality, or (4) a requirement of equality but at a high level. The first part of the brief also shows that the court answered yes to the first alternative, but no to the others.

The second part of the brief shows that there are about six relevant criteria including, (1) having an educated population, (2) decreasing discontent due to educational disparities, (3) avoiding the downgrading of affluent schools, (4) administrative ease, (5) consistency with prior cases, and (6) avoiding heavy taxpayer expense. The third part of the brief shows how each alternative scores on each criterion using a simple 1-3 scale, where 3 = highly conducive to the goal, 2 = neither conducive nor adverse, and 1 = adverse to the goal. The fourth part of the brief shows the combined raw scores for each alternative using the apparent scoring of the Supreme Court. The alternative with the highest combined raw score is "no equality required," which is the alternative that the Supreme Court adopted.

The fifth part of the brief is the threshold analysis. It shows what it would take to bring the second-place alternative up to first place. There was a gap of 2.50 points between first and second place on the combined raw scores. That gap would be eliminated if the "no equality" alternative were to drop by 2.50 points on any of the six criteria. That would be too big a drop on any one

[18]The data for the above example comes mainly from Nagel, *Applying Decision Science to the Practice of Law* 30 PRAC.LAW. 13-22 (1984). On computer-aided negotiation, see Nagel & Mills, *Microcomputers, P/G% and Dispute Resolution,* PROCEEDINGS SOC'Y FOR PROFESSIONALS IN DISPUTE RESOLUTION (1986); Nagel, *Microcomputers, Risk Analysis, and Litigation Strategy* 19 AKRON L. REV. 35-80 (1985); and Nagel, *Lawyer Decision-Making and Threshold Analysis,* 36 U. MIAMI L. REV. 615-642 (1983). Microcomputer programs relevant to litigation-negotiation include *The Art of Negotiating,* Experience in Software, Inc. 2039 Shattuck Avenue, Suite 401, Berkeley, CA 97404; and *SettleMate,* Lawyers Technology, Inc., 339 15th St., #200, Oakland, CA 94612. The first one is basically a checklist of suggestions for improving one's negotiating skills, although it leaves out systematically comparing the benefits minus costs of settling versus the benefits minus costs of going to trial. The second program is useful for determining the value of different types of injuries.

criterion since the criteria cannot go below 1.00. The gap would also be eliminated if the second place alternative of having a "minimum number of dollars per student" were to increase by 2.50 points on any of the six criteria. That would be too big an increase on any one criterion since the criteria cannot go above 3.00. The gap would also be eliminated if the Supreme Court were to place substantially more weight on having an educated population or on decreasing discontent due to educational inequalities. Those are two areas which the advocates of a minimum-dollars position should emphasize. The gap would be eliminated if the other criteria were given negative weights which is unlikely. Changing the weight would not help with regard to consistency with prior cases, since both alternatives scored the same on that criterion.[19]

TABLE 6

Computer-Aided Advocacy: San Antonio v. Rodriguez

A. The Alternatives and the Criteria

Alternative	*Previous Outcome*	*Criterion*	*Meas. Unit*	*Weight*
1 No Equality Reqd.	Yes	1 Educated Pop.	1-3	1.00
2 = $ Per Student	No	2 - Discontent		1.00
3 Min. $ Per Student	No	3 - Downgrading		1.00
4 High $ Per Student	No	4 Admin.Ease		1.00
5 Other	?	5 Consist.w/Cases		1.00
		6 - Expense		1.00

B. The Scores of the Alternatives on the Criteria

	Educated	*- Discon*	*- Downgr*	*Admin.Ea*	*Consist.*
No Equality Req	1.00	1.00	3.00	3.00	2.00
= $ Per Student	2.00	2.00	1.00	1.00	2.00
Min.$ Per Stude	2.00	2.00	2.00	1.00	2.00
High $ Per Stud	3.00	3.00	2.00	1.00	1.00

C. The Total Scores of the Alternatives

Alternative	*Combined Rawscores*	*Previous Outcome*
1No Equality Reqd.	13.00	Yes
2= $ Per Student	10.00	No
3Min.$ Per Student	10.50	No
4High $ Per Student	11.00	No

[19]On systematic case briefing, see LEGAL METHOD: CASES AND TEXT MATERIALS (H. Jones ed. 1980); W. STATSKY & J. WERNET, CASE ANALYSIS AND FUNDAMENTALS OF LEGAL WRITING (1977); and INTRODUCTION TO THE STUDY OF LAW: CASES AND MATERIALS (W. Thode et al. eds. 1970). Relevant software includes programs designed to teach law students how to analyze cases, as described in R. BURRIS, R. KEETON, C. LANDIS & R. PARK, TEACHING LAW WITH COMPUTERS: A COLLECTION OF ESSAYS (1979).

