A Summary of the Doctoral Dissertation A Decision Theoretic Model of Congressional Technology Assessment: A Theoretical Examination of the Characteristics of Complete Assessment Reports, With Applications

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by

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A DECISION THEORETIC MODEL OF CONGRESSIONAL TECHNOLOGY ASSESSMENT

Introduction

Throughout OTA's operational period, the dominent academic approach to the theory of assessment evaluation has focused on the characteristics of proper assessment activities.[1] On the other hand, criticisms of the office during this period have been predominately criticisms of the informational content of OTA reports.[2] Trying to guarantee the quality of assessment reports by means of criteria based on current notions of the assessment process has a rough parallel in fishing--it is somewhat like trying to guarantee that one will catch only a given type of fish by adjusting the size of the fish hook. Just as there are many different fish that will take the same sized hook, the very same generic assessment process can lead to assessment reports that differ widely in their quality. For example, both Coastal Effects of Offshore Energy Systems and A Technology Assessment of Coal Slurry Pipelines could be argued to satisfy the characteristics of the generic assessment process described in the Technology Assessment Act of 1972 (PL 92-484). But the latter refers to itself as "a predominately technical analysis" (page 11) that takes admittedly "inadequate account" of stakeholder opinions, while the former is an early attempt at a full scale TA.

The main objective of the work below is to clarify the notion of a "complete" assessment report. The discussion to follow is theoretical in that it attempts to describe the properties of a

level informing process. On the first level, assessment teams acquire the information that they present in the assessment report. On the second level, legislators become aware of the decision problem that they face with respect to a technology-laden policy issue. Motivated by the analysis of rational individual decision making suggested by statistical decision theory, the second level informing process is represented as the identification of the legislator's decision matrix for the policy issue. The relation between an OTA report (the product of the first level process) and a legislator's decision matrix (the product of the second level process) is modeled as a justifying relation in which the report contributes both (i) to justifying the legislator's understanding of his decision problem vis-a-vis the policy issue by showing his grasp of his position to be reasonable, and (ii) contributes to justifying a justifiable decision on the issue should this decision be challenged by his constituents.

It is argued that the purpose of congressional TA is two-fold:

(a) to contribute to restoring or supporting public confidence in congressional policy, and

(b) to contribute to rational congressional debates and decisions.

Given even the unique personality and political position of each legislator, there remains in his understanding of a policy issue a core of factual information which will prove important to his decision. It is argued that OTA's proper function is to provide legislators with a respectable source for this information, and ultimately to facilitate a justification of those policy decisions that are justifiable. The assessment report should be

PART ONE

THE DEVELOPMENT OF CONGRESSIONAL TECHNOLOGY ASSESSMENT

1-1. The Pre-September-1967 Period

The idea of technology assessment for the Congress can be traced back to influences on federal legislators from three sources: (1) the launching of Sputniks I and II in 1957, (2) the rise of the environmental and consumer movements, and (3) the post-W.W. II developments in operations analysis. The launch of Sputniks I and II shocked this country into huge expenditures on scientific research. The national budget for research and development (R & D) shot up from $2 billion in 1953 to about $15 billion in 1964, and most of the increase went to Executive Agencies like the National Aeronautics and Space Administration (NASA). As total annual appropriations for R & D continued to climb, uneasy federal legislators began to examine the merits of Executive Agency programs. They quickly discovered that the Agencies were far better prepared to justify their budgets, by sending teams of experts to Capitol Hill, than the members of the Congress were prepared to evaluate the arguments that they heard.

In 1963, the House Committee on Science and Astronautics (now Science and Technology), charged with legislative jurisdiction over most of the R & D budget, created an evaluative Subcommittee on Science, Research, and Development (now Science, Research, and Technology) chaired by Rep. Emilio Q. Daddario (Connecticut). Among the stated objectives of the Subcommittee were (i) "the overall evaluation of scientific research and

development throughout the country," and (ii) "the strengthening of congressional sources of information and advice in the fields of science and technology."[3] It was the general conviction of Subcommittee members that R & D activities should be evaluated according to their long run goals and probable long run payoffs.[4]

During the early sixties, environmental and consumer advocates like Rachel Carson, and later Ralph Nader, exposed a widespread pattern of faulty decision making, both by government and by the private sector, that imposed intolerable risks on the general public. As a result, by the mid sixties there was a common and growing fear that science and technology were out of control. This became vividly clear to the Daddario Subcommittee at the well-known meeting between Daddario and Charles A. Lindbergh in 1965, and in the Subcommittee's 1966 progress report the first call appears for a congressional technology assessment effort that would assemble a group of congressional advisers to evaluate R & D proposals not only on the basis of their scientific payoffs but also on the basis of their probable "undesirable byproducts or 'side effects'". This group, the Technology Assessment Board (TAB), was urgently needed, it was argued, to give an "early warning" of such dangers.

1-2. The Period From September 1967 to the Floor Debate on HR10243, February 8, 1972

The Daddario Subcommittee had some understanding by September 1967 of the research capability they were seeking, but they were far from being willing, at that time, to formalize it in a bill. The second phase of development can be characterized as a formative and reflective period. In phase two, the original

idea was examined and refined within the Subcommittee with the help of commissioned studies and Subcommittee hearings.[5]

In September of 1970, the Subcommittee made its first attempt to put the idea of a technology assessment capability for the Legislative Branch to a vote on the House floor. On September 16, HR18469 proposing the creation of an OTA was offered as an amendment to the Legislative Reorganization Act of 1970, but the amendment was ruled not germane and no further action was taken in 1970. By the fall of 1971, the Subcommittee, under the new leadership of Rep. John W. Davis (Georgia), was ready to bring HR10243, a slightly modified version of the previous bill, once again to the House floor. This occurred on February 8, 1972, and the bill was passed with important amendments made during the debate. S2302, the companion bill to HR10243, remained in committee in the Senate until September.

Testimony by Subcommittee members on February 8, and during subsequent hearings, suggests that the Office described by the unamended bill came close to capturing the Subcommittee's exact notion at that time of a congressional technology assessment capability. Charles A. Mosher, for example, has referred to the prior studies and hearings as "perfecting" the concept. Of the characteristics of congressional TA that one can infer from HR10243 and its history, eleven can be found that place important constraints on the content of an assessment report--only one of these was altered by the amendments on February 8. These characteristics are as follows.

