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Letter to the Editor—Comments on a Letter by Woolsey

Stafford Beer, A. Charnes, W. W. Cooper, B. Mellon, R. E. D. Woolsey,

REFERENCES

1. E. Bomberger, "Optimal Inventory-Depletion Policies," *Management Sci.* **7**, 294–303 (1961).
2. C. Derman and M. Klein, "Inventory-Depletion Management," *Management Sci.* **5**, 450–456 (1958).
3. R. Howard, *Dynamic Programming and Markov Processes*, Wiley, New York, 1960.
4. P. Kolesar, "A Markovian Model for Hospital-Admission Scheduling," *Management Sci.* **16**, B384–B396 (1970).
5. G. J. Leiberman, "LIFO vs. FIFO in Inventory-Depletion Management," *Management Sci.* **5**, 102–105 (1958).
6. W. Pierskalla and C. Roach, "Optimal Policies for Perishable Inventory," *Management Sci.* **18**, 603–614 (1972).
7. S. Ross, *Applied Probability Models With Optimization Applications*, Holden-Day, San Francisco, California, 1970.

Comments on a Letter by Woolsey

A LETTER by R. E. D. Woolsey [*Opns. Res.* **20**, 729–737 (1972)] entitled "Operations Research and Management Science Today, or, Does an Education in Checkers Really Prepare One for a Life of Chess?" has drawn some responses.

Stafford Beer, *Firkins, West Byfleet, Surrey, United Kingdom*

I should like to enquire why Robert Woolsey's superb paper has been relegated to the position of a Letter to the Editor. It is after all one of the best things we have had for a long time.

This is the kind of trivial rubbish that ought to count as a Letter to the Editor.

A. Charnes, *University of Texas, Austin, Texas;* **W. W. Cooper**, *Carnegie-Mellon University, Pittsburgh, Pennsylvania; and* **B. Mellon**, *Palo Alto, California*

One begins to be bewildered by R. E. D. Woolsey's repetitions on a theme. In the process of repetition, he has now pushed to an extreme where others who are also interested in applications may not wish to follow him.

In his repeated specifications of "actual work experience" of a "hands-on variety," he appears to believe that he may have found a foolproof desideratum for operations research in education and practice. There may, however, be conditions where it is unwise or even impossible to proceed in this manner. This was true in the earliest days when we were experimenting with these approaches to refinery operations and other types of chemical-engineering-management-OR combinations designed to alter the then prevalent practices. We found that team approaches involving a mix of persons were necessary. We have continued to find this kind of team approach desirable in other areas, such as advertising and marketing, accounting, finance, manpower planning and organization, and engineering design, where we have participated in some of the pioneering efforts that were (and are) being undertaken to open these as additional areas for potential OR applications.

The team approach appears to be omitted or underemphasized in Woolsey's apparent insistence that every OR "practitioner" must incorporate all of the virtues that he does in himself. Furthermore, we have also encountered team members fulfilling all of Woolsey's prescriptions who have, nevertheless, proved to be absolute disasters in practice and in education as well.

Our own guess is that OR—along with other parts of management—is sufficiently complex, and that the situations to be encountered are sufficiently varied, that it is desirable, and perhaps necessary, to utilize a very broad mix of persons in order to deal with many of the requirements. Something will depend, naturally, on the modes of organizing these mixes, on the nature of the problems encountered, and on the ways in which they may be identified and *re*defined as developments proceed. With these considerations in mind we can even visualize circumstances in which the "integer programmer" who infuriated Woolsey might well contribute something important to the solution of practical problems in the category that Woolsey describes on page 731. The same is true for education; we believe that OR students (and others too) might well be confronted with a mix of different instructors, including the pure theorist who, *qua* practitioner, might cause Woolsey to cry "fraud." A kind of education that we regard as potentially bad is one in which a school's OR department is staffed only by the kind of person described by Woolsey.

The prescriptions for journal editing, etc., offered by Woolsey are also extreme—as witness, for instance, his proposed authentication requirements. In attempting to publish the applications he advocates a main difficulty is encountered by the journal (at least this is true for ones with which we have been associated) in getting good cases reported in publishable form, and he, as well as others, should be urged to submit such materials wherever possible. After all, OR practitioners owe a duty to the progress of their profession (and we hope it is a profession), as well as to their employers, which need not (and should not) always be resolved in favor of the latter. This duty becomes pronounced, we think, when an application provides generalizable knowledge that is clearly capable of furthering such progress (even by competitors); for this reason, we, like others, have always insisted that such publication and teaching duties must not be infringed when any of the applications we work on yield such generalizable knowledge. It is not impossible to accomplish this. Furthermore, we think it can be done in many cases without either (a) breaching company, or even government, confidentiality or (b) engaging in the kind of obfuscation Woolsey describes. There may be exceptions, but, in any case, a sense of duty to the profession should at least force an examination of such publication possibilities when they appear pertinent.