D. What It Would Take to Bring the Second Place Alternative Up to First Place

	No Equalit	*Min.$ Per*	*Weight*
Educated Pop.	-1.50	4.50	3.500
- Discontent	-1.50	4.50	3.500
- Downgrading	0.50	4.50	-1.500
Admin.Ease	0.50	3.50	-0.250
Consist.w/Cases	-0.50	4.50	???????
- Expense	0.50	4.00	-0.667

COMPUTER-AIDED LAW MANAGEMENT (CALM)

Computer-Aided Judicial Administration (CAJA)

Table 7 shows how one can systematically view the problem of assigning judges to case types. This hypothetical problem involves two judges named Fox and Wolf. It involves the case types of criminal and civil cases. Each judge is expected to spend 10 hours in trial in an average week. In such a week, there are about 8 criminal hours and 12 civil hours of trial work.

Judge Fox received a score of 4 for criminal cases on a 1-5 scale, and Judge Wolf a 2. On civil cases, they both received a score of 3. The scoring was done by having each judge or all the judges in the system anonymously score each other. Each judge also scored himself or herself on degree of interest in the case types on a 1-5 scale. The ability scores and interest scores were averaged to give the scores of 4, 2, 3, and 3. What is the best allocation of these two judges to these two case types?

"Best" in this context means an allocation or assignment that will result in as large an overall quality score as possible within the row and column constraints. The overall quality score is the sum of each product of a judge's quality score times the hours assigned for a given case type. In this context the overall quality score is equal to $4a + 2c + 3b + 3d$. The object is to solve for a, b, c, and d so as to maximize that overall score while satisfying the constraints.

The best way to proceed if one does not have a computer is to give as few hours as possible to those cells which have quality scores of 1 or 2, and as many hours as possible to those cells which have quality scores of 5 or 4, while satisfying the constraints. Doing so results in an allocation of 0 hours to c, 8 hours to a, 2 hours to b, and 10 hours to d.

That method can be meaningful for a substantial number of judges and case types. One can, however, solve big judicial assignments faster and with more accuracy by using a linear programming routine. Such routines are easy to use on microcomputers. One simply informs the computer of the row totals, the column totals, and the quality scores. The computer then generates the optimum allocations. The program will also indicate (1) how much each quality

score can vary without affecting the optimum result, (2) how much each row total and column total can vary, and (3) how much of a change in the overall quality score would occur as a result of a 1-unit change in the hours assigned or in any of the inputs.[20]

TABLE 7

Judicial Administration: Assigning Judges to Types of Cases

Cases / *Judge*	*Criminal*		*Civil*		
	Quality Score	*Hours Assigned*	*Quality Score*	*Hours Assigned*	*Hours per Judge*
Fox	4	a	3	b	10
Wolf	2	c	3	d	10
Hours per Casetype		8		12	20

NOTES:

1. The allocation system is shown in its simplest form with two judges and two casetypes. Each judge is expected to put in ten hours a week to satisfy the average weekly total of 20 hours of trial time. Criminal cases constitute 40% of the total or 8 hours, and civil cases constitute 60% or 12 hours. Judge 1 receives scores of 4 and 3 on the two casetypes, and Judge 2 receives scores of 2 and 3.
2. A logical way to resolve the optimum allocation with this relatively simple example is to reason as follows:
   (1) Judge Wolf does a bad job on criminal cases. Therefore, give Judge Wolf 0 criminal hours. That means Judge Wolf gets 10 civil hours to add across to 10. Judge Fox must then get 8 criminal hours to add down to 8. Judge Fox must also get 2 civil hours to add across to 10 and down to 12.
   (2) Judge Fox does a good job on criminal cases. Therefore, give Judge Fox as many hours as possible on criminal cases which is 8. That means Judge Wolf gets 0 criminal hours to add down to 8. Judge Wolf must then get 10 civil hours to add across to 10. Judge Fox must also get 2 civil hours to add across to 10 and down to 12.
3. On a more general level, resolve the optimum allocation by reasoning as follows:
   (1) Pick out all the quality scores that are 1's or 2's. Give those cells as few

[20] Assigning judges to casetypes is discussed in ABA, *Standards Relating to Trial Courts* (1976), 86-93. For judicial assignment to casetypes, see especially Nagel, *Using Management Science to Assign Judges to Casetypes* 40, MIAMI U.L. REV. (1317-36 (1986)). Also see the more general literature and software on assigning people to tasks, such as W. ERIKSON & O. HALL, COMPUTER MODELS FOR MANAGEMENT SCIENCE (1986). On assigning lawyers to case types, see Nagel & Mills, *Allocating Attorneys to Casetypes,* CAPITAL U.L. REV. (1986).

hours as possible.