1. TA was to be a new type of research that was not carried out by any other congressional information

agency including the General Accounting Office and the Library of Congress. (see U.S. Congress [1967a, page 6], S2302 (section 2. (d) and (e)), and the Congressional Record, February 8, 1972, pages H867 and H874.[6]

2. TA was to provide information especially suited for use in the policy formation process. (see U.S. Congress [1967a, pages 12 and 14], S2302 (section 2. (e), and section 3. (c)), and the Congressional Record February 8, 1972, pages H868, H873 and H881).

3. TA was to be anticipative, and an "early warning" system for the Congress. (see U.S. Congress [1967a, pages 3, 7, 14, and 15], S2302 (section 3. (c)), and the Congressional Record, February 8, 1972, pages H867, H873, and H874).

4. TA was to identify and describe policy options, and their likely consequences. (see U.S. Congress [1967a, pages 12, 13, and 14], S2302 (section 3. (c)), and the Congressional Record, February 8, 1972, pages H867, H872, H873 and H881).

5. TA was to "appraise" or "assess" or "evaluate" these likely consequences. (see U.S. Congress [1967a, page 12], S2302 (section 3. (c)), and the Congressional Record, February 8, 1972, pages H873 and H882).

6. TA was to include a description of the social, economic and political effects of the policy options. (see U.S. Congress [1967a, pages 11 and 15], S2302 (section 2. (e)), and the Congressional Record, February 8, 1972, page H881).

7. TA was to be "objective" (or "unbiased" or "impartial" or "balanced"). (see U.S. Congress [1967a, pages 12 and 13], S2302 (section 2. (e)), and the Congressional Record, February 8, 1972, pages H869, H873, H874 and H881).

8. TA was to be managed by public appointees and include public participation. Every subcommittee authored TA bill, beginning as early as March of 1967 with HR6698, included significant representation of the "general public" on the Technology Assessment Board. (see, for example, S2302 (section 4. (a)5 and (b))).

In addition to these eight, which can be inferred from passages in S2302 itself, there are three very important characteristics which can only be inferred from discussions about the bill, and earlier

comments by the Subcommittee. These are that:

9. TA is not a substitute for the policy decisions of individual legislators. That is, TA does not make policy; it merely provides information. (see U.S. Congress [1967a, page 14], and the Congressional Record, February 8, 1972, pages H868, H874, H881 and H886).

10. TA would contribute to restoring or supporting public confidence in the wisdom of congressional policy. (see U.S. Congress [1967a, page 16], and the Congressional Record, February 8, 1972, page H871). Related to this, TA was at least to make available to the public information about the likely consequences of possible governmental decisions (see U.S. Congress [1966, pages 27-28], U.S. Congress [1967a, page 3], U.S. Congress [1970, page 87], S2302 (section 3. (e)), and the Congressional Record, February 8, 1972, page H870). Also, TA was arguably intended to evaluate or predict public reactions to these policies with the intent of avoiding unpopular decisions that might ultimately have to be reversed, at great expense, in the face of extensive litigation. (see, for example, Daddario's comments in U.S. Congress [1970, page 87], the comments of Rep. Cornelius E. Gallagher in U.S. Congress [1970, pages 27-28] and Rep. John F. Seiberling in the Congressional Record, February 8, 1972 page H872, and the comments of the National Academy of Engineering in U.S. Congress [1969, page 29]).

11. TA was to contribute to "rational" or "reasonable" debates and decisions. (see the Congressional Record, February 8, 1972, pages H868, H869 and H875. See also the exchange between Emilio Daddario and Dael Wolfle in U.S. Congress [1970, page 146]).

As the anticipated characteristics of congressional TA gradually became clear during this phase, it was natural to question if such a far ranging investigation of impacts was possible. Proponents of an OTA argued that it was, pointing to the post-W.W. II developments in operations analysis and such applications of these as PPB, PERT and MBO.[7] Without such well known methodological examples to give credibility to their arguments, OTA supporters might have seen their bill die an early, quiet death.

1-3. The Debate Over the Design of the Technology Assessment Board

Of the eleven characteristics mentioned above, only one, #8, came under fire. The other ten were never seriously challenged and they were implicitly attributed to congressional TA, it is argued, by the eventual passage of PL 92-484. On the other hand, the nature of public participation in TA was turned into a major issue by Rep. Jack Brooks (Texas). While legislators with any real interest in the OTA bill were nearly unanimously in favor of creating a place for public participation somewhere within the new Office, there were two opposing views of how this participation should be institutionalized. One view, defended by Daddario, considered it essential for the public to have representatives within the OTA in permanent positions of sufficient power to influence the operations of the Office. He argued for positions on the TAB. The second view, held by Brooks, looked on members of the public as hired outside talent to be called in by the OTA Director and an all-congressional TAB on an ad hoc basis.[8]

As a compromise, PL 92-484 established a thirteen member TAB (almost wholely congressional) and a twelve member Technology Assessment Advisory Council (TAAC). Ten of the twelve TAAC members are chosen from the public to serve four year terms as consultants to the TAB. TAAC members hold permanent positions with the OTA's management apparatus, but since the Council can act only at the request of the Board, and then only as it directs, managerial control of the Office remains in congressional hands. Additional public participation was to be sought during the assessment process

but strictly on an ad hoc basis. This was to be the final form of characteristic #8.

If the OTA were to carry out its duties as originally intended, OTA reports would satisfy all of the eleven characteristics mentioned above. In every case but one, these are characteristics explicitly endorsed by the Daddario Subcommittee and never challenged. In the remaining case of public participation, the characteristic resulted from a compromise that had the approval of the Subcommittee at the time the OTA bill became law. No assessment report could be complete (in an intuitive sense) that failed to satisfy even one of these.

1-4. The Operational Period: From October 13, 1972 to the Present

PL 92-484 became law on October 13, 1972, and throughout the entire subsequent period of OTA's operation there has been a continual debate over its proper interpretation. This is most strikingly argued in the 1976 study of the OTA sponsored by the House Commission on Information and Facilities[9], but there have been other studies as well, by academics, that make the same point.[10] At the heart of the debate is a disagreement over the proper content of OTA reports. Critics argue that they should be "early warning" documents in the original spirit of the assessment idea. OTA representatives seem to respond that the Office should serve the perceived needs of federal legislators.[11] It could be that the short term, quick and relevant analyses that have generated so much criticism resulted primarily from a cautious attempt by the Office to survive what was expected to be a rather

long period of experimentation as the Office learned how to do the extremely difficult "early warning" studies that OTA's designers were clearly after. Only time will tell if this is the case.

