A 0573

STAFF MEMO

March 9, 1981

TO: OTA Staff

FROM: Fred Wood Fred

RE: Results of Contractor Research on TA Methodology

Last fall, the Task Force on TA Methodology and Management initiated seven small contracts: three to survey TA experience in the private sector and in foreign countries, and four to apply a variety of TA methodologies to the OTA assessment process (using retrospective review of selected OTA studies where appropriate).

We have now received draft papers from all seven contractors, plus an eighth paper extracted from a recent doctoral thesis on congressional TA.

The papers range from 15 to 112 pages each in length and total about 500 pages for the set. Therefore we are circulating just the attached summary and placing two complete sets of the papers in the Information Center for those staff who wish to read further.

We welcome any comments you may have on these papers, and especially your feedback on which material seems most useful.

Thank you.

Attachment

OTA Task Force on TA Methodology and Management

Phase II-A Survey of Non-OTA Assessment Experience

SUMMARY OF PHASE IIA CONTRACTOR PAPERS

Survey Papers

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TWO COMPLETE SETS OF THESE PAPERS ARE AVAILABLE IN THE OTA INFORMATION CENTER FOR THOSE STAFF WHO WISH TO READ FURTHER. WE WELCOME STAFF FEEDBACK ON WHICH MATERIAL SEEMS MOST USEFUL.

SUMMARY OF PHASE IIA CONTRACTOR PAPERS

Survey Papers

1. James D. Maloney, Technology Assessment in the Private Sector: Some Findings of Potential Use to OTA, Midwest Research Institute, January 9, 1981, 31 pp.

Maloney sent inquiries to 33 private firms selected from a prior survey of the Fortune 1300. Only 9 of the 33 firms responded, even with repeated telephone follow-up efforts. Of those responding, Maloney found that TA is generally placed either in corporate planning (where a broad view of TA is the rule) or in R&D (where a more limited technoeconomic version of TA is practiced). A case example of each is provided (the Eaton Corporation and Sun Corporation, respectively).

Virtually all firms responding have formal planning mechanisms and processes, and are moving to a more strategic base for analyzing business opportunities and threats. TA appears to be viewed increasingly as part of the strategic planning function.

Maloney then develops a brief but interesting comparison between private sector and OTA technology assessment. He basically concludes that there are more similarities than differences, and that the assessment process used by OTA is closer to the private sector TA process than that used by the executive branch of government. Perhaps the major difference is that, while private sector TA strives to eliminate conflicts and develop corporate consensus around the "best" option, OTA assessments must identify and highlight conflicts and formulate a wide range of possible options.

Summary comment: Despite the rather disappointing response rate, this paper presents some interesting and sometimes new thinking about where OTA fits in the scheme of things, as viewed by a private sector TA practitioner.

2. Robert H. Randolph and Bruce Koppel, Technology Assessment in Asia: Pitfalls and Potential, East-West Center, Resource Systems Institute, January 1981, 56 pp.

Randolph and Koppel have quite comprehensively investigated the past, present, and probable future of TA in a set of seven representative Asian countries. One country (Japan) was found to have amassed considerable experience with technology assessment and even to have attempted some independent contributions to TA methodology. Although the other sample countries (Indonesia, Korea, the Phillipines, Taiwan, India, Iran) have experienced little TA in the usual Western sense of the term, they do reveal a wide range of research and decision-making activities closely related to the TA idea, suggesting that they may have an important potential for explicit TA in the future. However, it was found that the status of TA in Japan has declined in recent years, for a number of significant reasons. Conclusions are offered about ways in which

other countries in Asia (or elsewhere) may be able to avoid the pitfalls which have thwarted TA in Japan.

Summary comment: This is a first-rate paper, based largely on primary sources (interviews supplemented by apparently original English translations of native language reports), which I believe deserves publication.

3a. Vary T. Coates, Technology Assessment in Industry: A Counter-productive Myth, Dames & Moore, January 30, 1981, 15 pp.

In this thought-provoking paper, Coates argues that the term "technology assessment" should be reserved to describe a form of policy analysis that is designed to support public-sector decisionmaking.

Coates surveyed 27 corporate executives and researchers who had attended TA workshops or short courses. Twenty-three of the 27 responded in writing or by phone.

The results suggest that many corporations do, indeed, conduct analyses that are analogous to public-sector TA, yet inherently different in purpose and in scope because they are intended to enhance the viability and strength of the firm (and industry) rather than to maximize the overall benefits to society.

Firms have different, and often conflicting, definitions of TA. And within a single firm, different individuals can be working on the basis of conflicting definitions. Included under the TA rubric may be technology forecasts, market analyses, environmental scans, competitive analyses, and even social audits.

Coates concludes that the differences between public and private sector TA perhaps need explicit recognition, and that one is not a substitute for the other.

