

1986

## Preliminary Analysis of the Uses of Scientific Models in Dispute Prevention, Management and Resolution, A

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### Recommended Citation

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# A PRELIMINARY ANALYSIS OF THE USES OF SCIENTIFIC MODELS IN DISPUTE PREVENTION, MANAGEMENT AND RESOLUTION

J.D. NYHART\* AND E.A. DAUER\*\*

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## I. INTRODUCTION

Conflicts about the use of ocean and coastal resources typify an increasingly important class of social disputes: They involve multiple interests and parties, both private and governmental, often with widely distributed constituencies. The stakes frequently include, in addition to significant economic

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This article is one of a number of papers presented to a symposium at the M.I.T. Sea Grant College Program in 1985, entitled "Coastal Zone and Continental Shelf Conflict Resolution: Improving Ocean Use and Resource Dispute Management." (The papers from this symposium are cited hereinafter to M.I.T. Symposium.) The authors wish to express their gratitude to the William H. Donner Foundation, the U.S. Environmental Protection Agency, the University of Denver and the Massachusetts Institute of Technology for their support, and to Ms. Cathy Klein of the Class of 1987 at the University of Denver College of Law for research assistance.

dimensions, values not always amenable to financial quantification. The underlying scientific information is at once central and uncertain. And the shared uses of the resource, both present and proposed, have lifetimes far longer than those of ordinary commercial arrangements—implicating, therefore, repeated interactions among and evolution of the affected interests.

A typical example is the prospective use of the Bay of Fundy's tidal forces for the creation of electrical power, a project which will create economic value for some persons and interests, but which risks perturbing the economic and social expectations of a wide variety of others. The technology and its impacts are uncertain. Environmental and biological effects may not be fully known until years after the project has commenced.

Law provides an important (albeit often insufficient) backdrop for the resolution of such complex and polycentric conflicts. Litigation has become a common strategy, and the courts have become a site for framing the questions that underlie the parties' several needs. Litigation has, however, a number of serious limitations which may lead the parties to prefer some form of private alternative dispute resolution process (an "ADR").

The adoption of an ADR technique may alter the role of science within the conflict management process, but it will seldom diminish its importance. Indeed, one significant advantage of most forms of ADR is the removal of the necessary scientific analysis from the distortions inherent in the adversarial legal process. Scientific models and model-building are consequently tools of significant value to complex-case ADR.

"Model," at least initially, is defined by Psaraftis' definition: an abstraction of reality whose purpose is to represent a well-defined real world process.<sup>1</sup> An effective model is capable of providing insight into the workings of the processes it represents, and of organizing highly complex realities into workable scales. It thereby aids the parties employing it in propounding and testing various alternative solutions to the problems confronting them.

The present analysis divides the uses of models within ADRs into three basic types—Ordained Models, Model Building, and Non-Model ADR. Its goal is to describe the separate utilities of the three, and to suggest that choosing correctly among them can, in a given context, promote the achievement of an optimal resolution of the underlying conflicts. The discussion will begin with a set of standard criteria for assessing the quality of an outcome or resolution, and identify the ways in which traditional litigation falls short. It will then describe two principal domains of conflict management—Alternative Dispute Resolution (ADR) and Preventive Law (PL)—and will derive from them a set of strategic options which exist for any preferred outcome. Simultaneously, a new set of "process goals"—criteria drawn from

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1. Psaraftis, *Assessing Damage and Liability From Oil Spills*, in M.I.T. Symposium 65 (Nyhart ed. 1985).

the theories of ADR and PL and from the Law-Science domain—will be proposed, by which the conflict management process itself may be evaluated. The question in any given case will then be how well the selection of one model-use variant over the others achieves the desiderata and satisfies the process criteria.

The ambition of this article is modest—to suggest linkages at a theoretical level rather than to “prove” them empirically. A fully rigorous analysis, employing the three model-use variants strictly as independent variables, would require the articulation of a comprehensive theory of dispute resolution, a construction which the state of the literature does not yet allow. To the extent that the analysis does lead to at least some preliminary hypotheses about the linkage between process tools and conflict outcomes, it may be useful to the eventual elaboration of such a theory.

## II. DISADVANTAGES OF LITIGATION

Any theory of conflict resolution which aspires to evaluate alternative strategies must employ, tacitly or otherwise, specific criteria by which the “quality” of the outcomes or products may be assessed. A list of criteria suggested by Susskind & McCreary will be adopted for the purposes of this discussion:

1. The resolution should sufficiently satisfy by its distribution of gains and losses all of the affected interests to avoid the dispute’s reoccurrence in another form.
2. The solution should capture all of the joint gains available.
3. It should produce definite results and commitments which can be implemented.
4. The process must provide legitimacy to the product.
5. Uncertainty, particularly in the underlying science, should be dealt with “wisely.”
6. Outcomes should be reached efficiently in terms of time and expense.
7. Relationships among the participants should be enhanced for the benefit of future interactions.<sup>2</sup>

Litigation as measured by these desiderata has a mixed but generally poor ranking. It does achieve definitive results, and, if not commitments, then at least mandates of unquestioned enforceability. In addition, as Edward Bruce observes, “Collectively [judicial] decisions constitute a coherent body of law, which . . . serves as guidance to potential disputants in the future. . . . Other, less formal dispute resolution processes tend to be *ad hoc* and [do] not generate principles with the same authority. . . .”<sup>3</sup>

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2. Susskind & McCreary, *Using Alternate Dispute Resolution Techniques to Resolve Coastal Zone and OCS Conflicts*, in M.I.T. Symposium 19 (Nyhart ed. 1985).

3. Bruce, *OCS Lease Sale Litigation: Can it be Avoided?*, in M.I.T. Symposium 93 (Nyhart ed. 1985).

Bruce's observation actually makes two points. First, his word "authority," concerns Susskind and McCreary's "legitimacy" criterion.<sup>4</sup> Legitimacy in its practical sense means the ability of a resolution to provide those who fashioned it with a reason why their several constituents should embrace it.<sup>5</sup> A judicial decree is authoritative; it can be despised but not rejected. It is in any case involuntary and not the product of the negotiator's own agreement. Negotiated agreements do not have legitimacy, in this sense, *ex proprio vigore*. But that is not to say that legitimacy must be absent from well designed ADRs. It comes, in nonjudicial procedures, from perceptions about the adequacy of the procedures themselves, as well as from the evident good sense of the resolution.

Bruce's second point, that judicial decisions give guidance to future disputants, is of less immediate concern in any given dispute, except to the extent that one of the parties desires an outcome with binding precedential value for like conflicts with other parties in the future. It does seem correct that future litigation can be minimized if the applicable law is well developed and clear. But in order for that feature of litigation to be valuable, the conflicts must be recurrent in nearly identical forms and not involve large areas of factual uncertainty. Moreover, the pattern of outcomes in the future will be optimal in a litigation regime only if the precedential decision was itself optimal as measured by the remaining criteria on the Susskind and McCreary list. That is not always likely to be the case.