PART TWO

THE DECISION THEORETIC MODEL OF CONGRESSIONAL TECHNOLOGY ASSESSMENT

2-1. The Logical Relation Between Assessment Reports and Congressional Policy

Part Two is concerned with the logical relation between assessment reports and congressional decisions. The topical area of what follows is outlined in Figure 2.1. What one might call the standard account of this relation is diagrammed in Figure 2.3. Typical discussions of congressional TA suggest that its purpose is to inform the Congress. If this is properly carried out, it is suggested, attractive benefits will follow, such as more responsible legislative behavior, an improvement in the congressional image, and a taming of technological side effects on our society.[12] It is never made clear, however, how these benefits will come about. How will OTA contribute to more responsible legislative behavior and to public confidence in congressional policy? And if OTA is to contribute to rational congressional decision making, just how do OTA reports do this?

2-2. A Decision Theoretic Model of Congressional TA

One can discover answers to the questions above by a kind of logical rearrangement of the common understanding of the relation

Figure 2.1

CONGRESSIONAL ASSESSMENT AND THE DISSERTATION TOPIC

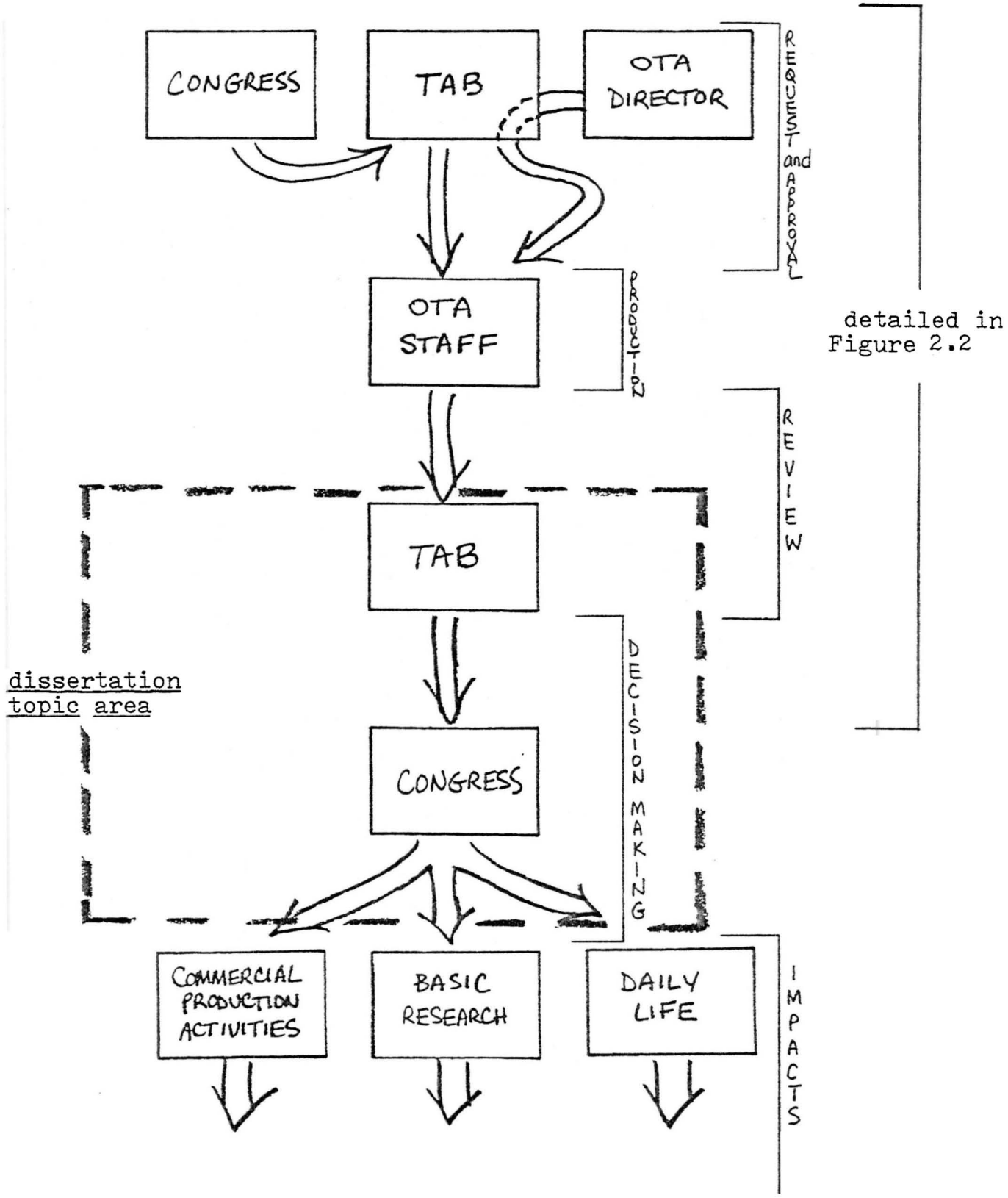
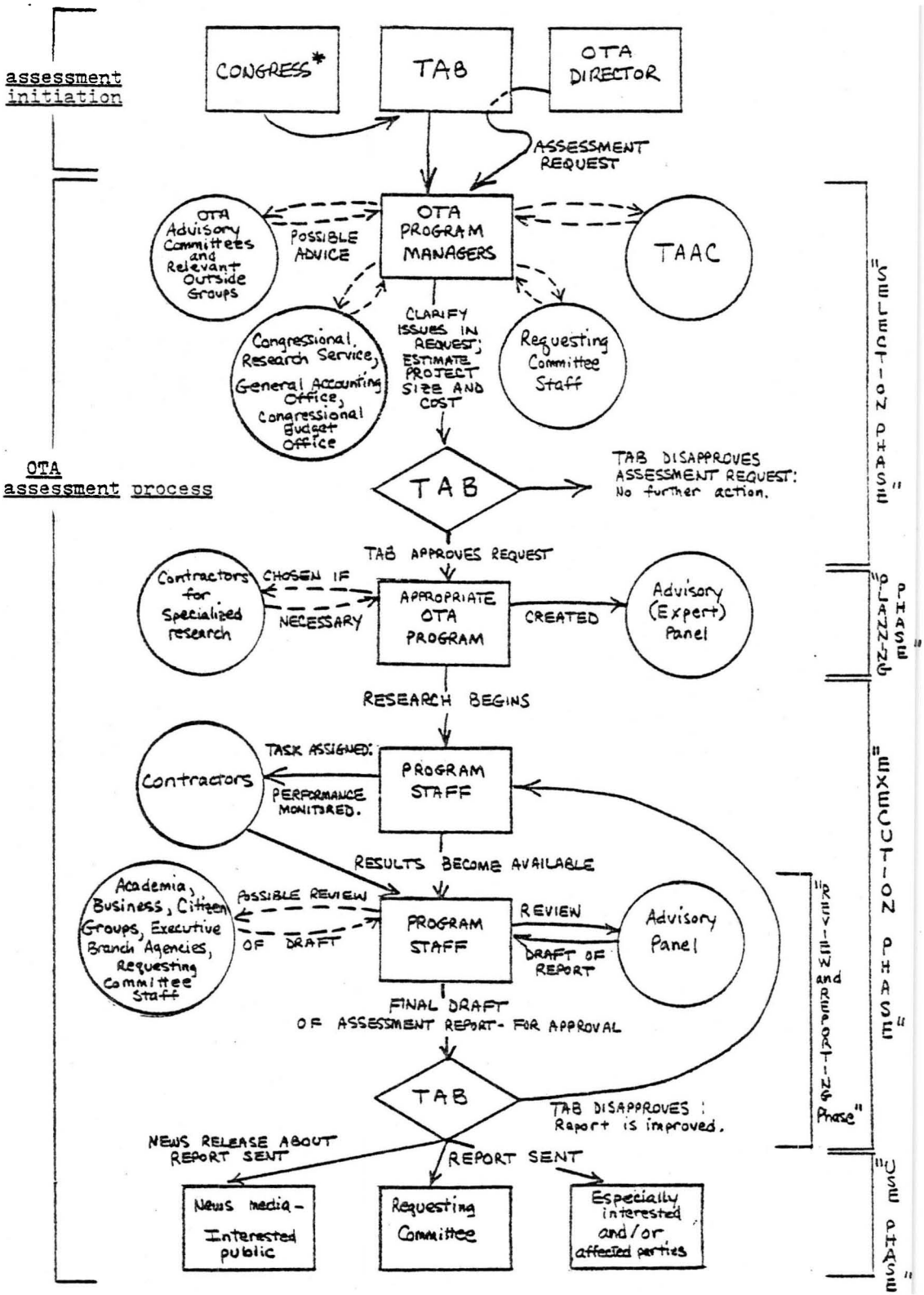


