

INDIAN STATISTICAL INSTITUTE

Report of the advisory committee of the council of the
recommendation of the second ISI Review Committee

INTRODUCTION

1.1 In pursuance of the Statute of the ISI Act, 1959, the Second Review Committee was appointed by the Government of India on 27 August 1982 with Dr. S.R. Sen, Chairman, International Food Policy Research Institute as the Chairman of the Committee. The terms of reference of the Committee were :

- (i) to review the work done by the Institute and the progress made by it;
- (ii) to inspect its buildings, equipment and other assets;
- (iii) to evaluate the work done by the Institute; and
- (iv) to advise the Government on the following matters:
 - (a) to what extent and in what manner the research activities of the Institute should be continued or modified in areas other than development of statistical theory and techniques and their practical applications;
 - (b) what should be the liability of the Government to finance the activities of the Institute and in what manner the Institute should increase its own financial resources;
 - (c) in what manner the administrative set up, management and personnel policy of and financial and budgetary control in the Institute should be improved to make them more effective;

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- (d) whether and to what extent the consultancy work done by the Institute, particularly in the fields of operational research and statistical quality control, should be operated on commercial or self-financing basis;
- (e) whether in the light of the experience gained so far, any amendments to Indian Statistical Institute Act, 1959 or to its Memorandum of Association are necessary to facilitate the working of the Institute; and
- (f) whether the audit of the accounts of the Institute should be entrusted solely to the Comptroller and Auditor General of India under Section 20 of the Comptroller and Auditor General's (Duties, Powers and Conditions of Service) Act, 1971 by suitably amending the provisions of section 6 of the Indian Statistical Institute Act, 1959, which in the opinion of the Central Government are of importance in connection with the work of the Institute.

1.2: As provided in sub-section (2) of Section 9 of the ISI Act, 1959, the Council appointed the Director to represent the Institute in the meetings of the Review Committee. The Review Committee had discussions with different groups of scientists of the Institute and also the representatives of the workers and submitted its report to the Government on 29 August 1983. The report contained 105 recommendations besides observations of a general nature. We should like to record our appreciation of the constructive approach of the Review Committee in its task of review of the work of the Institute and in formulations of its recommendations

1.3 The Council of the Institute, in its meeting held on 13 February 1984, appointed a Committee consisting of the following members to advise the Chairman and the Council of the Institute on the matters relating to the recommendations of the Second ISI Review Committee :

- (1) Chairman of the Council (Chairman of the Committee)
- (2) Director
- (3) Professor P.K. Bose
- (4) Professor Bhabatosh Datta
- (5) Professor Yash Pal
- (6) Professor S. Ramaseshan
- (7) Professor A.K. Sharma

1.4 The Advisory Committee visited the Headquarters of the Institute at Calcutta and its Centres at Delhi and Bangalore. The Committee ascertained the views of the scientific workers in various divisions and the representatives of the workers. In addition, the Committee met twice in Delhi to discuss and finalise its views on the issues brought out in the Review Committee report.

2. History and Development

2.1 When the Institute's work is under review, as it should be periodically, it is helpful to recall its origins, its conceptual frame and the history of its development. Without such historical background, it will be impossible to determine how and in what manner the Institute should function and develop in the future. Although by now it is probably well-known how the Institute came into being and developed, a brief history may not be out of place.



2.2 The Indian Statistical Institute, founded by Professor P.C. Mahalanobis in 1931, owes its origin in the statistical studies and researches started by him in the Statistical Laboratory set up in Calcutta. From the very inception of the Institute Professor Mahalanobis and his associates not only contributed to the development of theories and methods of statistics, but also made valuable applications of statistics to numerous other disciplines. Sir Ronald A. Fisher, the father of modern statistics, was a constant visitor to the Institute since 1937 and Professor J.B.S. Haldane joined its faculty in 1957. Inspired by these three stalwarts, the Institute began to undertake researches in several social and natural sciences in the belief that collaboration under the same roof would foster the mutual development of statistics and the disciplines concerned. In fact, Fisher described statistics as the 'key technology' of the century in view of its relevance to all scientific endeavour which either involves experimentation, measurement and inference from sample to aggregate or has to develop theoretical models for phenomena governed by the laws of chance.

2.3 On the basis of this belief small research units were established in a variety of disciplines belonging to the natural and biological as well as social sciences. The Institute's small research units were intended to play a triple role : firstly, each unit would actively engage in a programme of fundamental research which would throw up problems of statistical nature from time to time, some of which might well stimulate the evolution of statistical methods; secondly, each unit would contribute to the teaching of degree courses in statistics, familiarising

students with the types of problems and methods of observation, measurement, and experiment in its own field of the natural or social sciences; and thirdly, it was hoped that the research units would be able to act as a liaison between workers in similar fields of science in Universities and Government organizations on the one hand and the research statisticians of the Institute on the other in order to promote the spread of knowledge of statistical methods in India. In the view of Fisher, the establishment and continuation of these units was essential for the role that the sciences must play in the education of any competent statistician. Most such units which exist today had their origins in the fifties.

2.4 Ever since its inception, the Institute has been carrying out significant work in the field of applied statistics. The Institute has undertaken a large number of sample surveys to demonstrate the use of statistical methods for purposes of estimation. With the advent of the planning process in India, more and more information on various aspects of the nation's economy were required and the Institute through its National Sample Survey supplied this information. The Institute played a key role in drafting the 2nd Five Year Plan in the fifties.

