

Comments of Mr. Herrenato Nova Oñas:

### CONTRASTING TREATMENTS CONCERNING THE UNCERTAINTY OF MEASUREMENT

(Author's Note — This is a reaction to some statements made regarding management motivation and user education as these relate to the effort and product of statistical activity, and the role of the statistician in this regard.)

#### Introduction

Even when the statistician succeeds in some future time at providing timely data, there will be still that element of uncertainty in the data base which will serve serious disquiet or discomfort to their potential or actual users to constitute a feeling of frustration in the statistician that he has not been believed after all, because his statistical product was in a way set aside or ignored. It may be important, therefore, to consider some practical features of the monitoring and analytical aspects of protocol development and formulation. The example offered in this paper concerns features of these aspects which lead to effective regulation by national and local governments.

Control procedures really begin with measurements which form the data base for the control process. We observe, however, that the very act of measurement involves uncertainty despite efforts to increase precision and accuracy by the use of the most modern instrumentation and data handling techniques. Uncertainty of measurement is a very stressing perturbation on at least three responsible communities in our society which are participants of the control process, so much so, that the mechanisms of accommodation to this stress become important factors in determining the tactics and stringency in the application of control strategies.

The communities concerned are

- (i) the scientific community  
with its analytical and statistical sectors;

- (ii) the national legislative community which operates by information flow, extending from its acquisitions agencies such as the library of the legislature and the national office of technical assessment, from information sources in government executive agencies and private action groups, from legislative advisory panels and expert witnesses, into the legislative process at staff and committee levels, and culminating in control legislation for congressional enactment.
- (iii) the judicial community which includes formal courts, administrative law judges, levels of appeal, etc., in which the net results of control procedures are eventually brought to litigation by those who protest for or against the very instruments of control enacted by legislatures on behalf of the people and their environment.

It is instructive to note the contrasting ways in which these three communities react to the uncertainty of measurement and their interpretations in our time.

### **The Scientific Community**

The analytical and statistical sectors of this community adapt most readily to acceptance of the existence of uncertainty insofar as the limits of reliability of the data are concerned. This uncertainty of measurement is an understood and accepted part of scientific methodology. This part, therefore, is handled through statistical techniques, ranging from the simple to the highly sophisticated in character, which are constantly being refined and augmented to handle new types of data.

### **The Legislative Community**

The responsibility for constructing the control instruments under which the entire system of administration and regulation works is vested in this critical sector of society. We should note at this point that the law-making apparatus is not confined to legislative bodies alone, but that some of the promulgation of control instruments and principles begins with the administrative and legal echelons of the regulatory agencies. We find, however, that it is the combination of regulatory out-

puts from legislatures and the regulatory agencies which becomes the body of principles and under it is undertaken the total effort of monitoring and exacting compliance with decreed controls. What becomes an important feature, therefore, of the processes leading to the strength and scope of the resultant control legislation is the impact of uncertainty in the data base which is received as tolerable to the framers of regulation.

As a general observation, the legislative community does not seem to tolerate uncertainty of measurement very well. Facts and the opinions of experts are sought and compiled in volume, and built up to such size and content, to create technical areas of analysis from which absolute attitudes of control can be generated. Then, super-imposed on those absolute attitudes are philosophic judgments on sacrifices to the individual and benefits to the economy which must be balanced in the net national interest. The total resultant of these technical and social considerations is freed as much as possible in wording from the specter of uncertainty and, eventually, becomes the set of detailed controls by statute and administrative law. In a way we come by the impression somehow that the removal of uncertainty in this overall process of control legislation equates with provision to the framers of regulation of detailed technical information, analysis documentation, expert testimony, and recommendation by staff and technical panels of alternate pathways of regulation.

### The Judicial Community

It must come to us to recognize that judicial responsibilities are exercised, not only in courts of the national judiciary, but also in hearing and trial sessions which are scheduled by administrative law judges who function as part of the regulatory agency apparatus. The decisions at lower administrative levels may be and often are appealed upward, of course, to higher echelons of judicial authority for review and ultimate resolution of issues on a case by case basis. In the process, judges (and sometimes juries where they exist) meet with uncertainty at every stage of deliberations; and they accept it as a normal element of the total body of circumstances which must lead to findings of fact and ultimate judicial decisions. However, in a number of recent decisions of the judicial community, there has been an increasing trend toward resolution of uncertainty in the data base in the direction of demanding higher probabilities in the presentation of proof.

### The Sub-Communities

It will come as no surprise to the statistician that there may exist scientific, legislative and judicial sub-communities in private corporate entities, as well as in administrative and/or regulatory agencies of the government, in the form of organizational groupings peculiar to the entity or agency which do information/research, planning/policy-formulation, operations, and evaluation activities; and that these sub-communities will treat the uncertainty of measurement, or react to it, in contrasting ways suggestive of those observed in reference to the bigger communities discussed above.