Figure 2.2

THE CONGRESSIONAL ASSESSMENT PROCESS



* the chairman of any standing, special, or select committee of either House of the Congress, or of any joint committee of the Congress, acting for himself or at the request of the ranking minority member or a majority of the committee members.

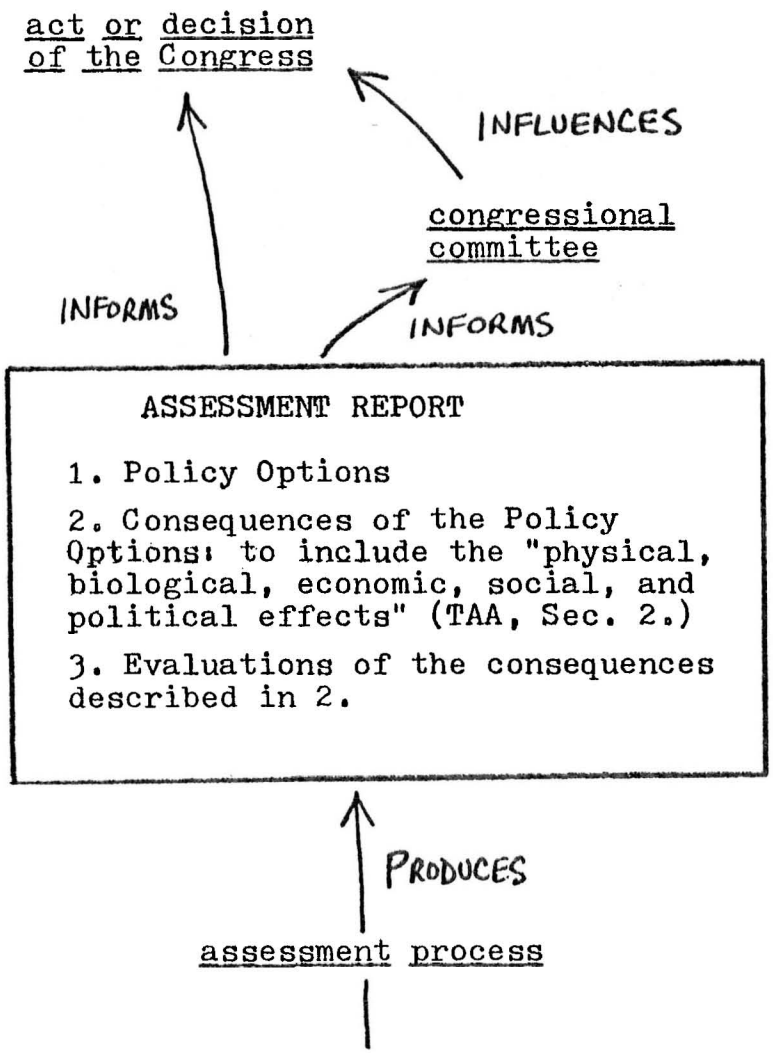


Figure 2.3

characteristics of the assessment report:

1. It contains information not available from either the General Accounting Office or the Congressional Research Service of the Library of Congress.

2. The contents of the report are especially suited to use in the policy formation process.

3. The report is anticipative of the likely future impacts of present decisions, and provides an "early warning" of possible adverse impacts.

4. No policy recommendations are made.

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characteristics of the assessment process:

1. Contributes to public confidence in congressional policy.

2. Includes public participation.

3. The process is "objective", "unbiased".

4. Contributes to rational decisions.

between assessment reports and congressional policy:

1. We take the purpose of congressional TA to be two-fold,

   (a) to contribute to restoring or supporting public confidence in congressional policy, and

   (b) to contribute to rational congressional debates and decisions;

2. We take the function (the characteristic activity) of congressional TA to be the production of a body of information especially suited to accomplishing its purpose.

The relation that is diagrammed in Figure 2.4 has these properties. The logical link between the assessment report and the congressional decision is justification. There are two senses of "justification" that apply:

(J_1): to justify--to show to be valid, or in accord with reason;

(J_2): to justify--to free from blame, absolve, or clear.