(2) Pick out all the quality scores that are 5's or 4's. Give those cells as many hours as possible.

(3) Make logical adjustments so that all the columns add down to what they should, and all the rows add across to what they should.

(4) Also try to minimize the number of casetypes per judge rather than have every judge do at least a little bit of everything.

4. The optimum allocation is defined as allocating the total number of hours to each cell so as to satisfy the row constraints, the column constraints, and any cell constraints, while at the same time maximizing the sum of the products of the quality score times the hours assigned for each cell. A cell includes a quality score of a judge on a casetype and a quantity of hours assigned to a judge on a casetype.

Computer-Aided Legal Administration (CALA)

Table 8 shows an example of computer-aided legal administration in the field of optimum sequencing of law cases. The illustrative problem is, "What is the best order in which to handle three cases that involve an estimated 10, 20, and 30 hours and that are predicted to generate $21, $61, and $80 in billing?" For the sake of simplicity, assume we have a one-lawyer firm working a 40-hour week. With three cases labeled A, B, and C, there are six ways in which they can be ordered consisting of ABC, ACB, BAC, BCA, CAB, and CBA. Which is the best order?

A more general way to view the problem is in terms of five different methods that are frequently proposed for ordering cases in a law firm, a government agency, or elsewhere. Those alternative methods arranged randomly are:

1. Take the cases in the order of the highest benefits first. That means CBA.

2. Look to the cases with the lowest costs first. That means ABC.

3. Take them first come, first served. That also means ABC.

4. Prefer the most profitable first, meaning the ones with the highest benefits minus costs. That means C ($80-30), B ($61-20), and then A ($21-10).

5. Take them in the order of their benefit/cost ratios. That means B ($61/20, or 3.05), C ($80/30, or 2.67), and then A ($21/10, or 2.10).

We want to pick the best ordering criterion in terms of maximizing the profits of the law firm, while operating within ethical constraints. At first glance, one might think the order of the cases will make no difference in the profit that can be made from these three cases. The cases are going to consume a total of 60 hours regardless of the order in which they are handled. Likewise, the order will not affect the fact that they will collectively bring in $162 in billings. If we assume that one hour is worth $1 or one monetary unit, then their

net profit will be $162 minus $60, or $102 regardless of the order in which they are processed.

TABLE 8

Law Firm Administration: Sequencing Cases
(PROBLEM: What is the best order to handle three cases that involve 10, 20, and 30 hours and that generate $21, $61, and $80 in billing?)

A. The Alternatives: Five Sequencing Methods

Alternative
1 Highest B's First
2 Lowest C's First
3 1st Come, 1st Serv
4 Highest B-C First
5 Highest B/C First

B. The Criteria: Two Weeks of Profit

Criterion	*Meas. Unit*	*Weight*
1 1st Week Profit	$	2.00
2 2nd Week Profit	$	1.00

C. The Profit Obtained by Each Alternative for Each Week

	Alternative/Criteria Scoring	
	1st Week	*2nd Week*
Highest B's Fir	70.50	31.50
Lowest C's Firs	68.67	33.33
1st Come, 1st S	68.67	33.33
Highest B-C Fir	70.50	31.50
Highest B/C Fir	74.33	27.67

D. The Overall Score for Each Sequencing Method

Alternative	*Combined Rawscores*
1 Highest B's First	172.50
2 Lowest C's First	170.67
3 1st Come, 1st Serve	170.67
4 Highest B-C First	172.50
5 Highest B/C First	176.33

NOTES:

1. The above computer printout shows that by taking the first three cases in the order of the highest benefit/cost ratio first, one thereby maximizes overall benefits minus costs.
2. This is so because the B/C order results in more profit being earned earlier, and that profit is thus available to draw interest or to be reinvested more so than if it is earned later.

