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For Cooperative Generic Research?

AN important current worry is that we are becoming a less technologically innovative society, in comparison to the recent past. Examples in support of this are decreased patents, decreases in innovation, decreased research, decreasing productivity, and so forth. On the other hand, there are mounting pleas for more basic research, purportedly to tap the well of understanding. From other quarters there are concepts of hoarding our present technology, since future ingenuity seems to be faltering. In practice, this means export controls on technology. I firmly believe that the present level of productivity is a major factor causing inflation, based on the following mechanism. In the past, when productivity was increasing, each worker was able to purchase an increasing amount of goods and services per unit of work time. In spite of the present leveling of productivity, workers demand an increase in monetary income under the mistaken notion that such an increase will still permit him (or her) to purchase more. Of course, with level productivity, increased wages causes the *price* of goods to increase, so the worker ends up back where he was. Thus, his standard of living stays constant while prices rise, which creates inflation. As the cycle gains momentum, workers must *demand* salary increases, just to keep up with rising prices. An important element for the cure is to increase productivity so that the amount of goods produced per unit work time is increased; this usually results in *reduced* prices, and each worker's real income increases, thus raising the standard of living, which is a desirable goal. With a stable work force, increased productivity means an increased gross national product (as measured in constant dollars).

But, in what is probably the greatest Catch-22 ever perpetrated in this country, the action of the government is to maintain a monetary policy which keeps the GNP constant, but with a rising work force. No matter how one looks at it, this means declining real wages. The classical deflation theory is that a constant GNP places less demand on resources, and the law of supply and demand will cause prices to at least stabilize. What apparently is actually occurring is that, as real wages fall, each economic group demands—and usually receives—large increases in wages, which continue to fuel the inflation. The evidence exists: the more the GNP is depressed by government action, the greater the inflation. A reader may think that this relationship is inverted, but many laws of economics are capable of being inverted by social institutions, such as the recent observation that the higher the interest rate, the larger the money supply simply because people are more willing to lend it at the higher rates while the demand for loans rises in anticipation of even higher future interest rates and costs.

It should be obvious that inflation can be stopped and real wages increased only by increasing productivity, which means more goods and services per labor work unit. The primary way that this can be accomplished is with advances in technology. Advances in technology are usually the result of applied research, in which my definition is that applied research results in a body of knowledge that is immediately useful for design purposes. These designs can be used for new products, product improvement, or for increases in either output function, speed, or efficiency.

Applied reseach currently is being performed by industry in support of its own products, independent research laboratories, universities, government laboratories, federally supported research centers, and individuals. In spite of this rather large base, there is some evidence that their output is diminishing. One can only speculate on the causes. For example, industrial laboratories have limited resources and tend to support existing product lines. Since several independent competitive companies usually exist, this tends to be somewhat duplicative, because the work that is supported is usually evolutionary to achieve a near-term payoff. Independent research laboratories usually operate under various small contracts to both industry and government. Here, the task selection becomes more complex. Each sponsoring organization presumably has a master plan which sets out the various goals and the schedule of applied research. For either industry or government, these goals usually are selected to support a particular product development and therefore are not generic. Federally supported reseach centers usually are subjected to similar rules, since each center is supported primarily by a specific government department. University research tends to be much more generic, since professors usually select their own research topics, then seek support for them; generally they stay close to their own field. However, there is little coordination between professors at different schools, and it is also difficult within a university environment to expand an area if needed. The point of all this is that the mechanism for selection of applied research tasks is either narrowly directed or, where broad, has a narrow base. More important, the needs as perceived by the user community are narrow, since each "customer" only supports that narrow segment of applied research that he believes necessary for his own organization.

On the other hand, there does exist a large "user" technical community which is both cohesive within a discipline and yet very knowledgeable concerning the applied research needs for future product development. This community is comprised of the American technical societies which are actually tightly organized through their technical committees. However, their present role is the ex-post-facto dissemination of technical information. It appears that these same technical committees also could be used as steering committees to determine the structure, content, milestones, and laboratories for applied research applicable to product development.[1] Such committees represent the "users" of this applied research and are also in the best position to decide who is most qualified to do the actual work. The applied research results would be available to any one from the sponsoring organization(s). For example, if the funding is from the U.S. Government, then it can be broadly available; if from a consortium of companies, then the results would be available to the supporting companies. In either event, the use of a broad-based technical steering group not only will eliminate unnecessary duplication, but, by so doing, the resources can be spread over a larger number of tasks and applied research organizations. The steering committee could have a rotating membership so that the group does not need to defend or continue previous decisions. Some examples of cooperative generic research are given in Ref. 1.

In summary, technical societies until now have generally been passive in their relationship to applied research by only providing a forum for ex-post-facto dissemination of results. It is suggested here that their role be expanded to include the planning, selection, and monitoring of applied research programs. This concept has the advantage of coupling a

[1] Zlotnick, M. and Sutton, G. W. "Chemical Process Industry: Research Opportunities and Strategies," presented at the 72nd Annual Meeting of the American Institute of Chemical Engineers, November 25-29, 1979, San Francisco, Calif.

somewhat diffuse user community more closely to selection of applied research disciplinary tasks and, of course, provides for a more alert community for the receipt of the dissemination of these results. It also helps to solve the problem presently faced by the funders of applied research programs by separating out those tasks which really should be terminated, while being able to start new projects. In the present system it is very difficult for upper level management to have sufficient technical knowledge of each area to make such decisions. The suggested new technique should greatly improve the generation of generic applied research results, which will be directly applicable to product development or improvement and thereby contribute to the national productivity, while also giving the technical societies a greater role, which they should be capable of fulfilling because of their expertise. This could be a new role for the AIAA. Your comments are invited.

Acknowledgments

We wish to acknowledge, with great appreciation, Ruth Bryans, who will shortly retire from her role of Administrator, Scientific Publications, for AIAA. She has stalwartly helped AIAA technical publications grow from one journal to six, plus the Progress Series books, and has handled the editorial aspects, scheduling, budgets, and authors with equal skill. Her successor is Norma Brennan, to whom we wish the best in her new role. Norma's broad experience in all aspects of AIAA Publications makes her qualified for this position, starting with the *ARS Journal*, later as assistant managing editor for all AIAA Journals, and more recently as Managing Editor for the Progress Series of books. Elaine Camhi will continue as the very competent Managing Editor of the *AIAA Journal*. I wish also to thank Dottie Hombach for her excellence in keeping track of my Associate Editors' work loads, and Connie DiStefano for handling my correspondence and problems.

I also wish to thank the following Associate Editors, whose terms have ended, for maintaining the quality of the journal: David Bushnell, Marvin Goldstein, Harvard Lomax, and Samuel McIntosh. I welcome the following new Associate Editors: T. Desmond Arthurs, Julius E. Harrs, Robert M. Jones, and Warren C. Strahle. Lastly, we all express our deep appreciation to our 1979 reviewers for their time and for the thoroughness of their reviews. Their names are listed below.

George W. Sutton
Editor-in-Chief

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*Because it is difficult to include the reviewers from September, October, November, and December 1979 in this issue of the Journal, they will be listed with the reviewers for 1980, in the January 1981 issue.