Woolsey's prescriptions for operating business schools are also extreme. For instance, we suggest a scrutiny of the theory of externalities—such as may be found in any good economics text—before putting his profit-orientation prescription into practice. Certain social objectives, sometimes considered desirable, also need to be considered. In any event, there are profit-oriented business schools already, although their practices may also fail to meet the needs that Woolsey has in mind. If he believes that more such schools are needed, or if their practices are in need of repair, he might consider starting one himself, with the right to donate the resulting profits (if any) to the arts, or to such other activities as he may desire. He could impose whatever requirements he wished with respect to the practices of such a school, including publications by members of the faculty. Assuming the success of such an endeavor, we hope that Woolsey himself continues to publish, at least along the lines indicated by our invitation in the preceding paragraph. Otherwise, his profit may well be a loss to others in the OR profession.

Provision for anticipatory theorizing and method-development research can be, and often is, needed in organizing for applications pointed toward new OR directions. This seemed apparent, at least to us, from our very earliest attempts at application, as, for example, our development of linear programming models and approaches for improving the management of refinery operations [*see*, e.g., A. CHARNES, "Optimality and Degeneracy in Linear Programming," *Econometrica* **20,** 160–170 (1952), and A. CHARNES, W. W. COOPER, and B. MELLON "Blending Aviation Gasolines—A Study in Programming Interdependent Activities," *Econometrica* **20,** 135–159 (1952)—pre-dating the formation of ORSA—as well as our subsequent article, "A Model for Programming and Sensitivity Analysis in an Integrated Oil Company," *Econometrica* **22,** 193–217 (1954)]. We may perhaps be permitted to express our doubt that the relatively rapid and wide-spread use of programming in these (and other) types of cases would have occurred without these publications, which included the resolution of the then outstanding problem of degeneracy. Other consequences in both applications and theory also attended the release of this work; we are unsure, to say the least, that this would have been helped by the publication delays and distortions that could accompany the kinds of editorial attentions recommended by Woolsey. It happened that the approaches suggested by this work were not adopted (in fact, were rejected at the very highest levels) by this company until after we left it and joined in other team endeavors with some of its competitors. Practice and its improvement are too important to be left only to the practitioners! Witness, as in these cases, the fact that the publications alerted the original company's competitors to the new possibilities.

In conclusion, we note that publication, and the professional scrutiny inevitably associated with this process, can be an additional safeguard against both inadequate operations research and a management that tolerates or encourages it. However, publication alone will not provide all that may be needed for quality guarantees in every case; experimentation with other devices is needed. They could include a review of pending work or an audit of past work by a group of independent peers that, on occasion, may include academics or theoreticians. We have witnessed, and also participated in, such experiments when they were undertaken by BARRY ROWLES—(subsequently President of M&M's/Mars Candies, Theodore Hamm Brewing, and Kentucky Fried Chicken, and now Group Vice President, Foods Group, of Heublein, Inc.), when he was responsible for the OR work at the National Supply Co., as well as by ROGER CRANE and DAVID HERTZ when they were attempting to develop OR capabilities for some of the major accounting firms. Rowles went the route of pre-audit, while Crane and Hertz utilized post-audits of already accomplished performance. In either case, the objective was to evaluate and improve future as well as present capabilities and accomplishments. There were other effects as well. In our case, for instance, a two-way flow resulted that influenced the direction of our own research.

Perhaps we also need to reexamine some of the hard-and-fast distinctions between management (good and bad) and operations research (good and bad) [*see*, e.g., A. Charnes and W. W. Cooper, "Management Science and Management—Some Requirements for Further Development," *Management Sci.* **13**, C3–C9 (1966), for further discussion]. A maintenance of these distinctions is possibly at the root of some of Woolsey's own difficulties; a relaxation of the permanence of these roles may also help to alleviate some of the difficulties that OR practioners can experience in implementing their proposals.

R. E. D. Woolsey, *Colorado School of Mines, Golden, Colorado*

CHARNES, COOPER, AND MELLON are correct in their criticism of my position paper on the ground of its omission of the team approach. It was certainly not my intention to suggest that one-man bands are the only sensible approach to operations-research and management-science practice. Again, there is no disagreement as to a good mix of theory and practice being present on any good faculty of OR/MS. The only thing worse than a faculty of theoreticians would be a faculty of Woolseys.

Their suggestion that I form my own business school is gratefully accepted. However, candor, as usual, forces me to admit that I cannot, at present, afford it. But I must say again that I do *not* mean that everyone should do what I suggest. I *do* feel strongly that the present theoretical emphasis is directed at aspects of theory that have little relevance to real problems. On this point I do not feel that there is any fundamental disagreement. There is no question that our colleges of theology are generating good bishops, archbishops, cardinals and (depending on where you went to school) perhaps even a pope or two. I am just asking for some repairs on our seminaries of pastoral counseling.

Finally, I agree with Charnes, Cooper, and Mellon that more blurring of the line between operations research and management is necessary. It is precisely for this reason that I teach here. I do not expect to instruct the successors of Charnes and Cooper at the Colorado School of Mines; a successor to Guggenheim or Carnegie is the best I can hope for.