

RESEARCH BY THE STATISTICAL CONSULTANT *
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The statistical consultant is concerned with statistical problems pertaining to research in fields other than statistics and with statistical problems related to a process or series of processes. The solution for the statistical problem encountered may not be available in the literature and in order to effect a solution research is required.

Several questions arise as to the role of the consulting statistician in statistical research undertaken to obtain an appropriate solution for the problem. Should the consulting statistician perform a significant portion of the research or should he merely relegate the problems to a "theorist?" Should the consulting statistician have a specified portion of his time allocated for research on statistical problems? What type of research should he perform? Should he work only on problems of immediate concern?

Discussion of the above and other questions is presented under the following four non-independent headings:

- i) Desirability of Research by the Consulting Statistician
- ii) Type of Research by the Consulting Statistician
- iii) Time Allocated to Research
- iv) Effect of Consulting on Statistical Research

It is hoped that the audience will add to the comments presented and to the topics discussed.

Desirability of Research in Statistics by the Statistical Consultant.

To be fully competent in statistical consulting, it is necessary for most statisticians to give further consideration to a problem than is possible in a conference with the consultee. "Second thoughts" on a problem quite often lead to more appropriate solutions. One method to ensure immediate "second thoughts" on a problem is to record in writing the problem and the advice given to a client immediately after his departure. Also, this record of advice is extremely useful in future considerations of the problem. The thoroughness with which a consulting statistician attacks a problem determines, to a large extent, the appropriateness and efficiency of the statistical procedure applied.

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Upon further reflection on a statistical consulting problem, it may develop that research in statistics per se or in statistics and/or other fields is necessary to obtain the desired solution. The consultant is the statistician most familiar with the statistical problem and he has established a working relation with the consultee; thus, it would be quite appropriate for him to conduct the research on the problem. Of course, the work could be relegated to a "theorist" but the consultant should also be a "theorist" if he performs competently in consulting. Also, the conduct of research of a statistical nature is educational and serves to increase the stature of the consulting statistician. He then becomes a more capable and better qualified consultant; he is not so prone to force all problems into a known framework, but is willing to devise new procedures if known ones are not entirely applicable. Thus, it appears not only advantageous but highly desirable that the consulting statistician conduct research of a statistical nature.

The professional advantages to the statistical consultant and to his organization resulting from research on statistical problems need no elaboration. The more scholarly approach of attempting to determine appropriate statistical procedures for the problem at hand rather than trying to force everything into a known frame of reference will maintain the proper balance between the professional and the service aspects of statistics.

Full time consulting tends to decrease ones knowledge of statistics in that many things learned in graduate school are seldom used and there is little or no time to learn other areas of statistics. True, the consulting statistician learns a lot about his clients' fields, but he tends to lose ground in his own field. Either he requires time for research and professional improvement or else he requires time away from his position for further education in statistics.

Type of Research by the Statistical Consultant.

The type of research to be performed by a statistical consultant depends primarily upon:

- i) the interests of the consultant,
- ii) the abilities of the consultant, and
- iii) the pressures for research from the consultant's clients and administrators.

The statistical consultant should have a good deal of freedom in the choice of topics for research. He is more likely to perform creditably on research problems of greater personal interest to him than he is on research problems of lesser interest. He should be able, if he desires, to do research on statistical problems whether or not they will be of immediate use to his clients. However, he should, in all fairness to his organization and to his clients, do research on statistical problems of direct concern to his clients.

Joint research by the statistician and his client is highly desirable. The many advantages of joint research by individuals in different fields is, I believe, magnified when one of the fields is statistics. The statistician always has the hope that empirical observations may be generalized by a mathematical expression. The chances of this happening are much greater when the statistician is a member of the research team.

Considerable theoretical and empirical research on statistical problems is required at present and will continue to be in the future. Thus, the consulting statistician has considerable lee-way in the selection of types of statistical research.

Time to be Allotted to Research.

The particular position and type of organization determine to a large extent the amount of a consulting statistician's time that can be allocated for research on statistical problems. However, a desirable amount would appear to be one-quarter to one-half of the statistician's office hours. A specified time each day, say 8:00 to 10:00 a.m. or 3:00 to 5:00 p.m., or a specified day(s) of the week, should be set aside for statistical research. No other appointment should ever be allowed to have priority over the research time of the statistician. This is one appointment that must be kept if research time is to be maintained. Present thinking among consultees appears to be that one is not busy unless there is a client in one's office. Keeping the office door closed and having phone calls intercepted by a secretary are useful devices to preserve one's research time. If the effort is expended to maintain research time, the results will be really rewarding to future consultees, to the organization, and to the individual himself.

Advantages of Consulting to Research in Statistics.

Statistical consulting is not a one-way street in that the consultant only gives and never receives. In fact, the research-minded statistician receives as many or more benefits than he imparts. The problems of real concern, the validity of mathematical assumptions, the validity of statistical models, the nature of experimental material, the deficiencies of statistical procedures, etc. are all topics upon which information is obtained through statistical consulting. The impetus for every statistical problem that I personally have worked on to date was derived from consultation on statistical problems of the consultee. Of course, my work was usually of a more general nature than required by the consultee, but the main point is that the consultee and the consultation supplied the initial impetus. The stimulation for statistical research obtainable from consulting can be one of the chief rewards in return for the consultant's help to his clients.

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There are; no doubt, other items that should be discussed in connection with the topic "Research by the Statistical Consultant," and these will, I hope, come out in the discussion. Most of us have examples to illustrate the various points discussed above. I would be happy to cite examples illustrating the various points outlined in the discussion if requested to do so.