Although litigation as a conflict resolution process may have certain limited virtues, it also has a number of serious disabilities particularly regarding complex matters in which science is both important and uncertain. Some of the disadvantages of conventional litigation are attributable to its procedures. Other disadvantages stem from the way in which questions must be framed and criteria imposed. Rules of standing and the cognizability of legal interests limit the flexibility of interests to be joined in the resolution process, both as to the exclusion of some and the mandatory access allowed to others. Practical and political considerations in the selection of representatives yield to formal legal definitions. Similarly, litigation normally requires that a problem be fully "presentiated"<sup>6</sup> *i.e.*, that there be a bounded answer provided in the present for a set of problems that may have both an extended lifetime and an evolution of interests, facts and parties affected. A lawsuit

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4. See Susskind & McCreary, *supra* note 2.

5. Dauer, Address to the Second Circuit Judicial Conference, reported at 101 F.R.D. 161, 226 (1983).

6. In this context "full presentiation" refers to the process by which the future relationships and obligations of the parties are embraced within a contemporaneous set of agreements which, while established in the present, govern the entire future of the arrangement. For a full discussion of the presentiation function within contract planning, see MacNeil, *The Many Futures of Contract*, 47 So. CAL. L. REV. 691, 754 (1974).

taken to its conclusion cannot create an institution capable of adaptation to future developments.<sup>7</sup>

A lawsuit must be decided in accordance with the law. Law of necessity addresses only those portions of a comprehensive problem which can be stated as legal issues. Two untoward consequences follow: first, the questions immanent in the problem are altered into forms which the legal system can address; second, the outcome must be phrased in terms of the questions put. Thus, both the underlying complexity of the practical conflict is unfaithfully posed, and the range of solutions available is severely narrowed.

This essential narrowing is the principal reason why litigative solutions to problems tend to be zero-sum.<sup>8</sup> Positive-sum solutions normally come not from the choice of directly competing claims, but from the exchange of values which makes up what other commentators have termed “integrative” solutions.<sup>9</sup> Negotiation rather than adjudication, and the expansion of the range of available solutions are critical to the maximization of joint gains. Litigation has neither.

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7. This describes the general case. There are instances of litigation—some referred to as “structural reform litigation”—in which through a remedy of injunction rather than damages a court may make affirmative orders and retain jurisdiction to oversee a future course of remedial conduct. *See generally*, Fiss, *The Social and Political Foundations of Adjudication*, 6 L. & HUM. BEHAV. 121 (1982). Such cases are generally restricted to constitutional and certain other public-law domains, and in the private-law domain to matters of marital dissolution and child custody. In commercial disputes of the type presently being addressed, continued judicial supervision of flexible remedies is nearly always unavailable.

It is also the case that litigation allows for norm articulation by the court as well as dispute processing, and that this function is arguably a part of the judiciary’s governmental role. *See*, Fiss, *Against Settlement*, 93 YALE L.J. 1073, 1087-89 (1984). The argument may be tenable, but it is inapposite: The focus of the present discussion is on the differential capabilities of litigation and ADR as measured solely by their satisfaction of the *parties’* goals.

8. “Zero-sum” and “Positive-sum” are phrases used in game theory analyses to describe the possibilities of negotiated or individual choice strategies. A zero-sum game is one in which every part of the advantage gained by one party comes at the cost of the same amount to the other: What I win you lose. A positive-sum outcome is one which leaves both parties better off than they were before the process commenced: If I have more pizza than I can eat and you have more beer than you can drink, and if we trade half of mine for half of yours, we will both be better off. Litigation settlements expressed only in dollar terms tend to be zero-sum: Dollars received by the plaintiff are equivalent losses to the defendant. For a general discussion, see J. VON NEUMANN & O. MORGENSTERN, *THEORY OF GAMES AND ECONOMIC BEHAVIOR* 47 (3d Ed. 1970).

9. An “integrative” solution is one achieved by negotiating parties whose interests are not narrowly conceived and set against each other in a zero-sum fashion, *see supra* note 8, but rather expanded and integrated into a resolution which can serve both sets of needs. Integrative solutions are nearly always positive-sum. *See generally*, H. RAIFFA, *THE ART AND SCIENCE OF NEGOTIATION* 131 (1982) (“Integrative bargaining converts a single-factor problem into a multiple-factor problem.”).

Finally, litigation does not always employ science "wisely." If a rule of law is phrased in terms of scientific fact, and if that fact is uncertain, then a legal outcome selects the most probable factual alternative and predicates its results on that. There is little room for the wiser use of scientific uncertainty as, for example, through the creation of ongoing science institutions built into the overall resolution.<sup>10</sup> (Or, as another example, for the movement away from science as the ultimate determinant and toward other more tractable and satisfactory criteria.) Law and science have separate integrities. "Good" science observes its own. In litigation, the internal integrity of science is regularly trumped by that of law.

### III. ALTERNATIVE DISPUTE RESOLUTION AND PREVENTIVE LAW

Alternate Dispute Resolution (ADR) techniques are designed to respond to the inadequacies of litigation. Their principal aspirations include the achievement of maximizing solutions through voluntary bargaining, with the questions posed and alternatives framed not in terms of some extrinsic analytical scheme but from the parties' collective perceptions of the nature of their interests. "Solution space" is correspondingly enhanced, and the rules of participation are established by the parties themselves.

The number of available ADR techniques is virtually limitless. Most common are various forms of mediation and structured negotiation, of which one recently developed variant is the "Mini-Trial." Private adjudication, including arbitration, is also within the concept, as are conflict anticipation, dialoguing, joint problem solving, and joint fact-finding.<sup>11</sup> Flexibility is the chief common denominator among them. This article will focus on that subset of techniques which shares the characteristics of employing third-party neutrals in a facilitative (*i.e.* nonadjudicatory) role.<sup>12</sup>

The techniques of negotiation, mediation, arbitration and the Mini-Trial are applicable to those circumstances in which a problem has ripened into a conflict or dispute. (Hence the phrase alternate dispute resolution.) There is, however, a second mode of conflict management which addresses not the

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10. J. NYHART, SCIENCE, TECHNOLOGY AND JUDICIAL DECISION-MAKING: AN EXPLORATORY DISCUSSION 1-21 (1981); J. NYHART & M. CARROW, LAW AND SCIENCE IN COLLABORATION 255-96 (1983).

11. A number of ADR typologies have been published, among them: E. GREEN, S. GOLDBERG & F. SANDER, DISPUTE RESOLUTION (1985); ALTERNATIVES TO THE HIGH COSTS OF LITIGATION [hereinafter ALTERNATIVES]: TAYLOR, FINE & MOUKAD, CPR WORKING TAXONOMY OF ALTERNATIVE LEGAL PROCESSES, Part I (May 1983 at 9); . . . Part II—Litigation Management and Planning (August, 1983 at 4); . . . Part III—Dispute Prevention (November 1983 at 5); . . . Part IV—Court Supervised Alternative Dispute Resolution (December 1983 at 5).

