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UNIVERSITY OF THE PHILIPPINES DILIMAN



WORKING PAPER SERIES

**A STRATEGY FOR TEACHING STATISTICAL
CONSULTING**

by

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UPSS Working Paper No. 2008-05
November 2008

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ABSTRACT

Teaching in a developing country is generally challenging due to the inadequate infrastructure in the development of teaching materials and the facilities in the delivery of such. The teacher has to be creative enough in developing cost-effective teaching materials, efficiently allocating the limited resources. Statistical consulting can be taught effectively using audio-visual equipment support. In a developing country, it has to be taught through case studies, coaching and guided practice to complement the absence or inadequate audio-visual facilities. The methods are fairly adequate in imparting to the students the techniques and necessary skills in the practice of statistical consulting.

Keywords: *teaching statistics, statistical consulting*

INTRODUCTION

Statistical consulting is the interpersonal relationship between the consultant and the client. Communication is the key element in the consulting process. The mechanics in which statistical methods are used to resolve the problems of the clients requires efficient communication dynamics between the client and the consultant. On the client side, the goal is to convey the problem clearly to the consultant. The consultant on the other hand, should be able to verify with the client that indeed, result of statistical analysis will provide enough information towards resolution of the real-life problem being consulted.

Teaching in the Philippines has been extra challenging over the years. While the youth and children population has continually been increasing, government expenditures to education have not increased proportionally. The proportion of expenditure to education, culture and manpower development hovers around 19% to total expenditure in the past few years [2000 Phil. Stat. Yearbook, NSCB]. Relative, to GDP, expenditure to education dropped from 4.4% in 1997 to 3.79% in 1999. This along with other economic and social

problems stimulates creativity for the teachers to utilize the resources optimally to educate the youth.

While advocacy on the correct use of statistical analysis in the Philippines is still pushed by various stakeholders, the inadequacy of practicing statisticians should also be addressed simultaneously. Both the public and private sectors started to realize the need for statistical consulting since the 80's, but there are only a few trained statistical consultants in the country. Experience is usually required for statisticians to get contract from those needing their services, this often ends up bringing in consultants from other countries. It is important to conduct training and statisticians be exposed to such activities to develop the track record needed.

THE CONSULTING SCENARIO

The consulting clients in the Philippines may be grouped into three: other researchers, the private sector and the public sector. Other researchers would include graduate students working their thesis, medical practitioners working for a paper to be submitted for publication, or other academe-based researchers working within the framework of academic publishing. Most of the problems usually consulted by these clients would fall in the area of research design including sampling and data collection strategies, descriptive analysis, and significance testing (with or without covariates). Significance testing would include verification of a previous result/theory, comparison, and validation of innovative diagnostic over a gold standard through the computation of sensitivity and specificity indices. These

problems are addressed in a thorough discussion between the consultant and the client regarding the problem, insistent probing on the part of the consultant is proven effective.

The problems consulted by the public sector usually revolve around the generation and analysis of official statistics and in impact assessment for various development interventions. The most commonly required approaches are sampling design, small area estimation, statistical modeling where the data usually posed some constraints, indexing methods, and other aggregation/summarization procedures. Techniques of modeling under complex survey data, variance estimation in complex designs, and non-parametric estimation would usually help.

The problems consulted by the private sector are imposing so much challenge to the statistical consultant. Survey data and data mining are similarly dominating the consulting practice in private sector. Survey data are used in feasibility studies, product testing, pre-product launching and generally in the construction of a marketing strategy. The availability of large usage databases, loyalty card information, electronic transaction records, requires much techniques from data mining procedures. Many approaches however, have to be tailor-fitted for the firm due to the varying design of the data architecture and the information they are searching for. The consultant's immersion with the client to understand all the processes involved in the firm is necessary. Solution is usually complex but results are generally fulfilling.

THE TEACHER

To teach statistical consulting, it is important that the teacher have extensive practical experience. The teacher should have a hands-on experience in a variety of consulting problems to be able to share to the students various approaches used in resolving such. Most of the consulting contracts especially with the private sector impose confidentiality clause, the teacher then who has intensive consulting experience will be able to mask the identity of the firm involved in the problem discussed.

