CHALLENGE TO AND OPPORTUNITY FOR STATISTICIANS IN A SOCIALLY CHANGING WORLD*

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Let me express my good wishes and congratulations on your achievements for earning a Bachelor of Science degree in Statistics. Then, let me welcome you to the Statistical profession! As Professional Statisticians, you may wish to enter the field of either a theoretical worker or a practicing Statistician. Or you may wish to be classified as an academician and continue to work under a university atmosphere, or a subject matter analyst or a statistical data specialist. To protect the integrity of your profession, I wish to suggest, if at all possible, that you accept only a professional statistician's job.

I. Responsibility of Statisticians

Statistical theory and techniques must have relevance to the needs and demands of the developing country like the Philippines. As a Professional Statistician, you have the responsibility to cross-examine the data for consistency in definition, measurement and units. Through actual computation and analyses, you will deeply realize that no theoretical statistical formulas (the Science of Statistics) will be of much value unless these theories can be used as the framework in numerical terms to concrete and conceptual universe. Statistics then becomes an Art. Only in this way can you play a major role in decision making in research, business, industry and government.[1]

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*Speech delivered to the B.S. Statistics Graduates, Graduation Ceremonies, Statistical Center, University of the Philippines, Diliman Campus. 23 April 1981.

**Editor, The Philippine Statistician.

[1]Oñate, B. T. Statistics for Executives. Philippine Executive Academy. U.P., Baguio City. 1965.

Two important points, namely: the cross-examination of data, and the computational aspect, play significant roles in the statistical development of emerging economies. While the theoretical advancement in the statistical field has been recognized, the collection, processing, tabulation, and publication of official and non-official statistics have lagged behind in their development. Statistics as a scientific tool must be handled by an expert. To be useful, it must be appreciated by the user, such as the government or the executive of a private enterprise. This interplay provides two interesting requirements about statistics. Firstly, the Statistical Expert must be quite familiar with the field in which his scientific tools are to be applied – the Art of Statistics. Secondly, the Statistician must be able to forge a form of partnership between himself as the producer of statistics and the executive or manager as the user of statistics.

The Statistician as producer of statistical theory and techniques (The Science) is generally accepted without much question. However, as a producer of statistics or data (The Art), the Statistician is identified with data and in this situation the "statistics" and the statistician are liable to be suspect. It is worthwhile to distinguish between these two dimensions. This attitude of the public in general is brought about by the fact that the collection, processing and tabulation of statistical information are done by people other than the Professional Statisticians. Any person, without any training or shall we say one illiterate in the science of statistics may be able to set himself as a Statistician and proceed to practice the profession. Then, he is able to find someone, including the government, foolish enough to employ him as such. The educational requirements necessary for competence in the use of modern statistical techniques are the same as the rigid requirements necessary for the medical, engineering and other professions. One has to look around to see the simple fact that many people, who profess to call themselves Statisticians (or who profess to be knowledgeable in the science of Statistics), are in fact quite incapable of understanding even the simplest statistical concepts. It is important that the public recognizes the rigid requirements

called for in the statistical profession. You are therefore called upon to inform the public about these requirements.

II. Some Fields in Need of Statisticians

Presently there are quite a number of important subject matter or fields which make use of statistical theory and techniques and which require the services of Professional Statisticians. Some of the most important areas which you may wish to consider are as follows:

a) Biology and Agricultural Research – basic research and experimentation in life processes, biometry, design of experiments and genetic engineering.

b) Business and Development Finance – production statistics, volume of sales, management, inventory control, plant location, communications and control theory, and auditing and accounting procedures; statistical framework of appraisal reports, external debt reporting and financial flows.

c) Demography – study of growth of human populations, including birth rates, death rates, and migration rates, and the distribution and composition of populations including personal, social, and economic characteristics.

d) Economics – measurement of production, prices, volume of trades, resources and labor force. Analyses of consumers and producers' behavior and market responses to such factors as price changes, advertising, and government regulations.

e) Education – problems of the teaching and learning process, measurement, testing, and studies of educational institutions.