As Laurence Tribe has correctly remarked, technology assessment "is often intended not only to aid the decision maker in choosing a course of action, but also to help him in persuading others of the wisdom of his choice."[13]

Given the model in Figure 2.4, if it is completed by detailing the crucial relation between the assessment report and the individual legislator's perception of his decision problem as diagrammed in Figure 2.5, some very interesting results follow. Drawing upon statistical decision theory, the individual legislator's decision problem is modeled as a decision matrix.[14] Given the justifying relation (J_1) that is assumed to hold between the legislator's understanding of his decision problem and the assessment report, this places some rather strict constraints upon the content of an assessment report (which suggest the properties of

THE LOGICAL RELATION BETWEEN CONGRESSIONAL TA AND CONGRESSIONAL DECISION MAKING

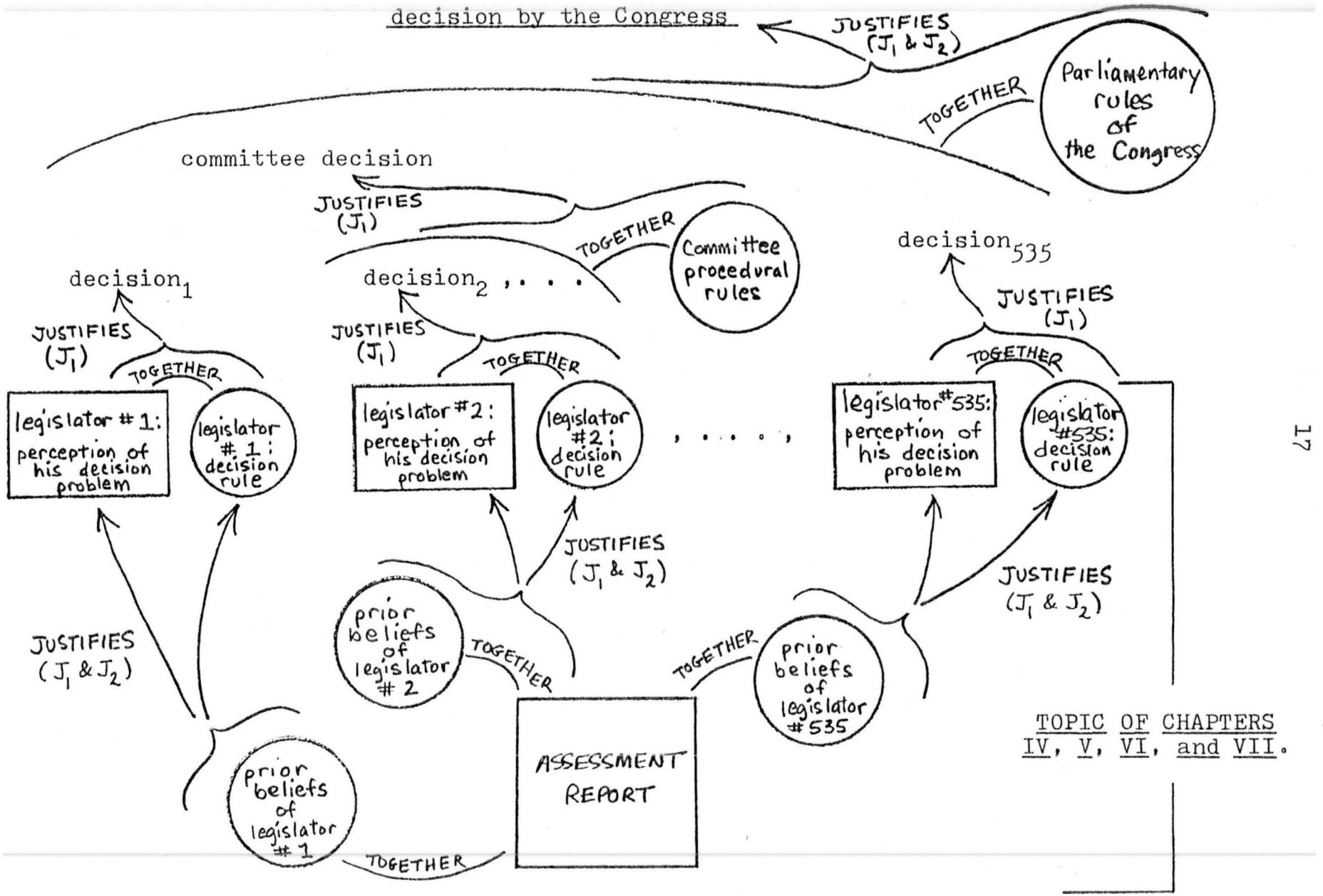

Figure 2.4

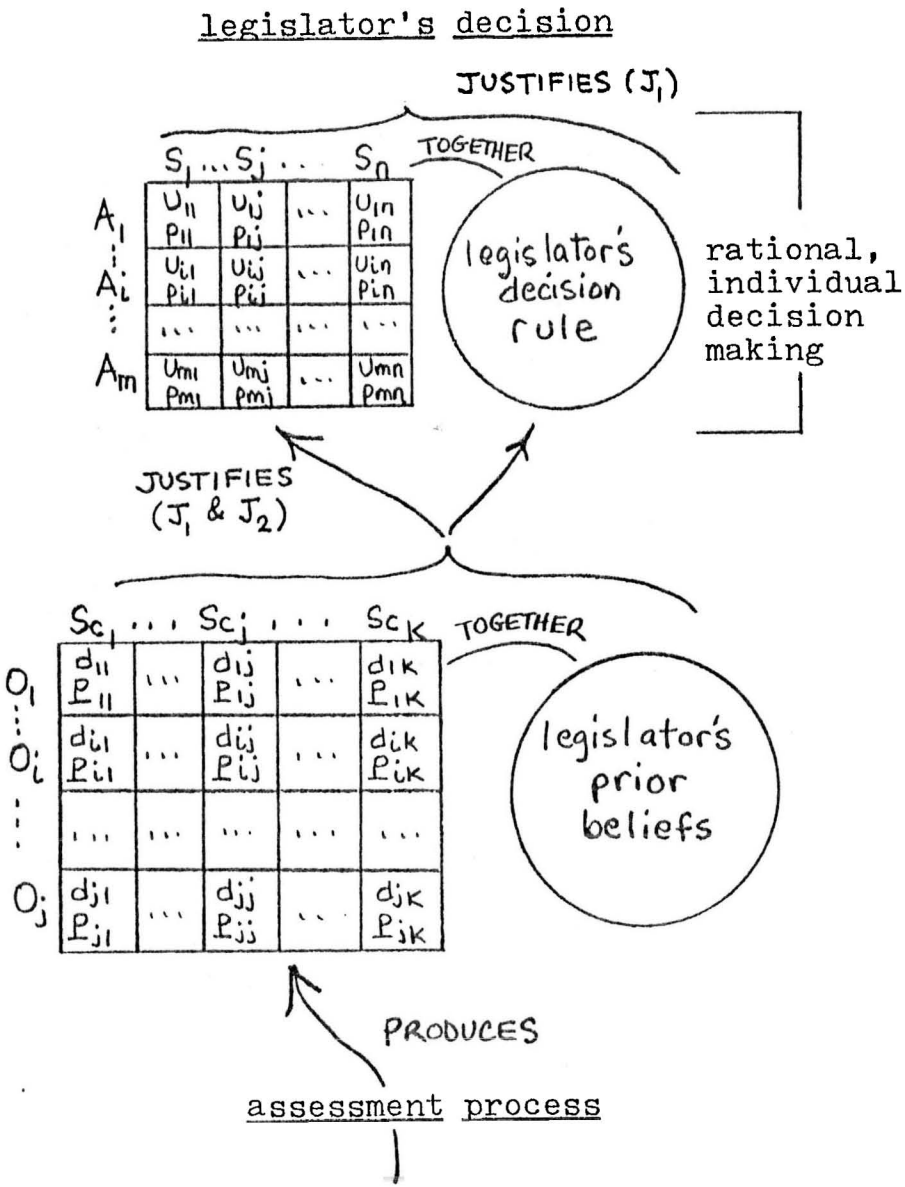

Figure 2.5

characteristics of the assessment report:

1. It contains information not available from either the General Accounting Office or the Congressional Research Service of the Library of Congress.

2. The contents of the report are especially suited to use in the policy formation process.

3. It identifies and describes congressional options (the $O_1,\ldots,O_i,\ldots,O_j$) and their likely consequences, including their "physical, biological, economic, social, and political effects" (included within the scenarios $Sc_1,\ldots,Sc_j,\ldots,Sc_k$).

4. The report contains evaluations of the consequences described in 3. (reported as the desirabilities d_{ij}, and the probabilities P_{ij}).

5. It provides an "early warning" of possible adverse consequences.

6. The report is "objective", "unbiased".

7. No policy recommendations are made.

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characteristics of the assessment process:

1. It produces an assessment report with the characteristics described in Chap. IV-VII.

a complete report). Furthermore, it clarifies how congressional TA contributes to rational congressional debates and decisions (one of the questions above). It does so by contributing to rational individual decisions by the legislators.

To a certain extent, legislators can defend unpopular decisions by proving that they are supported by sound arguments. Thus justification in sense J_1 can contribute to justification in sense J_2. As Figure 2.4 suggests, if both the legislator's perception of his decision problem and his decision rule can be justified (J_1), there exists a justification (J_1 and so J_2) for congressional policy which rests on the justifiability of the congressional parliamentary rules. By contributing to the logical support of individual decisions by individual legislators, OTA reports thus contribute to the defense of those congressional decisions that are defensible, and contribute as well to legislators' attempts to educate and reassure worried, ill-informed constituents. It is in this way that the OTA contributes to public confidence in congressional policy.

2-3. The Assessment Report

According to the above model of congressional TA's role in policy formation, an ideal OTA report would contribute to a justification of the legislator's perception of his decision problem. A type of report that has this property consists of the following information:

1. A manageably small and jointly exhaustive set of the significantly different, feasible congressional action options. These are the O_1, O_2,..., O_j in Figure 2.5.