12. See, e.g., Dauer and Nyhart, "A Loss Allocation Procedure for a Joint Defense Agreement," December, 1984 ALTERNATIVES at 14.

resolution of existing disputes, but the avoidance or anticipation of disputes in the future, and the architecture of solutions to shared opportunities. This second mode may be referred to as "Preventive Law."<sup>13</sup>

Preventive Law, or more accurately, preventive lawyering, seeks to anticipate and account for conflicts that may arise in the future. It does so by arranging transactions and relationships in such a way as to minimize the probability of conflict, to avoid its disruptive potential, and to secure the maximum degree of transactional success—achieving those goals through steps taken in the present.

At its most fundamental level, the mode of problem analysis in preventive law is the reverse of what is employed in adjudicative legal reasoning. That difference can be illustrated by focussing on four concepts: Facts, Rules (of law), Results, and Purposes.<sup>14</sup> In adjudication, the facts are searched for, and when "found" are taken as givens. The relevant Rules are applied to the Facts in the form of conditional syllogisms, the conclusion of which is a Result: "If A took and carried away the property of another [a fact] with intent to steal [another fact], then A has committed larceny. [The result.]" In preventive reasoning, by contrast, the first step is the articulation not of Facts, but of the party's Purpose.

From an elaboration of the several Purposes, the Results necessary to achieve them can be derived. Then, working "in reverse" with a knowledge of the available Rules, the Facts which must exist—in order for the Results and hence the Purposes to exist—can be determined. The balance of the operation is to cause those Facts to come into existence, typically through the design of present agreements.

In that process of designing workable forward-looking agreements, three features should be included, in addition to the substantive terms of the agreement itself.<sup>15</sup> The first of these is prediction. It is necessary, for example, to be able to predict perceptions of injury as they may arise in the future: Who is likely to experience (and on what occasions) a sense of having been injured as the arrangement unfolds in planned or unplanned ways? How is that perception likely to be acted upon? How, then, can the risk of its occurrence or its disruptive potential be minimized?

The second is the creation, at the outset, of a method of monitoring performances throughout the life of the arrangement. Doing so establishes

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13. See L. BROWN & E. DAUER, "A Synopsis of the Practice and Theory of Preventive Law" in ABA, *THE LAWYER'S HANDBOOK A3* (Rev. ed. 1982).

14. A discussion of these four concepts appears at L. BROWN & E. DAUER, *PLANNING BY LAWYERS: MATERIALS ON A NONADVERSARIAL LEGAL PROCESS 270-78* (1978).

15. The three will also inform, as described *infra*, text immediately following note 25, the set of qualitative criteria by which a given conflict management strategy may be evaluated.



criteria for analyzing future claims of right and helps to minimize the consequences of untoward acts by providing early warning of their existence.

The third is the preservation of bargaining positions into the future. Any complex exchange which exists through time will have in it opportunities for adjustment, modification to accommodate new facts and changes in implicit expectations. The workability of the design both in the present and throughout its life can depend upon the relative bargaining positions which the original agreement creates (and the parties' satisfaction with them as the arrangement unfolds). The design must therefore be dynamic and responsive to the several participants' needs and aspirations.<sup>16</sup>

Preventive Law deals with potential conflicts. ADR deals with manifest conflicts. Complex multi-party problems, such as those of coastal zone and continental shelf resource use, call upon the techniques of both domains. As a later section of this article will suggest, there is a method for integrating them into a single continuum of conflict management. From that integration an additional set of considerations of use to the selection of "process tools" will be derived.

#### IV. A CONCEPTUAL FRAMEWORK

##### A. *Introduction to the Variables*

The basic framework of the following analysis is that of seeking relationships among three distinct sets of variables. These are "Process Tools," "Process Goals," and "Chronological Strategies." "Process Tools," which may be thought of as the independent variable,<sup>17</sup> is the first of these sets. There are three process tools, each being a variation on the uses of models within a conflict management process: Ordained Models, Model-Building, and Non-Model ADR.

The second is a set of thirteen "Process Goals"—criteria for assessing qualitatively how well-designed a given dispute resolution (or avoidance) procedure may be. Together they describe, in effect, an ideal conflict management strategy.

The third is a set of four "Chronological Strategies." These are derived from the integration of ADR and Preventive Law. They are not so much desiderata as they are descriptions of the resolution options available to the

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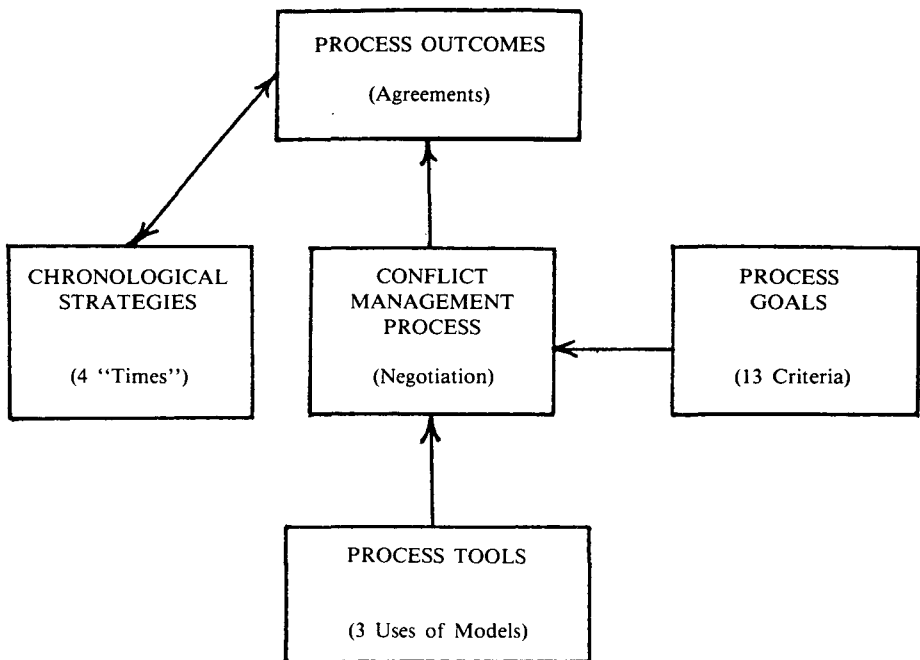
16. See L. BROWN & E. DAUER, *supra* note 14, at 485-91.

17. "Independent" and "dependent" variables are, in social science methodology, related as cause is to effect. The dependent variable is the factor one is trying to predict or explain through manipulation of the independent variable. "[T]he explanatory variables are referred to as the independent variables." D. BARNES & J. CONLEY, *STATISTICAL EVIDENCE IN LITIGATION METHODOLOGY, PROCEDURE AND PRACTICE* 100 (1986).

parties in the design of any substantial agreement. Ideal agreements optimize uniquely the relative proportions of the four.