f) Engineering – research and experimentation of many kinds including design and test of performance, improvement of methods of test, improvement of inferences from test, and reliability testing including better methods for control of quality.

g) Health – occurrence and cost of accidents, of disease, and handicaps, problems of medical care, hospitalization, insurance, and the public health program.

h) Insurance – determination of mortality, morbidity and accident rates among insured lives and in the general population, and the determination of rates of premiums for property and liability insurance programs.

i) Marketing and consumer research – problems related to the size of the market, the most efficient system of distribution, location of outlets, study of consumer preferences and purchasing habits.

j) Medicine – epidemiology, basic research experiments on cause, diagnoses, treatment, and prevention of diseases.

k) Operations research and administration – operations research including problems of management related to people, jobs, material, equipment, methods, and working conditions.

l) Psychology and psychometry – problems related to the measurement of learning ability, intelligence, personality characteristics, normal and abnormal behavior of an individual as well as the creation of scales and measuring instruments for use in these general areas.

m) Social sciences – design of sample surveys to help build and test theories about social systems and social welfare, cost analyses of social insurance, analysis of data from differing cultures to explain differences in values, attitudes, and behavior patterns of groups of people, levels of living, and the design and analysis of experiments to describe and explain group behavior; casual flow diagrams for social engineering.

n) Ecology and problems of the environment – standards, predictions and surveys.

o) Space sciences – reduction and interpretation of experimental measurements collected by space vehicles like the "Columbia" space shuttle.

p) Electronic data processing – construction, operation

and use of high speed computing and data processing equipment.

One may, however, wish to continue basic research in statistics such as probability, statistical theory and methods. This list asserts to the wide range of possible applications of statistics. In the application of Statistics as an Art and depending upon one's interests, one or more of these scientific fields could be explored.

III. Challenge and Opportunity[1]

The challenge to and opportunity for the Statistician in a socially changing world will have several dimensions.

Firstly, the Statistical Science or Statistics will be applied as an Art in the multi-disciplinary requirements in these sciences and in national planning and development.

Secondly, the training, consultation and research functions of the Statistics Discipline will be accelerated and expanded to include new areas of activities. These functions should include the organization of a Consortium of Statistical Experts from the Universities and Statistical Agencies who will serve as the Faculty for the training of personnel toward the M.S. and Ph. D. degrees in Statistics, as venue for the provision of high level consultations on statistical matters, and as a Core of Advisors for relevant theoretical and applied research on statistical problems. This approach, among others, will bring about the strengthening of the caliber and prestige of the statistical profession.

Thirdly, the theoretical design of a new framework had emerged and the social and economic areas of concern will provide the statistical framework for the developmental plans. Systems for monitoring and evaluation (M & E) of the accomplishments of the Plans at the macro and micro levels must be developed and these systems will be used also to measure the impacts, effects,[2] and

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[1]Oñate, B. T. Scenario for the Statistics Discipline in the 80's. 2nd National Convention in Statistics. PICC. December 1980.

[2]Onate, B. T. Project Benefit Monitoring and Evaluation as a Component of Rural Area Development Project Design. 1979 (Being Revised).

directions of the energy shocks and other related global happenings. A correspondence must be established between the government, technocrats and recipients of development in the conceptualization, implementation and institutionalization of these areas of concern. Man (Woman) must now be used as the center of both means and ends of development. The statistical community will provide the leadership in the accomplishment of these new opportunities.

Fourthly, in addition to the development of the theory and the applications of statistics in all fields of scientific and human endeavors and to national planning and development, the Statistician must now come forward and be involved in the in-depth analyses of the economic and social problems besetting the Filipino Society and he must provide the leadership toward solutions of these problems. The Statistician must be in the forefront of activities related to the framing of sound policies and in the generation of relevant strategies for efficient and effective decision making in government and the private sector. For example, the Statistician should develop not only the theory of the design of surveys and the applications of the theory but must be in the forefront toward the development of experimental and analytical procedures and results which could be applied at all stages of the survey operation starting at the framing of objectives, development of the frame, sampling design and estimation procedures, questionnaire design, and interview method for in-depth and probing analyses, operations research in field activities, effective tabulation with efficient computer processing of data. To be included in this R & D (Research and Development) efforts will be an effective and efficient information and user sub-system for influencing decision makers at all levels of the Management hierarchy. The Statistician must be aggressive in this regard and must therefore provide the needed leadership at each stage of the survey operation. In the absence of this aggressive leadership of the Statistician, the non-statistical professions will certainly take over this prerogative with rather disastrous results. This is one dimension of the challenge to the Statisticians in the 1980's.