Since strategies used in resolving various problems usually vary, a clear presentation of such can help future consultants think creatively along that line once they are working with similar consulting problems in the future. The teacher should be able to illustrate to the students how clients are handled and the process in which certain problems are resolved.

One bottleneck in the metamorphosis of a classroom-trained statistician to become a consultant is in the operationalization of statistical theory. There is difficulty to recognize the reality behind normal distribution and how to deal with it when actual distribution is different. How will the statistician fill-in the compromise between statistical theory and really? These are the issues that the teacher of statistical consulting has to deal with the students.

THE STUDENT

Since consulting is not instantly learned in the classroom, students need to work with actual, real consulting problems. There are three possibilities available. First, is to encourage students to extract problems from their workplace. They can also be assigned in the

consulting laboratory within the school. Or, agreement with private or public firms can be made for the students to be exposed in an actual consulting problem with the guidance of the teacher.

The students should be willing and open to learn the creative rudiments of the consulting business. They should be open to new ideas, criticisms, acknowledgement and rectification of errors if needed.

The appreciation of the operationalization of statistical theory may take sometime, things that can be considered in the timing of a statistical consulting program.

CURRICULUM DEVELOPMENT

Statistical consulting is usually taught with intensive audio-visual equipment support. A well-known statistical consultant doing real consultancies are recorded on video and are viewed by the students with the guidance of the teacher. The class will then continue discussing issues related to the video presentation. The video presentations should be in varying problems and topics for wider exposure of among the students.

Statistical consulting has been part of the graduate curriculum (masteral level) at the School of Statistics, University of the Philippines. The program is a 1 unit, 2-semester course to be taken by the students in their second year in the program.

The program usually starts with the teacher presenting some pointers on the conduct of statistical consulting. The role of communication is emphasized in the process. The classroom discussion follows an informal format, similar to a question and answer discussion. The teacher would cite some cases based on consulting experience to explain to the students how to execute certain steps in the consulting process.

Although the application of certain methods are presented as need arises, the students are encouraged to explore the literature for a more sustainable learning process, instead of merely feeding them with certain methods.

The students are also advised to read not on statistics alone but also on the subject matter of the consulting problem for a better appreciation.

Towards the middle of the first semester, the students are assigned clients from the consulting laboratory. Oftentimes, these clients are graduate students from other disciplines seeking assistance on their respective thesis or other researches. The students are asked to discuss with the client the research problems, present this in class, and give a collective advice as to how to approach the problem. Once the consulting problem is completed the students are also asked to present results in class to share the approaches and strategies to their classmates.

Statistical consulting is generally taught using audio-visual infrastructure support [McCulloch et. al., 1985]. In the Philippines, it has to be taught through case studies, coaching and guided practice to complement the absence or inadequate audio-visual facilities.

SOME EVALUATION RESULTS

The evaluation for the course and the teacher yields good impression from the students. In a scale of 1 to 4 where 1 is highest, the average rating of student interest on the course as well as their satisfaction on the way course is handled average to 1.58. The students found that enrolment in the course indeed enriches their statistical knowledge from the different core courses taken regularly in the program. They attribute the effectiveness of the course to the teacher's mastery of various statistical applications, the experience from various consulting activities, and a favorable student-teacher interaction.

Some recommendations of the students include the regular discussion of special topics at least once a month, compilation of consulting problems at the end of the semester, and addition of more consulting clients to each student.

CONCLUSION

Teaching of statistical consulting requires experience on the part of the teacher of actual consulting work. The exposure has to be varied to be able to target a wider class of consulting problems that the students may encounter later on. The creative use of case studies and exposure to actual consulting problems shall help the students appreciate statistical consulting and observe the rudiments of the practice so they can develop into a responsible

statistical consultant later on. The students should be encouraged to explore not just the statistics literature, but also need to understand some basic background about the area where statistics is being applied.

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