The burden of the following conceptual framework is to identify the causal relationships that may be found among these three sets of variables: in particular, (1) whether, in any given type of conflict, satisfaction of the thirteen process goals can be enhanced by the "correct" choice of a particular process tool; and (2) how well or poorly that same choice may lead to the best combination, in the outcome, of the four chronological strategies.

Before beginning the analysis it is necessary to describe in some detail each of the three sets of variables. That will be done in the following sections. Their overall relationship may be summarized in advance with the following figure:



*B. Process Tools: Variations in the Use of Models*

The three process tools which make up the independent variable represent a basic division among the ways in which "models," particularly scientific models, can be employed within ADR procedures.

The first is the "Ordained Model," a set of statements about causal relationships, or standards for measuring and determining recognizable injury, accepted by the parties and capable of providing criteria by which future disputes may be defined and resolved. The model will often not have been

developed by the parties themselves, but will have been accepted by them at the outset and can thus be characterized as being neutral.<sup>18</sup>

Ordained models have the advantage of offering finality and efficiency in resolving future disputes. Concomitantly, however, they have the disadvantage of fixing, at a moment in time, interests and facts which may not in reality be fixed. That does not reduce their usefulness in proper cases. It does, however, suggest that in some circumstances it may be useful to incorporate into the existing agreement procedures by which the future may be accommodated without disrupting the ongoing resolution process.

The second process tool is "Model-Building," a technique by which the parties or representatives of groups of parties are brought together in the process of constructing a model. The construction process itself is the focus of the conflict management strategy. It may be short or ongoing, but in every case it strives for a consensus about the model to be employed and thus about the basic facts, assumptions, uncertainties and values at stake in the underlying problem. The process may eventuate in an accepted model to handle future disputes, but differs from those ADRs employing an ordained model by not beginning with the assumption that there is any factually "correct" set of inputs or relationships. It thus replaces descriptive analysis with prescriptive argument.

It may be in any given case that the argument—about the data, the assumptions, or the uncertainties—has already taken place, resulting in substantial consensus about the model's inputs. Generally, however, this second process tool is used for producing that consensus. The direct involvement of the parties highlights some of the advantages provided by its use.

The third process tool may be termed "Non-Model ADR." By this is meant a form of conflict management which incorporates a subsidiary procedure (usually facilitated by a neutral third party) that provides the parties or decision-makers with one or more sets of allocative criteria for use as they see fit. The process begins by intentionally not determining the nature of the values to be exchanged. Hence, it eschews the too-early use of a model representing any one aspect of the underlying reality.

An example of a "non-model" ADR is a recently developed multi-defendant loss allocation procedure.<sup>19</sup> It adapts the "Mini-Trial" form of facilitated negotiation to multi-party toxic substance cases in which the attendant science is disputed or uncertain (or both). The process, which includes the use of an expert science advisor adjunctive to the neutral facilitator, has been applied in the construction of liability sharing agreements among jointly liable (or internally cross-liable) defendant corporations.

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18. The choice of one ordained model over another can in some circumstances itself be conflictual. (Indeed, litigation very often turns on precisely that choice.) When such a conflict becomes intractable, a "model-building" strategy may be necessary.

19. Dauer and Nyhart, *supra* note 12.

At selected stages in the process, a neutral (and independently expert) science advisor consults in confidence with the participants' science staffs, in an effort to reach the widest possible consensus about what is known, what is unknown, what is disputed and what can or cannot be further determined within practical boundaries of time and cost. The result is the advisor's report, which is made available to the principals as their structured negotiations begin.

In litigation, the relevance of scientific facts is rigidly determined by the applicable law, even when the uncertainty of those facts is substantial. In this "non-model" process, relevance can be made a function of uncertainty, to allow for workable rather than merely probabilistic solutions. As their needs require, the parties may use, ignore, or override the outputs of otherwise available scientific models, in favor of such criteria as business economics, industrial relationships, or internal and external political considerations.

In sum, the non-model process has these essential features:

1. It removes scientific fact-finding from the distortions of the adversary process, respecting science's own paradigms and procedures.
2. It does not presume that the answers to questions of scientific causation will be determinative. As such, it provides science to the decision-makers as only one of several sets of allocative criteria.
3. It employs, in addition to neutral expertise, the participants' own scientific staffs—not as witnesses, but as scientists.

To date, the discipline of conflict management has developed comparatively little experience with these three process tools. An ordained model was used in the United Nations' Law of the Sea context.<sup>20</sup> The non-model procedure has been employed on several occasions in joint defense agreements for toxic-tort lawsuits.<sup>21</sup> Model-building as an explicit piece of consensus-building's technical armory has also been used, albeit on a limited scale.<sup>22</sup> Nevertheless, these ideas, and the very concept that process tools are useful as auxiliaries in a wide spectrum of primary conflict management applications, seem a worthy subject for fuller examination. Problems<sup>23</sup> arising in the

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20. Antrim, *Computer Models as an Aid to Negotiation: The Experience in the Law of the Sea Conference*, in M.I.T. Symposium 139 (Nyhart ed. 1985) (describing the uses of an ordained model during negotiations among 150 nations on questions concerning the extraction of ocean resources, principally through deep sea mining).

21. The procedure has been widely distributed among the corporate sector by the Center for Public Resources in New York City and thus not all of the occasions of its use are known. For a discussion of one company's (Exxon) experiences, see Lowenberg, *Use of Single Defense Counsel*, CPR LEGAL PROGRAM PROCEEDINGS 18 (S. Scott ed. 1985).

22. See generally, C. HOLLING, *ADAPTIVE ENVIRONMENT ASSESSMENT AND MANAGEMENT* (1978).

23. Examples of such problems are described in the several papers making up

continental shelf and coastal zones, again, typify the multi-party and multi-issue contexts in which their employment may be most illuminating as well as most useful.

### C. Chronological Strategies

From the principles of Alternative Dispute Resolution and Preventive Law a framework can be derived which summarizes the choices available to those charged with the management of conflicts and disputes. It should be clear by this point that what is meant by "conflict management" spans the full spectrum of both time and process choices. "Time" means the possibility of preventing, ameliorating, shaping the handling of, and resolving disputes. "Process choices" means not only the many mechanisms described in the various typological studies of ADR<sup>24</sup>, but more particularly those three process tools delineated in the preceding section of this article.

#### The Chronology of Conflict Management

As has already been noted, it is useful to observe that most of the complex conflict situations typified by ocean uses span considerable time during which the parties, their interests, and the technical and scientific uncertainties are likely to change. The choice of responses to the dynamics of a dispute can therefore be a critical component of its management.

Conflict resolution strategies may be employed either in cases of present dispute, or for the purpose of preventing disputes from arising as one or more of the parties engage in planned activities in the future. ADR and Preventive Law may therefore be thought of distinctly. There is, however, a set of connections between them which is useful to the present analysis. First, most voluntary agreements providing for exchanges of economic values employ both present conflict and future conflict management techniques. Most contracts, for example, both define the measures of present exchange and provide the standards by which executory performances will later be judged (and, often, resolved).