A. Theoretical Design of New Framework: Social and Economic Areas of Concern

Who Measures and For Whom

In the preparation of the social and economic areas of concern which could serve as statistical framework for planning and development, there is a need to understand fully who is providing the measures and for whom these measures will apply. Initially, these areas of concern would be conceptualized and institutionalized on the basis of the thinking of the leaders in government including those in the Ministries or Departments and these areas will often refer or emphasize work programs which are the responsibilities of these Ministries or agencies in the government. These areas of concern as conceptualized and institutionalized by government may not fully or only partly coincide with those prepared by technocrats or the private sector who may also differ among each other even for those working in specialized or specific areas of concern. If the areas of concern developed separately by government (G) and technocrats (T) are tested with those areas of concern generated or obtained from the micro monitoring system on the basis of the level and degree of participation and actual observation of the recipients (R) or beneficiaries of development, we will find that there may be little or no correspondence between government and technocrats, government and recipients, and technocrats and recipients. This situation is illustrated by a matrix shown in Chart 1, where the areas of concern conceptualized by the government is described by a triangle (Δ), the technocrats by a square ($\square$), and the recipients by a circle (O). The conceptualization, institutionalization and implementation of the contents of this matrix will be the challenge to the statistical profession in the coming decade.

Theoretical Design

One may identify six processes in the social system, namely: (i) Production; (ii) Consumption; (iii) Protection; (iv) Learning; (v) Interaction; and, (vi) Decision. Singly or jointly, these processes will generate certain impacts on development which in turn will

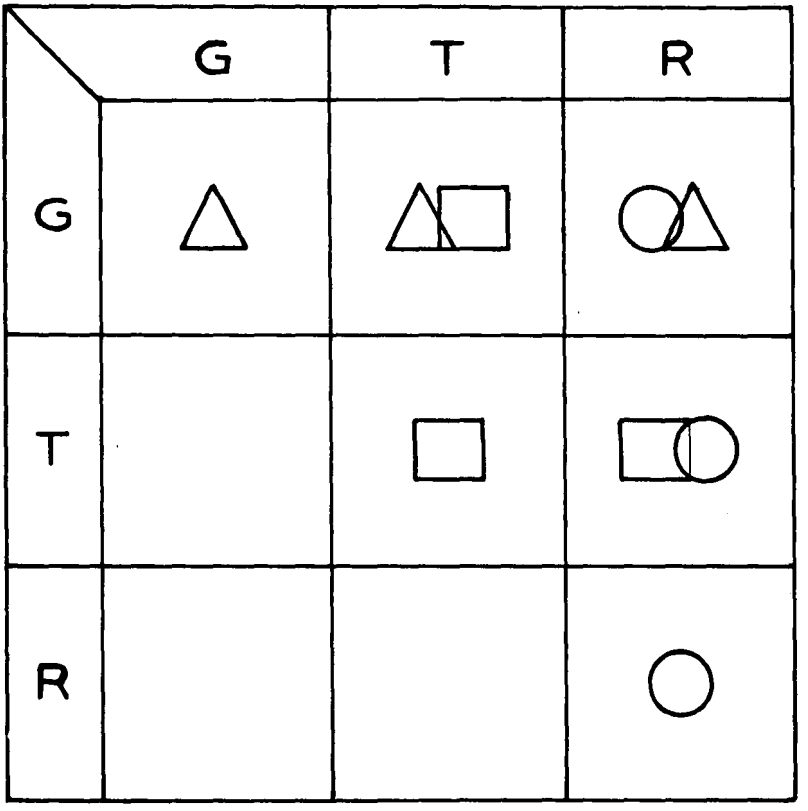
determine the state or quality of life of recipients in a particular project area or province, region or at the national level. This conceptual model of a social system is shown in Chart 2. One has to develop an empirical relation between inputs (or facilities or use of facilities) and outputs through causal flow diagrams, a form of social engineering, to explain the processes in the social system. Since this is extremely difficult at the present stage of knowledge and too variable for evaluation purposes, the other alternative is to institute a statistical monitoring and evaluation system with special emphasis to measure the level and distribution of the income, industrial, migration, public service, negative and indirect or multiplier impacts. The results of this monitoring system on a time series could be used as inputs or intermediate variables or outputs to derive the empirical bridge for evaluation of economic and social development schemes. The matrix (Chart 1) and the development of models for the social system (Chart 2) will serve as components of the scenario for the Statistics discipline in the Philippines for the new decade.