Summary Comment: This paper makes interesting reading especially when contrasted with the Maloney paper. Together the two papers identify many of the same similarities and differences between public and private sector TA, but seem to come to different conclusions.

3b. Vary T. Coates, Technology Assessment in Europe and Japan, Dames & Moore, January 30, 1981, 29 pp.

This paper presents an overview of TA activities in Canada, Egypt, the Federal Republic of Germany, Great Britain, Israel, Japan, the Netherlands, Sweden, the German Democratic Republic, and Poland.

The survey found that the United States is still the only nation which has a TA organization to serve the national legislature. There have been a number of attempts to establish such a body in other nations, including Sweden, the Netherlands, Great Britain, and West Germany.

These efforts have all failed, due in part to the political realities of a parliamentary form of government

On the other hand, a number of "exciting and sophisticated" TA activities were identified in established government offices, special government committees, various ad hoc government groups (e.g., the Berger Commission in Canada which produced the major assessment Northern Frontier, Northern Homeland), and of course non-government organizations (centered largely in universities, research institutes, and high technology industries or industrial groups).

Summary Comment: This is a noteworthy paper in part because it highlights the unique role of the U.S. OTA. The implication seems to be that the fact of OTA's existence is a reflection of the strength and independence (and political balance) of the U.S. Congress, particularly when compared to other national legislatures.

A quick reading of the Randolph/Koppel paper along with this paper gives one an excellent sense of international TA activity.

Methodology Papers

4. M. W. Merkhofer, A Process for Technology Assessment Based on Decision Analysis, Stanford Research Institute, January 1981, 62 pp.

Decision analysis, a formal approach for identifying and analyzing rational decision-making behavior, is increasingly being used in the public and private sectors as a powerful aid for planning technology related decisions. This paper describes a TA process based on techniques and concepts of decision analysis and indicates how the approach might contribute to the objectives of OTA. Appendix A to the paper illustrates the TA process with an example dealing with synthetic crude oil. Appendix B reviews several recent OTA studies to investigate the extent to which elements of the proposed process are currently being used by the OTA.

Summary Comment: Merkhofer has developed a conceptual framework for what he calls "decision-focused TA," and presents a useful illustration based on a 1975 SRI study of synthetic fuels commercialization. But as the author points out, "due to time and resource constraints the review (of selected OTA studies) consisted of little more than a quick reading of the final reports produced under each study." The value of this paper lies in providing a possible methodology for TAs where quantitative modeling, explicit specification of uncertainties using probabilities, measurement of risk sensitivity/risk aversion, and sensitivity analysis are feasible and necessary. Merkhofer is apparently using this approach in an ongoing NSF-funded TA of public key encryption technology, and I would expect his methodology to be published as part of that study.

5. Lynne Filderman and Louis H. Mayo, Technology Assessment Methodology and Management Practices: Comments on the OTA Function and Methodological Modes, Program of Policy Studies in Science and Technology, The George Washington University, January 12, 1981, 112 pp.

Filderman and Mayo have described the basic TA approaches used by GWU over the past 14 years. They then go on to develop an illustrative framework for evaluating OTA studies. The framework is organized around the major distinguishing characteristics of TA, broadly construed. This framework is then used for the retrospective review of selected completed OTA studies (Medical Cost-Effectiveness, East-West Trade, Environmental Contaminants, Biomass).

The paper concludes that the variety of studies "performed by OTA strongly suggests that no particular assessment methodology can be uniformly applied. However, this does not necessarily mean that a basic procedural pattern or structure of organizing an assessment would not be useful." One such structure is provided as illustrative of how OTA might match TA methodologies with specific study objectives.

Summary Comment: This paper does a good job of distilling many years of TA experience into a framework which should be useful to OTA. The retrospective reviews appear to be reasonably complete and quite balanced. While the paper is long, it can be read selectively. I would suggest reading chapters I, V, and X first, then chapter II followed by chapter VII. If time permits, read chapter III followed by chapter VIII. Finally, try chapters IV, VI, and IX.

6. Paul Donovan, Bruce Rosenblum, et. al., A Management Overview Methodology for Technology Assessment, Review & Critique, February 2, 1981, 110 pp.

Donovan and Rosenblum et. al. have developed and described a "management overview methodology for TA," which to a large extent is, in their own words, "simply organized common sense...reproduced at least in part by current OTA approaches."

Section I of this paper lists a set of desirable characteristics of TA procedures and the resulting reports. Section II describes the nature of the Focus Questions, which form the keystone of the Review & Critique (R&C) methodology. The focus questions serve to define the areas of investigation and become the basis for assignment of staff work, contracts, etc.

Section III of the paper discusses the four fundamental concerns (the foundation of the R&C methodology) and how any assessment question can be analyzed in terms of its impact on "Economy, National Security, Environment, and/or Social Equity and other Social Concerns."