Because many such situations involve both presently competing claims of legal right and potentially competing claims on future resources, there is on the analytical plane a possibility of representing the parties' most basic conflict management choices on a single continuum. Thus the inner logic of

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the 1985 M.I.T. conference. See, e.g., Prout & Tippie, *Chesapeake Bay Program Management: Coordination and Consensus-Building*, M.I.T. at 47; Scott, *The Role of Facilitation, Mediation and Negotiation in Initiating Petroleum Exploration in Georges Bank During Lease Sale No. 42*, M.I.T. at 115; and Baker & Knecht, *Fundy Tidal Power*, M.I.T. at 121.

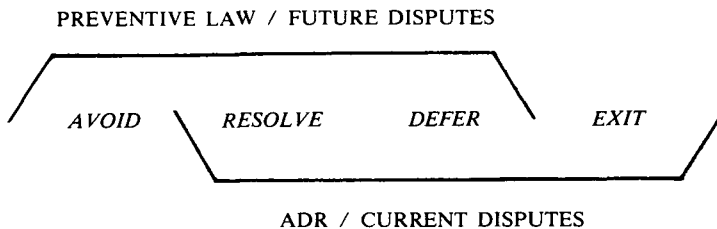
24. Works cited *supra* note 11.

Preventive Law and that of ADR may be combined to provide a single framework for a theory of dispute management.

The parties to a present dispute have three basic choices: they may choose to *resolve* it; they may choose to establish a procedure by which it may be resolved in the near term (we shall refer to this as *defer*); or they—or one of them—may choose to *exit*, *i.e.*, to accept the consequences of the problem's persistence. Many ADR techniques conclude with a blend of the three, using the choices to modulate the negotiations in a way which achieves the maximum consensus without breakdown over those parts of the problem that defy substantive resolution by the procedures then in effect.

Related choices are available with respect to potential or future disputes (or conflicting interests in an exchange). First, future disagreements may be fully "presentiated" and *resolved* by a contemporary agreement. (Hence the importance of prediction.) Second, they may by agreement be *deferred* to a process or institution created by the present agreement. (Thus monitoring performances and preserving future bargaining positions.) Third, they may be *avoided* in the sense that the structure of the initial agreement leaves minimal possibility of their arising later. (The Purpose-Result-Rule-Fact mode of analysis.)<sup>25</sup>

Ocean conflicts, like other complex polycentric cases, call both sets of choices into play. There are presently conflicting claims of right as well as potential future claims and the need for integrative, long-term exchanges. Conflict resolution strategies sufficient to the task will therefore employ both the ADR and the Preventive Law continua; hence, the argument that the three choices in ADR and the three choices in Preventive Law may be combined into a single set of four:



A comprehensive strategy for the effective management of long-term problems (or opportunities) will thus attend to the four elements of the combined present and future domains.

A simplified example can be constructed from the California coastal conflicts discussed by Knaster, Gianninni and Uchikura.<sup>26</sup> Oil industry seismic

25. L. BROWN & E. DAUER, *supra* note 14.

26. Knaster, *Negotiation of OCS Conflicts in the Santa Barbara Lease Area: The Mediator's Perspective*, in M.I.T. Symposium 101; Gianninni, *Negotiation of OCS*

testing was thought by fishing interests to be in conflict with fish husbandry; fishing trawl lanes were in conflict with seismic platforms; and, as to the future, deep water oil exploration and extraction were believed to be creating risks to the marine ecology. The problem thus contained numerous present and future opportunities for both profit and conflict.

Certain of the ongoing physical conflicts were *avoided* by agreement on changed facts (altered sea lanes). Others were *resolved* by the establishment of compensation offices and of ongoing liaisons. Some were *deferred* by the creation of a testing program (*viz.* building a model) for seismic effects on fish biology. And, although not detailed in the report, it is reasonable to expect that some residual aspects of the problem were unresolved, *i.e.* one or more parties may have *exited* with respect to them.

Because every negotiated arrangement must address at least some aspects of both the present and the future, each outcome can display components of each of the four categories or "chronological strategies." Given the state of the theoretical literature, it is not yet possible to establish *a priori* how, for any given conflict type, the relative contributions of the four should be adjusted for an optimal mix. All that can be said at this point is that the process which leads to the agreement should be capable of allowing whatever combination seems optimal at the time without unintended skewing caused by the process tools employed. Flexibility and openness in the resolution procedures may thus be significant factors. Briefly, then, the four chronological strategies displayed on the combined ADR/PL continuum—*avoid*, *resolve*, *defer* and *exit*—comprise one of the two independent dimensions against which the suitability of process tool selections may be assessed.

#### D. Process Goals: Criteria for Effective ADR

Process goals represent criteria for measuring qualitatively the structure of a given conflict management procedure—more particularly for present purposes, the usefulness in selected contexts of the three process tools (or model-use variants) just described. (The criteria for evaluating the *outcomes* of a negotiation have already been identified.)<sup>27</sup> These goals are derived from the related theories of ADR and Preventive Law, and from replicated principles of the Law-Science domain. The latter is particularly noteworthy in the types of conflicts being addressed, because of the importance of affording to the process the best possible scientific and technical input.

There are thirteen such criteria, which may for convenience be grouped into three main areas, representing in order: (1) ADR/Preventive Law; (2)

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*Conflicts; The Commercial Fishermen's Perspective*, in M.I.T. Symposium 105; and Uchikura, *Negotiation of OCS Conflicts: The Oil Industry's Perspective*, in M.I.T. Symposium 107 (describing negotiations over fishing rights and oil exploration in the Santa Barbara channel during the years following the 1969 Santa Barbara oil spill.)

27. SUSSKIND & MCCREARY, *supra* note 2 and accompanying text.

issues in “constituency management”; and (3) the experience of science-in-law.

## 1. Alternative Dispute Resolution and Preventive Law

### *a. Value Identification*

At the outset of traditional negotiations one or more of the parties may fix prematurely on goals or positions thought to be important, whereas in many cases the clarification of more fundamental underlying values or interests may move the parties away from positional bargaining and into interest bargaining.<sup>28</sup> The use of a process tool should help in thus defining the scope of the dispute in terms of underlying values and real interests.

### *b. Solution Space*

The conflict management process should help the parties to broaden the solution space, by enlarging the total benefits to be distributed (by helping, for example, to identify new Pareto-optimal frontiers, or by illuminating additional interests to trade), or by increasing the perceived fairness of their distribution. Creative solutions to conflicts are arrived at by the avoidance of rigid or preconceived remedies and by the parties’ recognizing that they have varied interests which can be traded and, therefore, more effectively negotiated or compromised.<sup>29</sup>

### *c. Adaptability to New Information*

Complex conflicts tend to be dynamic over time. There is a need to facilitate the introduction, validation, and acceptance of new data into the conflict management effort as they become available.