3. In the above example profit from the first week is given twice the weight or importance as profit of the second week. An alternative approach would be to weigh the weeks equally, but to time-discount the second week more so than the first week.
4. The reasonable assumption is that the 60 hours of work involved in doing the first three cases means 40 hours in the first week and 20 hours in the second week. The assumption is also that there is billing every week, not just at the end of the cases, and that the bills are paid promptly.

At second glance, however, we realize that one method may bring in more money earlier than another method. The method that brings in the most money as early as possible is the most profitable because that early money can be invested in the firm or elsewhere, thereby drawing interest which might otherwise be a missed opportunity. Table 8B shows that the criterion for judging these methods should be how much profit they generate in the first week, the second week, and so on, with more weight given to the profit of the first week than the second week.

Table 8C shows for each method how profitable it is in terms of the separate weekly profits, rather than the overall profit which is the same $102 for all the methods. The winning method is taking the cases in the order of their benefit/cost ratios. That method generates $74.33 in the first week, which is about $4 higher than its nearest competitor. If we assume that these numbers are $1,000 units, then by not taking the cases in their B/C order, the firm may be losing the interest that could have been made on $4,000 invested for one week. If that kind of loss is multiplied by 52 weeks and 30 cases rather than three cases, then a lot of money may be needlessly lost.

The $74.33 is calculated by noting that case B has the highest B/C ratio, and thus comes first. Case B takes 20 hours and generates a net profit of $41. We then go to case C, which has the second best B/C ratio. It takes 30 hours, but we only have 20 hours left in the week. We therefore do 2/3 of the case, and thus earn 2/3 of the $50 profit which is $33.33. If we add that to $41, the first week generates $74.33 profit. The second week brings $27.67 in profit, or the remainder of the $102.

One can contrast that optimally profitable sequencing with any of the other less profitable methods. For example, if the cases are processed in terms of their individual profitability, we would take case C first, rather than case B. Doing so would consume 30 hours for a profit of $50. We would then have time for only 10 of 20 hours of case B, which is the next most profitable case. That would earn half of the $41 profit, or $20.50. If we add $50 to $20.50, then we get only $70.50, or $70,500, rather than $74.33, or $74,333.

To be more exact we could time discount the profits of the second week using the time-discounting provisions of the P/G% program. That would give

a more accurate overall score than giving the first week's profits a weight of 2. The time discounting, however, would not change the rank order as to which is the best sequencing method.

A computer can aid in implementing the B/C sequencing method by questioning the relevant lawyers as the cases come in as to their estimates of the expenses and income for each case. The computer can then arrange the cases each week in the order of the B/C ratios, and then display that order to aid in deciding which case to take next. To prevent cases with a low B/C ratio from being unreasonably delayed, the computer can flag cases for immediate processing in time to meet the statute of limitations, other deadlines, or an ethical constraint that says no case should have to wait more than a given time to reach a certain stage.

By following such procedures, the law firm administration will not only be maximizing the law firm's profits, but it will also be maximizing the happiness of the clients collectively. This is so if we assume that $1 in billing activity generates the equivalent of one happiness unit. That way the B/C method thus generates more client happiness earlier than the alternative methods do. The estimated total happiness units per week can be calculated by adding 40 to the numbers given in the first column of Table 8C, and adding 20 to the numbers in the second column. The B/C method thus generates 114.33 happiness units, which is higher than any of the other methods. It is pleasing when law-firm administrative methods can be found that maximize both the interests of the law firm and the interests of the clients.[21]

SOME CONCLUSIONS

The essence of computer-aided decision making is the processing of goals, alternatives, and relations between goals and alternatives in order to choose a best alternative. This is the basic model or methodology. The essence of law decisions is judging, lawyering, and the administration of judging and lawyering. This is the basic substance.

What are the benefits of using computer-aided decision-making which justifies their general use in law decisions? The benefits include the following:

1. Working with the basic model encourages being more explicit about goals to be achieved, alternatives for achieving them, and relations between goals and alternatives.

2. The model leads to choosing the alternative, combination, or alloca-

[21]On computer-aided sequencing of law firm cases and other jobs, see Nagel, *Sequencing and Allocating Attorney Time to Cases*, 13 PEPPERDINE L. REV. 1021-1039 (1986); and Nagel, Beeman & Reed, *Optimum Sequencing of Court Cases to Reduce Delay*, ALA.L.REV (1986). Also see the more general literature on efficient sequencing, such as R. CONWAY, et al., THEORY OF SCHEDULING (1967). On allocating time per case regardless of the order of the cases, see Nagel, *Attorney Time Per Case: Finding an Optimum Level* 32 U.FLA.L. REV. 424-441 (1980). The software that is more relevant to optimum sequencing is probably docketing software such as *Docket* by Micro-Craft, 2007 Whitesburg Drive, Huntsville, Alabama 35801.

tion that is best in light of the goals, alternatives, and relations.