Section IV of the paper presents the steps by which a TA could be conducted using the R&C methodology. The methodology includes a "fast loop iteration"--to develop focus questions based on a quick cut at laying out key problems and trends, options, and implications--and a "slow loop iteration"--to carry out the study and analysis necessary to answer focus questions. The fast and slow loops work together in a process of successive refinement to produce a final report. Section V discusses several ways in which the R&C methodology could be used by OTA.

The last half of the paper presents retrospective analyses of three completed OTA studies (Steel, Biomass, East-West Trade). By way of qualification, the authors note that "These retrospective reviews were developed by R&C with little detailed information regarding the process by which each assessment was done and the constraints of time, budget and scope which were imposed on the assessment staff..." but rather "on the basis of the published report." The R&C task was not to conduct a comprehensive critique of the selected OTA reports, but instead to "determine the changes in treatment, emphasis and presentation which would have occurred" had the assessments been done using the R&C methodology.

Summary Comment: Of all the contractors, Donovan and Rosenblum have had the most interaction with OTA staff. As a result their paper is

reasonably clear about how OTA could use the R&C methodology, and in ways which appear to be generally consistent with the Task Force findings and recommendations. Some believe that the R&C methodology is really very similar to--or at least substantially consistent with--the methodology of choice for many OTA projects (and project directors). What do you think?

The paper is quite long. I would suggest giving priority to pp. 1-48 on the management overview methodology.

7. Todd La Porte, Technology as Social Organization: Contributions to the Improvement of Social Impact Analysis for Technology Assessments, University of California at Berkeley, January 1981, 88 pp.

The La Porte paper is, in its own words, a challenge to technology assessors to take an expanded view of technology-as-social organization. By this La Porte quite simply means that in order to fully and accurately assess the social impacts of a technology, the assessor must describe not just the technical aspects but also the resource and social requirements for full deployment of the technology.

- Resource requirements=capital investment, operating costs, logistics, labor force.
- Social requirements=occupational skills profile, training programs, administrative systems, and network complexity.
- Full deployment=includes functional activities of construction operation, transport, security, and the like.

La Porte then develops several models and hypotheses about the relationships between technology and social variables. While emphasizing the importance of this type of information, he admits to the uncertain adequacy and reliability of available data and the likely heavy burden placed on assessment teams to gather original data. "This could become a formidable task."

In Part II the paper briefly discusses eight completed OTA reports (Taggants, Gasohol, Biomass, East-West Trade, Steel, Cost-Effectiveness, Solar Critique, Environmental Contaminants) in terms of the types of analytical problems posed and the knowledge evidenced about social properties of technology. La Porte concludes by recommending that OTA make a concerted effort to improve the conceptual and, in the social science sense, the methodological skills and vigor applied to future projects.

Summary Comment: This paper includes some good ideas which should be useful to OTA and, in fact, show similarities to certain aspects of the paper by Filderman/Mayo described earlier. I would suggest reading Part II first, "Implications for OTA Processes," if your time is limited.

8. Lewis Gray, A Decision Theoretic Model of Congressional Technology Assessment, Ph.D. Dissertation, Indiana University, January 1981, Summary approx. 30 pp.

Dr. Gray has kindly agreed to prepare a 30 page summary of his 463 page dissertation which, by coincidence, was completed at the same time as the other contractor papers.

This paper does basically three things. First, Gray reviews the legislative history of OTA in an effort to more precisely interpret what P.L. 92-484 means. Through examination of the various debates, hearings, studies, and bills leading up to P.L. 92-484, including the final amendments and compromises, Gray identifies important characteristics of congressional TA. "Of these eleven characteristics, only one, #8 [representation of the general public on TAB], was to become an issue. The other ten were never seriously challenged, and they were implicitly attributed to congressional TA," Gray argues, "by the eventual passage of the Technology Assessment Act."

Second, Gray develops a decision theoretic model of congressional TA. The major elements are:

- A manageably small and jointly exhaustive set of the significant different, feasible congressional action options.
- A set of mutually exclusive and "practically exhaustive" relevant scenarios.
- A set of opinion polls of the affected parties, or "stakeholders," with respect to the decision, one poll for each outcome.
- A set of the objective, numerical conditional probabilities associated with the outcomes.

Gray's approach is, in his own words "an attempt to infer the properties of a theoretical entity, an ideally complete assessment report. It is possible that no actual report will ever be ideal." Gray proposes a "completeness checklist" for use in quality control and evaluation of congressional TA, and applies the checklist retrospectively by way of illustration to the OTA report on Coastal Effects of Offshore Energy Systems.

Summary Comment: While theoretical in nature, this doctoral thesis is directly relevant to the OTA assessment process and, by that measure, stands apart from other doctoral research on TA. The author deserves credit (and his degree) for a credible job on a very difficult--if not impossible--topic. The review of OTA's legislative history is one of the best I have seen and could probably stand alone as a publishable article, as perhaps could other portions of this work.