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28. “Positional bargaining” occurs when one or more of the parties’ strategies is to adopt and defend a *position* rather than to pursue the underlying interest which the position is thought tactically to serve. “Interest bargaining” occurs when the topics of explicit negotiation are the parties’ real interests.

As more attention is paid [by the negotiators] to positions, less attention is devoted to meeting underlying concerns of the parties. Agreement becomes less likely. Any agreement reached may reflect a mechanical splitting of the difference between final positions rather than a solution carefully crafted to meet the legitimate interests of the parties. The result is frequently an agreement less satisfactory to each side than it could have been.

R. FISHER & W. URY, *GETTING TO YES: NEGOTIATING AGREEMENT WITHOUT GIVING IN* 5 (1984).

29. Sebenius, *The Computer as Mediator: Law of the Sea and Beyond*, 1 J. POL’Y ANAL. & MGMT. 77-95 (1981).



*d. Maintenance of Bargaining Positions*

The model or other process tool should create opportunities for adjustment, further dispute resolution, modifications, and the like throughout the life of the agreed-to arrangement. It should help to maintain the relative bargaining positions created by the original agreement into the future, and be dynamically responsive to the aspirations and perceptions of the several parties to preserve their reentry into the adjustment process. (The point is twofold: First, to avoid collateral attacks on the arrangement in the future; and second, to make the agreement more attractive and therefore more likely to achieve consensus in the present.)

*e. Predicting Injury*

An important element of preventive law is the prediction of future perceptions of injury. The present parties should be able to discern who is likely to feel a sense of injury and of entitlement as the dynamics of the arrangement unfold, so that the solution outlined can be either as impervious or as responsive as the circumstances may allow.

*f. Bindingness*

The use of a model should help in creating conditions, formal and authoritative or otherwise, through which the parties will consider themselves bound to the commitments they have undertaken (or that have been undertaken in their names). The ability of voluntarily arrived-at agreements (as contrasted with the power of the courts in adjudication) to bind the parties is a crucial aspect of alternate dispute resolution. Frequently, personal participation binds the parties psychologically; in other instances, the good sense of the agreement provides the only glue capable of assuring that the agreement will stick. However, there are other measures, legal and quasi-legal, that can be employed in private arrangements to augment the sense of "bindingness."<sup>30</sup>

*g. Monitoring Performances*

A process tool's use should aid the parties' (and any third-party facilitator's) monitoring of the respective performances and commitments throughout the life of the arrangement and help in creating criteria for analyzing future claims of right and for minimizing the consequences of untoward acts by providing early warning of their existence.

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30. One such would be to provide incentives for non-departure. In a litigation settlement agreement, for example, the parties might agree that the ADR process would be nonbinding but that the neutral advisor's opinion would be admissible into evidence should one of the parties reject the outcome and proceed to trial.

## 2. Constituency Management

Most complex conflicts involve multiple parties. It is therefore characteristic that conflict management agreements are negotiated by representatives. Experience demonstrates that each interest must consider the constituency management problems both of itself and of the others. How, therefore, can the *representatives* of the different constituencies fully and effectively conduct the negotiations, settlements, and creative arrangements in such a way that their constituents will be most likely to accept and adhere to the undertakings to which they would be committed? The next two evaluative criteria deal with these aspects, which are among the most difficult in multi-party complex negotiations.

### *h. Party Flexibility*

The process tool selected must enhance the flexibility necessary for the optimal (pragmatic and occasionally political) inclusion of parties, apart from the technical rules of interest or "standing." In particular, it should allow interests identified after the process has begun to be accommodated. The movement of parties among groups and alignments should be facilitated as the negotiations proceed.

### *i. Legitimacy*

Those who fashion the process require a rationale as to why their several constituencies should embrace it and its outcomes. As in the case of bindingness, legitimacy may come from the process' own internal rigor. Or, it may derive from its prior use or the aegis under which it is conceived and implemented.

## 3. The Science and Law Domain

Large and complex conflictive situations such as those arising in the commercial exploitation of the coastal zone and continental shelf are likely to be surrounded by uncertainties, many of them economic and political, but many of them of a scientific or technical nature. Their management or resolution may take on added difficulty because of the need for gaining understanding and agreement on facts, on implications of outcomes, and on the assumptions underlying the technical input. The most informed persons as to the scientific or technical issues are frequently not the principals—those empowered to resolve the dispute—but rather their technical and scientific staffs. Even among the most informed, what is unknown may be so great as to create substantial uncertainty.

As part of the task of shaping alternative means of resolving scientifically-laden issues, it makes considerable sense therefore to attempt to improve the quality of the technical input. Doing so gives a more rational basis for

arriving at a settlement by providing, among other benefits, a sound basis on which the negotiators may present their agreement to their respective constituencies.

One strategy is to create neutral sources of credible scientific input. Another is to make specific efforts to gain consensus among the parties as to the technical facts and assumptions in advance of the negotiation or other resolution process. Still another is to structure the technical aspects of the process in ways designed to enhance the quality of the science.

There are sound principles to be drawn from experience in the regulatory sector, which suggest that it is possible by careful drafting of the process to improve the quality of its scientific dimensions. The following criteria are concerned with the quality of the relevant science.

#### *j. Distinction and Allocation of Functions*

The uncertainties and dynamics of complex problems tend to transform scientists into policy makers or facilitators, and sometimes vice versa. Crisp identification of the respective functions of the scientists, negotiators and decision-makers tends to correlate those functions with their respective capabilities and authority. Process tools should help in making those allocations in a collaborative rather than a competitive manner.

#### *k. Framing the Question*

The aim here is to ask scientific rather than policy questions of scientists—"is" rather than "ought" questions—and to minimize (though one cannot completely remove) the distraction and potential disruptiveness of the value-laden aspects of technical and scientific work. The use of a process tool should help frame questions for the scientists and technical persons so that they can respond in a way consistent with their expertise and function, and help minimize the value-laden quality of those questions.

#### *l. Room to Breathe for Scientists*

The formal judicial process frequently restricts the ability of scientists and technical experts to provide evidence or apply their expertise in the manner in which they believe proper and find familiar. Rather than allowing the law to determine the relevance of disputed scientific facts, as it does in litigation, the goal should be to allow the pertinent scientific disciplines to establish their own regime of what is germane. The process tool should therefore help to insure that the scientific and technical persons have ample room within the negotiating structure and its subsequent implementation to deal with the data in a manner that satisfies their sense of the internal integrity of their disciplines. If so, "better" science is the result.

### *m. Accessibility*

The scientific and technical considerations of the underlying issues become a part both of the negotiation process and of the eventual resolution, whether that outcome is binding or non-binding. They therefore must be folded into the formal embodiments of the outcome. The scientific input must be satisfactorily accessible (and readily understandable) to the negotiators, and the science must be "user-friendly." As part of the same goal, the process tool selected should help achieve effective communication (and, thereby, understanding and trust) among the several technical disciplines and among the parties and their facilitators.