3. The model leads to choosing predictive decision rules that are capable of separating the past cases into winners and losers in light of their characteristics. That separation is relevant to accurately predicting or explaining future cases.

4. The model facilitates making changes in order to determine the effects on the bottom line of different goals, alternatives, relations, and other inputs.

5. The model informs the users what it would take in order to bring second-place alternatives or other alternatives up to first place.

6. The model allows and encourages the users to inject their knowledge of the subject matter, rather than impose substance on the users.

7. The model lends itself to being used with microcomputers in order to simplify arithmetic, record keeping, and manipulation of the data.

8. The model stimulates new insights into causal and normative relations that might otherwise be overlooked.

Costs involved in obtaining these benefits are mainly a willingness to think differently and more explicitly about the judicial process and lawyering than one may be accustomed to. The benefits do seem to substantially outweigh these costs, especially if these models are considered supplements to traditional perspectives, rather than substitutes. What is especially needed is to spread an awareness of these decision-aiding methods and applications, because to know them is to find them useful. It is hoped that this paper will facilitate that purpose of making these models better known, so they can be made even more useful.

ADDENDUM TO "COMPUTER-AIDED LAW DECISIONS"

The purpose of this brief addendum is to provide three specific examples of lawyers who have made use of the P/G% software to aid in arriving at lawyer-like decisions. The first example is E. Fremont Magee, a partner in the firm of Piper and Marbury of Baltimore, Maryland. He says in a February 19, 1985, letter: "I regularly make use of P/G% for the selection of candidates for arbitration panels in medical malpractice claims here in Maryland. Before a medical malpractice matter can be tried in court in Maryland, it must first be submitted to a statutory three member arbitration panel. Each side is given sketchy resumes of five potential candidates to serve as panel chairmen. Each of these is an attorney. In addition, there are five candidates to serve as the lay member and five health care providers to serve as the health care provider member. Each side has the opportunity to strike two candidates from each list. Generally, the biographical information of the lawyers includes date of birth, year of admission to the bar, undergraduate school, graduate school, trial frequency, number of years of litigation experience, medical malpractice experience, arbitration experience, association with health providers, nature of

practice and related matters. I use the program to rank the five potential candidates based on the various values I assign to these various criteria."

The second example is C. Howard Thomas, Jr., a partner in the firm of Saul, Ewing, Remick, and Saul of Philadelphia. He presented two interesting uses of P/G% made by his law firm at the Legal Tech '86 Conference in Philadelphia. One use involved deciding where to move the offices of the firm. The firm had to move because it needed larger quarters. There were about five key places to choose among. There was considerable emotion in arguing over the five places. The partners decided to be explicit on the criteria the firm was seeking to achieve and how each place scored on each of those criteria. By doing that, the emotional subject could be handled more rationally. The analysis showed a certain place to be the tentative winner. A sensitivity analysis was then performed to see what changes in the relative weights of the criteria and in the scores of the alternatives on the criteria would be necessary to bring each other place up to the same desirability level as the first place alternative. It was decided that all of the needed changes were unreasonable. The partners then felt pleased they had made the right choice as to where to move the law firm. The firm has also made use of P/G% in deciding whether to litigate or settle out of court. The analysis in at least one big case was shared with the client to convince the client that accepting the settlement was a wise decision.

The third example is Karen S. Dickson and John Finan of the Akron University Law School. They analyzed a dozen key cases which involved the issue of whether a worker is an employee or an independent contractor. The analysis involved scoring each case on seven criteria as to whether the criterion was present or absent. Each case was given a summation score by adding its points on the criteria. The cases in which the total points were nine or more consistently found the worker to be an employee. The cases in which the total points were eight or less, consistently found the worker to be an independent contractor. That consistent pattern was established after noting the need to give extra weight to whether the principal has control of the details of the agent's work, as compared to the other criteria. Dickson and Finan thus used the P/G% prediction methodology to inductively operationalize the concepts of employee and independent contractor more clearly than the courts had previously verbalized those concepts.