2. A set of mutually exclusive and "practically exhaustive" relevant scenarios. By practically exhaustive I mean that it is not possible, as a matter of current fact, to add additional relevant scenarios. The scenarios are the Sc_1, Sc_2,..., Sc_k in Figure 2.5. A scenario is a description of how the world might be that includes only those features of the world, and particularly the physical, biological, economic, social and political features, that are relevant to the decision.

3. A set of opinion polls of the affected parties, or "stakeholders", with respect to the decision, one poll for each possible pair of a congressional option in 1. and scenario in 2 (i.e. for every $(O_i\text{-}Sc_j)$ pair). These polls are denoted by the d_{ij} in Figure 2.5 which I will call the "desirabilities" of the pairs. The option-scenario pairs will be called "outcomes" hereafter by analogy with the outcomes of a decision matrix.

4. A set of the objective conditional numerical probabilities (interpreted as propensities) associated with the outcomes. That is, for each outcome, there will be some P_{ij} which is the objective conditional probability of the occurrence of Sc_j given the execution of O_i. The fourth part of the assessment report is the set of all of these, for every possible value of i and j.

Intuitively, a complete assessment report is one which satisfies all eleven of the characteristics in Part One above. The relation between this notion of completeness and the model of congressional TA presented in section 2-2 above is that the theoretically ideal OTA report just described, that contributes to justifying the legislator's perception of his decision problem,[15] is also complete in the sense of Part One. The argument for this claim is a point by point confirmation of the eleven characteristics in Chapter II:

1. Information of the type required for the assessment report is indeed of a type not provided by either the General Accounting Office or the Library of Congress, as a 1976 Senate study on congressional support agencies will confirm.

2. The assessment report is especially suited for use in the policy formation process since it is specifically designed to facilitate the formation of legislators' individual decison matrices.

3. The assessment process is clearly anticipative by virtue of its pursuit of scenarios. It can also reasonably be called an "early warning" device since it describes the anticipated reactions (adverse and favorable) of stakeholders to the likely outcomes of congressional decisions. When the outcomes seem likely to be undesirable, this will be made clear, both to the Congress and to the public.

4. The policy options required are the O_i in the assessment report. The consequences required are among the subsets of relevant features which comprise the scenarios (Sc_i).

5. Evaluations of the consequences of the policy options are provided by the d_{ij} and the P_{ij} in the assessment report.

6. The social, economic and political effects of the policy options among the relevant features in the scenarios.

7. The information in the assessment report is to be obtained in an unbiased manner.[16]

8. Congressional TA, as I have modeled it, <u>requires</u> public participation.

9. Assessment reports contain no recommendations.

10. Assessment reports predict public reactions to policy options and make the possible outcomes of these options apparent to the public via the process of surveying public opinion. They

contribute to public confidence in congressional decisions by (1) supporting the justification (J_1 and J_2) of those decisions that are justifiable, and (2) contributing to rational decision making.