Social and Economic Areas of Concern as Statistical Framework for Planning and Development

The impact indicators for the Philippine Developmental Plan are covered in the macro component of the Economic and Social Impact Analysis (ESIA)/Women in Development (WID) Project of NEDA. This Project seeks to develop, operate, and maintain a system of macro (and micro) indicators to serve as frame of the economic and social development plans and also to measure the degree of achievements of the developmental goals expressed in the Plans. The indicators generated by this Project will include not only goal indicators but also indicators of the effectiveness of policy instruments. The goal areas are as follows: (i) Production; (ii) Finance; (iii) Foreign Trade; (iv) Employment; (v) Household Wealth, Income and Expenditures; (vi) Energy and Natural Resources; (vii) Population; (viii) Health; (ix) Education; (x) Housing and Environment; (xi) Social Welfare; (xii) Public Order, Safety and Justice; (xiii) Development Administration; and, (xiv) Regional Equity. This NEDA framework will represent the

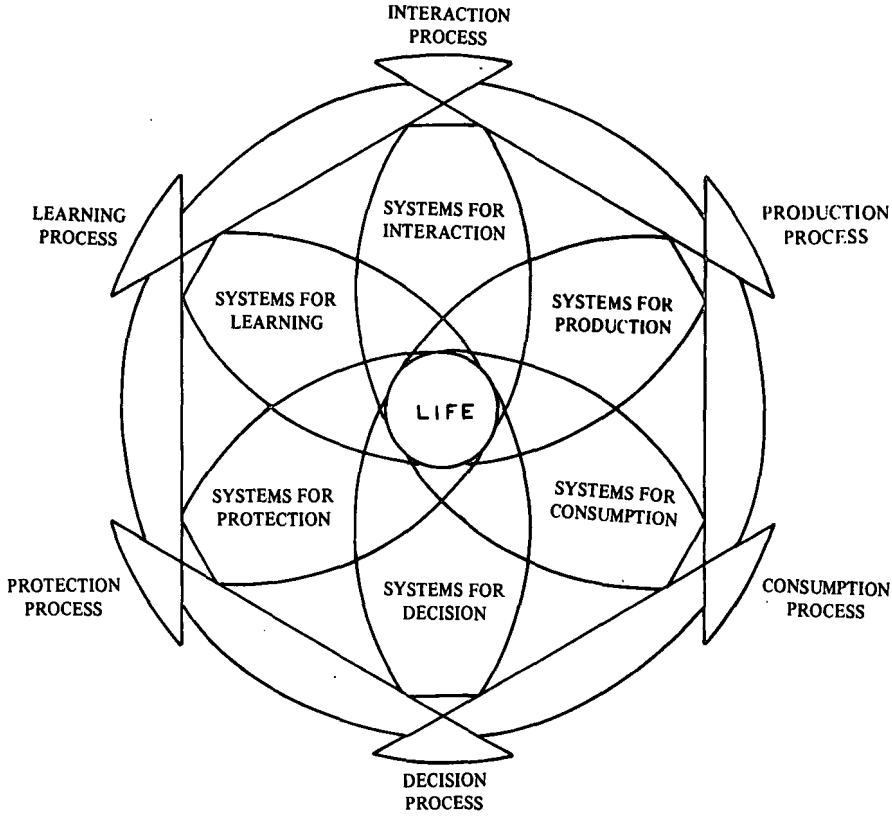
Chart 1.