## V. PRELIMINARY EVALUATION

With the three process tools, thirteen process goals and four chronological strategies thus elaborated, it is now possible to offer some conceptual, albeit preliminary, suggestions about the relationships among them. This inquiry proceeds by considering each of the three process tools in turn and assessing how well or poorly each serves: (1) to enhance the satisfaction of the process goals; and (2) as to the four chronological strategies, to allow the parties to reach an optimal combination of avoidance, deferral, resolution and exit. The non-model ADR, the least structured of the three, is examined first.

### *A. Non-Model ADR*

It will be recalled that a non-model ADR is a form of conflict management incorporating a means of marshalling acceptable data for use by the parties and the third-party negotiator as they see fit. The process, at least initially, is not directive as to the allocative criteria to be employed. Assuming that the problems at issue are complex technically, laden with scientific uncertainty and contention, one candidate for providing primary allocative criteria is the domain of science. Yet other domains—custom, economics, politics, law—may offer more commanding (or easier) decision-making criteria. Translated into the terminology of ADR, the emphasis is on the importance of identifying the broadest range of interests of the parties, in order to facilitate the largest solution space.

Thus a non-model ADR process tool eschews *a priori* selection of any preferred set of criteria, holding that choice open until well into the bargaining process. It provides virtually unlimited solution space. It also encourages the tailoring of the process to the specific needs of the situation and parties, therefore potentially avoiding costs of superfluous structure. There is, for example, no commitment to building a model unless and until its usefulness may be demonstrated. Because of the flexibility of this process tool, the role of the facilitator is very significant.

Another advantage of the non-model approach is the high degree of bindingness that may be expected to arise from the fact that the parties are a part of the process. Having created the contours of the dialogue themselves, they can reasonably be expected to adhere to the agreed inputs—and outputs. At the same time, it anticipates the prospective usefulness of scientific and technical considerations by providing for a neutral science advisor to the facilitator, for the latter to use as circumstances suggest. In this manner the non-model ADR could, if called upon, help significantly in achieving process goals from the science-law domain.

As to the “four chronologies” in particular, non-model ADRs have, because of their flexibility, some significant limitations and advantages. Exit (except from the ADR itself) may be made somewhat more difficult by the very capaciousness of the resolution potential. By the same reasoning the ease of resolution is enhanced because of the increased solution space. The avoidance of future disputes may require the construction of a process to which conversations about future events may be referred without creating any perceptions of injury. Such a construction is more likely to be agreed to if there are no pre-negotiation assumptions that narrow the available practical domains. Thus, non-model ADR techniques would allow for (though not necessarily compel) substantial components of dispute avoidance.

Against these virtues must be balanced a limitation on the ability of a non-model ADR to defer elements of the conflict, which arises from its refusal to establish criteria in advance. Deferral means an agreement to resolve either present or likely prospective issues in the future, and differs from exit in that some process for that later resolution is agreed to in the present. That process must be more than a mere agreement to defer. It must be a *procedure* which appears at least hopeful as a means of resolving future questions. It is of course possible for the deferral mechanism to be all “process” and no “substance,” but in a complex case such a procedure would be unlikely to achieve wide consensus among the parties. The resolution of future conflicts (deferral) may therefore require established criteria, whereas a non-model ADR eschews the articulation of criteria in advance.

In brief, a non-model ADR seems to be a method of choice in circumstances where there is factual contentiousness rather than only uncertainty. Yet, it may be contraindicated in cases with long lifetimes—*i.e.*, for problems and exchanges with protracted futures and occasions for repeated or evolving interaction among the parties.

### B. *An Ordained Model*

The use of an ordained model is in many respects the opposite of non-model ADR. An ordained model reduces solution space but does serve legitimacy and several of the other process goals.

A model is an abstraction of reality. But it is of necessity a representation of a *selection* of the total reality of the parties and issues. In a toxic waste

liability allocation system, for example, there could be a model of the relevant toxicological or geological science; or an economic model of the corrective options available; or a political model of the consequences of strategies for future joint action.

The point is that no model can represent all of the potentially relevant dimensions of reality. Selecting a model, regardless of the scope and multidisciplinary ambition it may contain, therefore represents a choice that some aspects of reality are highly relevant to the discussions, while others are much less so. A model generates criteria. Choosing *what* to model is necessarily a choice of the pertinence of the domain from which the model arises. Thus, an ordained model should not be expected to widen the solution space or to identify values in the critical, initial sense. An ordained model does not of itself provide incentives for the parties to express their *own* views of reality, or of what really matters to each of them within the whole range of possible realities.

However, to the extent the allocative criteria—what counts in the end—are appropriately identified, and are reflected in the model, then it can be very useful in assisting the parties to calibrate their negotiations within those selected parameters. Then the necessity of quantification can force useful value evaluation. The nearly infinite capability of a well-constructed model to play “what if” serves as a way to broaden the potential solution space *within* the selected sets of criteria. Parties can try a wide range of solutions in the limited variable areas to see what the effects are. Finally, it should be noted again that the inherent constraints of an ordained model may serve well situations with party complexity too vast to allow extended solution space.

The value of a model to bind the parties may be low if they have not participated in its development or otherwise do not understand its strengths and limitations, even though they have by definition “accepted” it for purposes of the resolution process. On the other hand, to the extent that its representation of reality accords with that of the parties and is responsive to their issues, the carefully constructed model can provide an analytic rationale of considerable strength, which may lead the parties to adhere to the commitments undertaken during the process. The quantitative clarity made possible by such a model can aid in binding when clarity increases the likelihood of meeting commitments.

In a similar vein, the appeal of the rationality of the analysis made possible by an accepted model may legitimize the commitments’ claims on the constituencies represented by the negotiating parties.

An ordained model can be useful in predicting injury, if the injury can be expressed in the quantifiable terms for which the model can generate outputs. Similarly, a model can be used for monitoring performance, in a way that helps to maintain bargaining positions, because it sets at the time of the agreement the criteria and operating parameters, and thus the outputs providing baseline expectations against which to observe performances. (The

model's utility in aiding all of these goals of course depends upon its own adequacy and quality.)

The ordained model can be very useful in helping achieve the goal of party flexibility, since any interest can make use of it (in the Law of the Sea experience many did).<sup>31</sup>

The success or failure of an ordained model in achieving the law-science process goals—allocation of function, responsible framing of the technical questions, the degree to which the scientific resources are free to operate within their own milieu, and the accessibility of the science to the decision-makers—is even more critically determined by the quality of the model and by factors exogenous to it. It is a vessel, providing the opportunity for achievement of goals. To the extent the assumptions underlying its algorithms remain free of hidden values (i.e., they address technical rather than policy questions, and the technical input into the model itself is the product of “good science,”) they will forward those goals. But a model carries the danger of obfuscating underlying assumptions, and of overweighing the scientific input if it is given undeserved and uncritical value.

Ordained models may therefore be indicated in circumstances where bindingness is for other reasons high; where there are extended opportunities for interaction; and where solution space restrictions may be less important due to a consensus about the relevance of the portion of reality the model represents.