11. Assessment reports contribute to rational congressional decision making by contributing to rational individual decisions by the members of Congress.

PART THREE

AN APPLICATION OF THE MODEL

3-1. The Completeness Checklist

Since the report described above in Part Two is complete (in the sense of Part One) it suggests an absolute standard for completeness against which actual or proposed OTA reports can be compared. This standard is presented below in the form of a checklist, Figure 3.1. The chapter and sectional references in this Figure refer to discussions in the original dissertation that cannot be included here because of a lack of space. The checklist consists of a series of questions to be asked about the report to be evaluated, and the right side of the checklist is left open for comments by the evaluator. It is argued that if an answer to any question not marked with a double dagger (i.e. '‡') is "no", then the report is not complete,[17] that is it fails to satisfy at least one of the characteristics listed in Part One.

3-2. Other Complete Assessment Reports

It has been argued that the production of a report such as that described by the checklist is sufficient to satisfy the legislative mandate to the OTA. The question naturally arises, in light of this, whether the production of such a report is also necessary for completeness, that is, are such reports the only complete reports? The answer is "no". Properties on the checklist marked with a '‡' are attractive but unnecessary, and reports that violate only these properties might or might not be complete.

For an interesting example, consider the property of having a "practically exhaustive" set of scenarios. A report could lack such a set for any one of the several reasons suggested by the checklist, and this is the typical situation in TA reports of whatever origin, OTA or other. Does this violate any of the eleven characteristics in Part One? Not necessarily. Practical completeness of the scenario set is a very attractive property of an assessment report, but Daddario suggested as early as 1967 that it was unnecessary:

> To assess technology one has to establish cause and effect relationships from the action or project source to the locale of consequences.
>
> A direct or immediate effect is easy to spot and assess. The direct effects in turn will cause other consequences--indirect or derivative effects. As the scope of assessment moves outward in time the derivative effects become the result of many causes and not of one specific technological change...
>
> The function of technology assessment is to identify all of these--both short-term and long range. The emphasis, though, will be on the short-term impacts that can be measured by natural science parameters. That is, the focus of Technology Assessment will be on those consequences that can be predicted with a useful degree of probability.[18]

Complete OTA Reports:
A Checklist of Characteristics

1._____A list of congressional action options?

test: by inspection.

_____Manageably small?

test: By inspection.

_____Objectively obtained?

test: The soundness of the assessment report's argument for the objectivity of the paring method used (IV-2)*

‡ _____Jointly exhaustive?

test: (a) If a checklist is provided, are there any obvious omissions? (IV-2)

(b) If a stakeholder survey is used, were the stakeholders representatively sampled? (IV-2)

(c) Is the assessment report's own argument for the exhaustiveness of the action options sound? (IV-2)

*The notation '(IV-2)' refers to a discussion in section 2. of Chapter IV. A similar notation is used throughout this checklist. Also, see section 3. for an explanation of the "‡" qualification.

Figure 3.1

_____Feasible?

test: Logically possible? Physically possible? Socially permissible?

_____Logically possible?

test: (a) If the congressional options are clear, are any contradictory? (IV-1)
(b) If the options are not all clear, are the inconsistent subsets identified? (IV-1)

_____Physically possible?

test: (a) Was the list of options examined and judged plausible by appropriate experts? (IV-1)
(b) Is every known and significant scientific dispute about the plausibility of any option reported? (IV-1)

_____Socially permissible?

test: Legally permissible? Not morally unacceptable?

_____Legally permissible?

test: Consistent with legal precedents? (IV-1)

_____Not morally unacceptable?

test: Either by inspection or by means of public polling. (IV-1)

Figure 3.1 (Continued)

_____Objectively tested?

test: (a) Was a representative sample of stakeholders polled? (IV-1) Were stakeholders among the inarticulate sectors of society and among the traditionally unrepresented academic disciplines polled? (IV-1)

(b) Does the assessment team report their criterion of acceptability? Is it sound?

(c) Alternatively (and/or) to (a) and (b) above, is it obvious that the options are not morally unacceptable?

2._____A set of scenarios?

test: By inspection.

* _____Mutually exclusive?

test: By inspection.

_____Relevant?

test: Either by inspection or by means of a survey of outcome desirabilities. (a) If a survey was used, were stakeholders representatively sampled? (V- 3.(a)) (b) Alternatively (and/or) to (a), are the features in the scenarios obviously relevant?

_____Manageably small?

test: By inspection.

Figure 3.1 (Continued)

_____Objectively obtained?

test: The soundness of the assessment report's argument for the objectivity of the paring method used. (V-2, 4)

‡ _____Practically exhaustive?

test: (a) Did any technique used to construct the set of relevant features have a known and currently correctable defect which could result in overlooking a relevant feature? (V-4)

(b) Was any technique which seems likely to contribute to the set of relevant features overlooked? (V-4)

(c) Was a representative sample of stakeholders surveyed? (V-4)

(d) Are the assessment teams criteria for choosing features of the world to present for stakeholder consideration discussed? Are they likely to ignore relevant features? (V-4)

_____Were all the relevant physical, biological, economic, social and political <u>effects</u> identified by the assessment team?

test: Does the assessment team argue persuasively that expert consensus in each area is that no further potentially relevant effects are likely? (V-2)

Figure 3.1 (Continued)

_____Were all the relevant natural and institutional conditions identified by the assessment team?

test: Does the assessment team argue persuasively that no further potentially relevant features are currently identifiable? (V-2)

‡ 3._____A set of unaggregated desirability polls, one for each outcome?

test: By inspection.

_____Stakeholder opinions?

test: (a) If stakeholder polling was used, was a representative sample polled? Are the results summarized according to stakeholder characteristics provided by the Congress or known to be useful to the Congress? Are the results presented by congressional district? (VI-3)

(b) Alternatively (and/or) to (a), are the desirabilities of the outcomes obvious to the appropriate legislators? If this is not clear, does the assessment team argue persuasively that it is true?

‡ 4._____A set of numerical conditional probabilities, one for each outcome?

test: By inspection.