MATRIX ON THE CONCEPTUALIZATION OF AREAS OF CONCERN FOR SOCIAL AND ECONOMIC DEVELOPMENT: GOVERNMENT (G), TECHNOCRATS (T) AND RECIPIENTS (R)



*Example: G – National Economic and Development Authority (NEDA)
T – Agricultural Economics and Development Association (PAEDA) or Philippine Social Science Council (PSSC)
R – Filipino People

Chart 2. A CONCEPTUAL MODEL OF A SOCIAL SYSTEM



SOURCE: ADB NAMGANG AREA DEVELOPMENT PROJECT. CHAPTER X. 1974, FIG. 1.1

government's interpretation, conceptualization, and institutionalization of the areas of concern with the Filipino people as the recipient of progress and development. This framework could serve as a component of the statistical scenario for the 80's. It is important to emphasize that this scenario cuts across economic goal areas as well as social areas of concern. This type of endeavor will illustrate the amazing versatility of the Statistician which could bring about new challenges to and opportunities for the years ahead.

Poverty, Growth and Human Development

Another area which will require our full attention in the 80's will be the measurement of the level, direction, growth, and distribution of the many dimensions of poverty with special reference or focus on absolute poverty which is a condition of life so characterized by malnutrition, illiteracy, and disease as to be below any reasonable definition of human decency. There appears to be unanimous opinion of the need to reduce and at some point eliminate absolute poverty. A concomittant area to the approaches of overcoming poverty with the strong concern for growth would be the goal area of concern related to human resource development. These twin problems are usually attacked not at the macro level but at the micro or project site level. This approach will mean, isolating these various pockets of poverty both rural and urban so that specific policies and strategies could be conceptualized, developed and implemented with the rural and urban poor as the specific recipients of development. The focus will therefore shift to factors and policies that particularly affect the incomes of the poor. Under both these concerns on poverty and growth, the potential contribution of human development must be considered. If this is so, it is important to stress the contribution of a long period of social, political, and cultural factors on poverty and on particular disadvantaged groups. This situation points to the role of the Statistical System towards the identification of these areas as well as devising the proper techniques and approaches in the measurement of poverty, growth and human development and their distribution, and the interactions between

these areas of concern for the improvement of the quality of life (QOL) of the rural and urban poor. Man (Woman) must now be considered as the center of the means and ends continuum of development.

B. Ethics and Guidelines for Statisticians

The Statistician should develop not only the theory of statistics as a "science" and its application to all known fields of human endeavors as an "art" but also in the process of seeking truths about the functioning of the Filipino society, one should be able to provide visions to correct injustice, remedy oppression and guarantee an improved and better quality of life (QOL) for the Filipino. This new vision should make you invariant to the constraints brought about by the existing economic, political and procedural rights. In this way, the Statisticans could also contribute toward the generation of a truly Filipino ideology.

In the accomplishment of these tasks, the Statisticians should follow and observe the ethics or guidelines of *objectivity, integrity,* and *independence.* Knowing the theory as well as the reliability and accuracy of data, the Statisticians should now be actively involved in the framing of policies and generation of strategies for decision making at all levels of management and administration.

The Statistician is considered to be a very amazingly versatile person. Having worked with and for social and physical scientists and at all levels of management in the application of his (her) statistical tools, he (she) has become also well versed in the concepts and problems of economics, politics and society that affect or will affect the QOL of the Filipino. The Statistician is therefore, one of the few professionals or the only professional who is in this enviable position of contributing to a better and wider perspective for in-depth analyses of current problems and prospects and in the generation of solutions for social and economic development.

IV. The Statistician in a Socially Changing World

As dynamic member of the Community, the Statistician will be asked to assist in the measurement of the levels and improve-

ment of the Quality of Life (QOL) and the Qualtiy of Man (QOM). Thus, he (she) must be sensitive to these needs and demands of a socially changing world. This is the challenge to and opportunity for Statisticians in the coming years. There is no doubt that the Statistician will be equal to this challenge and opportunity!