As to the optimal combination of the chronological strategies, selective exit from an ADR employing an ordained model is made more difficult by the fact that issues to which the model does provide answers are presumed fairly to be concluded by it. (This effect may be marginal in magnitude.) An ordained model was particularly well adapted to the Law of the Sea mining context, for example, where exit was not a desirable option, and where the resolution of complex questions in the present was necessary to serve the related issues in which the mining problem was embedded.<sup>32</sup>

Avoidance of future disputes is a complex assessment. On the one hand, the narrowness caused by adopting an ordained model may reduce somewhat the range available to the parties for the fashioning of agreements concerning the future. On the other hand, however, to the extent that disputes are generated by perceptions of unredressed injury, and assuming that such perceptions can be dissuaded by reference to a previously agreed-to (“ordained”) set of evaluative criteria, the likelihood that a sufficiently unresolved dispute will reoccur may in fact be much reduced. It is therefore difficult to assess a model's impact on the avoidance strategy. One could conjecture, however, that the certainty it provides in terms of regulatory “what ifs” is both necessary to and facilitative of such decisions as the capital investment problems of deep-sea mining.

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31. Antrim, *supra* note 20, at 146.

32. *Id.* at 142.

Resolution and deferral should be much advanced by the use of an ordained model. Deferral should be advanced because the present acceptability of a future process is improved when the uncertainties of its later application are reduced. An ordained model reduces those uncertainties by assuring the parties that criteria agreed-to and legitimated in the present will be those obtaining as questions arise in the future. Resolution may be enhanced, perhaps too much so in a few cases, in that an ordained model may be too crisply applicable. The "intelligence" of the model itself may be important in this regard.

### *C. Model Building*

Involving the parties in the task of building a model provides the opportunity for focus on consensus-building as contrasted with immediate dispute resolving. It holds promise for achieving those process goals which turn most directly upon the parties themselves. There is the need in building the model to be specific, most often in a quantifiable way, about the factual premises and assumptions that collectively comprise the representation of the reality at hand. Thus model building offers the prospect of helping to identify the parties' underlying—and possibly otherwise unarticulated—values. Because it brings the parties together on a creative task other than (and rationally antecedent to) the resolving of the specific disputes at hand, it also offers an opportunity to identify widened solution space. Of course, the opportunity may be missed: The parties may be so tied to prior positions that they see the modelling process as a vehicle for casting not only their preferred solutions, but also their positional values in concrete. There is nothing intrinsic to the process that will guarantee that this does not happen. Open exchanges of views and a consistent focus on the requisites of agreement are likely to surface real values and, it may be hoped, eventually widen the solution space within which they are operating. A skilled third-party neutral can, in such instances, be helpful in enforcing that focus.

It should also be noted that to the extent that the development of consensus about facts, premises and underlying assumptions has been accomplished before model building commences, its value in achieving these process goals will be less significant.

A further advantage of model building as a resolution tool is that by participating in the construction of the model, the parties may be expected to develop a commitment to it, and through it, to the entire conflict management process to which it is auxilliary. To the extent such a commitment takes place and is transposed, there occurs a binding of the parties to the commitments made during the negotiations. The negative side, however, is that the parties' various constituencies may feel particularly left out and alienated by not being a part of the model building and therefore less likely to accord legitimacy to the outcome. A countervailing consideration is that model building does not predetermine the selection of parties who participate. Party flexibility is therefore well served. But there is nothing, again, intrinsic



to the process which requires that result. One may in fact speculate that the opposite can also happen: Those who began building the model might claim it as their own, shutting others out from ownership.

Three additional process goals—adaptability to new information, the clear framing of scientific questions to elicit scientific replies, and the development of scientific input accessible to the non-technical users—all seem to be made more easily achievable by making the parties part of the model building, provided the scientific/technical persons were in fact part of the process and—again—provided there was skilled third party facilitation.

As to the need for flexibility in arranging the optimal combination of “chronological strategies,” model building is an intermediate option. The process eventuates in, but does not begin with, an ascertainable set of criteria for the enhancement of the deferral option. Likewise, the resolution function is neither over-determined nor deterred by a too-early (or too confining) statement of what is and what is not substantively relevant.

Similarly, where building the model proceeds apace with the construction of a future-looking arrangement, each aware of the other, it should be possible to avoid the “architectural” constraints which the use of an ordained model risks. Hence the avoidance option is affected neutrally by this selection—neither interfered with nor promoted.

Finally, as to exit, the flexibility to include or exclude from the model any aspect of the total reality thought crucial by some party to a part of its interests is in fact the flexibility to exit with respect to that interest. Exit is not, however, without its costs in this setting. Because this resolution procedure does eventuate in some certain model, an interest not wrought in during the process may not be able to be recognized at any later time.

Model building takes time. It also requires a sufficient probability of eventual success to justify the attempt. Constituency problems abound. Despite its positive utility with respect to the “four chronologies,” this process tool may not be best in every case.

## VI. SUMMARY

This brief and preliminary analysis suggests that there are numerous factors to be considered in the selection of a process tool for a given dispute. While scientific models may in general be useful in the treatment of such complex and large scale problems as those typified by the coastal zone and continental shelf, there is in their *judicious* use the possibility of maximizing the various goals which define good process management.

No one of the three process tools, or model-use variants, described in this paper is capable of simultaneously achieving each of the thirteen delineated process goals, and the four chronological strategies derived from the fusion of ADR and Preventive Law. It is therefore necessary for process managers to inquire into a wide range of conflict process dimensions: Is it time, for example, for broadening solution space (non-model), or for finding

good solutions within already agreed-to sets of decisional or allocative criteria (ordained model)? Is there a need to break out of sets which have become non-productively rigid (using a non-model ADR in the midst of a bogged down lawsuit)? Is there an important need to bring parties or a limited number of their representatives together, and to stimulate their identification with the negotiation process so as ultimately to bind them to it (model building), or is it more important to provide rigorous support for an outcome so that it commands the allegiance of diverse sets of the negotiating parties' constituents (ordained model)? Are the ongoing dynamics of the problem such that settled reference points will be needed both in monitoring the outcome and in maintaining a relative standing among the parties in the future (ordained model), or will it be useful in the future not to be so bound but to be able to reconvene, or to seek new allocative criteria (continued model building, non-model)?

Such considerations illustrate (but do not exhaust) the need to examine carefully the context of each problem in choosing the preferred process tool. And, of course, these and other tools are not mutually exclusive: Development of a model and its implementation may, for example, grow out of an earlier use of a non-model ADR.

This article offers a taxonomy of process tools and criteria for their use, and suggests that there are correlations among them useful to parties engaged in conflict prevention or resolution. The correlations that have been suggested are, at this stage, almost entirely theoretical, though they have been drawn both from the authors' own experiences and from those reported by others.<sup>33</sup> Additional empirical validation is clearly necessary. As scientific models come to be more widely employed in future occasions of conflict management, verification of these theoretical constructions should become a possibility.

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33. See works cited *supra* notes 12, 23.