Figure 3.1 (Continued)

_____Objectively interpreted?

test: (a) Are observed relative frequencies directly applicable? (VII-1)

(b) Alternatively (and/or) to (a), were the probabilities derived from observed relative frequencies supplemented by testable theories? (VII- 1)

(c) Alternatively (and/or) to (a) and (b), were the probabilities obtained by Monte Carlo simulation? (VII- 3)

(d) Alternatively (and/or) to (a), (b), and (c), were the probabilities obtained from expert testimony? (VII- 3)

Figure 5 (continued)

The Subcommittee seems to have felt that if in focusing on "those consequences that can be predicted with a useful degree of probability" a more obscure and difficult to predict indirect consequence was ignored, there might be no harm done. There would always be constraints on the time and money available to the OTA no matter how generous Congress was with OTA appropriations, and even practically exhaustive scenario sets might require large amounts of both to produce. A charitable interpretation of Subcommittee descriptions of congressional TA would assume that such constraints were quite familiar to the Subcommittee members, and conclude that the Subcommittee was after only (i) a certain base level research funding (which they suggested might eventually reach $7 - $8 million (see the Congressional Record, February 8, 1972, page H871), about $4 million less than the current OTA budget), and (ii) the best assessment reports, of the type suggested by the legislative history of PL 92-484, that could be obtained within the budget. Thus practical exhaustiveness is probably not a necessary condition for completeness.

A possible problem could arise, however, with regard to characteristic 10., if the funds and time made available to assessment teams were consistently inadequate to produce an informative set of scenarios. In such a case, poor decisions such as those on the Cross-Florida Barge Canal, and the Big Cypress Jetport[19] would continue to occur, undermining public confidence in congressional decision making. In point of fact, however, the current OTA budget seems adequate for the production of informative, useful reports.

3-3. Other Applications of the Model

In the original dissertation, the checklist in Figure 3.1 is put to use in a lengthy analysis of the OTA report Coastal Effects of Offshore Energy Systems. In addition, several difficult current issues for assessment theory such as (a) the proper balance in OTA research between long-term, early warning studies and short-term, quick analyses of current topics, (b) the proper role of the general public in congressional assessment, and (c) the possibility of truly objective assessments, are discussed and then resolved by means of the theory in Part Two. Space limitations preclude any review of the work here.

NOTES

[1]See Porter, Alan L. and Rossini, Frederick A. [1977], "Evaluation Designs for Technology Assessments and Forecasts," Technological Forecasting and Social Change 10: 369-380, and Koppel, Bruce [1979], "Evaluating Assessment: A Comment and a Perspective," Technological Forecasting and Social Change 14: 147-152, for example.

[2]For a good example of criticism of this type see Casper, Barry M. [1978], "The Rhetoric and Reality of Congressional Technology Assessment," Bulletin of the Atomic Scientists 34: February, pages 20-31.

[3]See U.S. Congress [1963] House: Committee on Science and Astronautics, Government and Science No. 1: A Statement of Purpose, Report of the Subcommittee on Science, Research, and Development, Washington, DC: USGPO, page 9.

[4]See Wenk, Edward, Jr. [1972], Politics of the Ocean, Seattle: University of Washington, page 79.

[5]The congressional publications that resulted include the record of a "congressional seminar" in 1967, three studies of technology assessment (by the LRS at the Library of Congress, by the National Academy of Sciences and by the National Academy of Engineering) released in 1969, records of Subcommittee hearings held in 1969 and 1970, and a study by the National Academy of Public Administration released in 1970.

[6]I refer to the following documents in these citations: U.S. Congress [1967a] House: Committee on Science and Astronautics, Technology Assessment, statement of Emilio Q. Daddario, Washington, DC: USGPO,

U.S. Congress [1970] House: Committee on Science and Astronautics, Technology Assessment - 1970, hearings before the Subcommittee on Science, Research, and Development, May 20, 21, 26 and 27. June 2 and 3, 1970, Washington, DC: USGPO.

U.S. Congress [1969] House: Committee on Science and Astronautics, A Study of Technology Assessment, report of the Committee on Public Engineering Policy, National Adademy of Engineering, Washington, DC: USGPO.

[7]See Melvin Kranzberg's testimony before the Subcommittee as early as 1967, for example, in U.S. Congress [1967b] House: Committee on Science and Astronautics, Technology Assessment Seminar, proceedings before the Subcommittee on Science, Research, and Development, September 21 and 22, 1967, Washington, DC: USGPO, page 81, and the arguments in U.S. Congress [1972] Senate: Committee on Rules and Administration, Technology Assessment for the Congress, Subcommittee on Computer Services, Washington, DC: USGPO, pages 61-62.

[8]See U.S. Congress [1972b] Senate: Committee on Rules and Administration, Office of Technology Assessment for the Congress, hearings before the Subcommittee on Computer Services, March 2, 1972, Washington, DC: USGPO.

[9]U.S. Congress [1976] House: Commission on Information and Facilities, The Office of Technology Assessment: A Study of Its Organizational Effectiveness, House Document No. 94-538, June 18, 1976, Washington, DC: USGPO.

[10]See Skolnikoff, E.B. [1976], "The Office of Technology Assessment," in U.S. Congress [1976] Senate: Commission on the Operation of the Senate, Congressional Support Agencies, Washington, DC: USGPO, pages 55-74, for example.

[11]See the comments by Daniel DeSimone in U.S. Congress [1978] House: Committee on Science and Technology, Review of the Technology Assessment Act, hearings before the Subcommittee on Science, Research, and Technology, August 3 and 4, September 27, October 6, 12, 13, 19, 20, 1977 and March 21 and 22, April 4, 1978, Washington, DC: USGPO, page 285.

[12]See the Congressional Record of February 8, 1972, pages H865-H887, for many similar comments.

[13]Tribe, Laurence H. [1973], "Technology Assessment and the Fourth Discontinuity: The Limits of Instrumental Rationality," Southern California Law Review 46: 627.

[14]For an excellent, succinct introduction to statistical decision theory see Chernoff, Herman [1968], "Decision Theory," in Sills, David L. (ed.) [1968], International Encyclopedia of the Social Sciences, NY: MacMillan and The Free Press, pages 62-66.

[15]This is argued in detail in several places within the original dissertation.

[16]This is discussed in several places in Part Two of the original dissertation, and the possibility in principle of an unbiased assessment is examined in Part Three.

[17]Once again, this argument requires too much space to include here.

[18]U.S. Congress [1967a, page 13]--see note 6 above.

[19]See the Congressional Record of February 8, 1972, page H872.