2.5 Following the visit in 1947-48 to India of Walter Shewhart, the well-known specialist in Statistical Quality Control (SQC), it was realised that there was scope for the application of statistical methods in the industrial sector. In order to promote such work the Institute started a SQC Unit in Bombay in the mid-fifties,

soon thereafter several more such units were established by the Institute in different parts of the country for the purpose of creating awareness in industry of the potential use of statistics in quality control work.

2.6 It soon became apparent that, for wide-spread use of statistics, it was necessary to produce trained personnel regularly. With this end in view the Institute started a training course in statistics. Initially, the training was confined to a small group of persons employed in Government and academic institutions. In a few years the Institute developed a 3-year advanced professional statistician's course; this attracted many brilliant young students, who had completed their mathematics courses at post-graduate level in the Universities, to take up statistics for their career. This led the Institute to become one of the foremost research and training centres for statistics in the world.

2.7 The Institute has a long history in the use of ^{the} electronic computer. Since the early fifties the Institute has made use of successively newer generations of computers : a HEC-2M electronic digital computer, a medium-sized Russian computer Ural-11, an IBM 1401, a Honeywell H-400 EOPM system and lastly a new third generation Soviet computer EC-1033 and a Varian V-77-200 mini computer.

2.8 In a matter of about 25 years, the Institute had grown in size and stature. Keeping in view the contributions of the Institute to the science of statistics and to the development of statistics in India, it was recognized as an 'Institution of National Importance' by the Government of India through an Act of Parliament in 1959. The autonomous character of the Institute was retained within the

limits prescribed by the Act and the Institute was empowered to confer degrees in statistics. While piloting the bill in Parliament, Prime Minister, Pandit Jawaharlal Nehru, said :

"The Institute is well known. Nevertheless, I should like to give just a few facts in regard to it. It was started in the early thirties, and has grown since then very considerably. Till now, it is not only the only but the very big Institute doing statistical work in Calcutta, and in fact, all over India. There can be no doubt about its importance. In fact, its importance is recognized internationally, all over the world. It is one of the noted statistical institutes in the world, not only in India; in India, of course, there is no other doing that type of work

Now, clause 3 of this Bill says that because of this and that 'it is hereby declared that the Indian Statistical Institute is an institution of national importance', I submit that it is the recognition of a fact. We have been really treating it as that and, what is more, it has a very high place in the world today amongst statistical institutions. It is really considered one of the principal world organizations in this line. They have actually made some contribution to the advancement of statistical science in the world....."

Stressing the need to keep the Institute a non-Government autonomous institution, Pandit Nehru declared :

"Now we want science to grow, and I think it is quite essential that we should accept this broad approach to this question that scientific work should have a certain latitude. Therefore, we have decided that in this particular matter this should continue to be an autonomous organisation....."

So far as audit is concerned, we thought about it very carefully and we decided that we should not compel the audit being done by the Auditor General because, excellent as the Auditor-General's office is, it also functions under certain governmental routines which may not be applicable more especially to a scientific organisation..... Therefore, we have suggested in this Bill that the auditors should be naturally Charactered Accountants but recommended or selected by the Government, on the advice of or in consultation with the Auditor General....."

- 2.9 With the passing of the Act, empowering the Institute to award degrees in statistics, courses of study leading to the Bachelor of Statistics and Master of Statistics were introduced. The courses were designed by Professor P.C. Mahalanobis, Professor J.B.S. Haldane, Professor and others, C.R. Rao. The basic approach was to combine the study of statistics with courses in a number of subjects in the natural and social sciences. The aim was to produce the versatile statistician in conformity with the Fisherian principle cited earlier. This was a unique exercise in the teaching of statistics and which, so far as we know, has never been attempted in any other organization in the world on so comprehensive a scale.
- 2.10 The Institute has all along remained a society registered under the Societies Registration Act. The Memorandum of Association of the Institute specified the objectives, the manner of functioning, the powers, composition and functions of the Council, General Body etc. The Memorandum of Association underwent changes a couple of times and the new Memorandum of Association was adopted in 1976. Before the revised Memorandum of Association was finalised, extensive consultations took place with the Government of India and the revised version in the present form was approved by the Government. The objectives of the Institute as stated in its revised Memorandum of Association are :
- (a) to promote the study and dissemination of knowledge of statistics, to develop statistical theory and methods and their use in research and practical applications generally, with special reference to the problems of planning of national development and social welfare;

- (b) to undertake research in various fields of natural and social sciences with a view to the mutual development of statistics and these sciences;
- (c) to provide for, and undertake, the collection of information, investigations, projects and operational research for purposes of planning and the improvement of the efficiency of management and production;
- (d) to undertake any other ancillary activities in fulfilment of the objectives in (a), (b) and (c) above.

2.11 To sum up, ISI was meant to promote the whole area of the branch of knowledge which goes in the name of statistics. Although in the public mind there are all kinds of misconceptions about statistics, the broad fact remains that there are many areas of the sciences whose meaningful study can only be undertaken through the use of statistical methods. The development of statistics as well as the advancement of the frontier areas of the sciences today require careful nurturing of mathematical tools. It is now acknowledged on all sides that there has not been any serious attention paid to the growth of statistics and mathematics in this country. Indeed, ISI is the only institution in India, and is so recognized all over the world, which maintains in the key areas of both statistics and corresponding mathematics, standards recognized as very high. In any re-organisation of the ISI, we are firmly of the view that the vision of Prof. P. C. Mahalanobis, both in creating the Institute and in developing various disciplines in it, must not be allowed

to be diminished or eroded. In this light, we have examined the recommendations of the Review Committee.

3. General Observations

- 3.1 At the outset, we should make it clear that it is not our intention to prepare a point by point comment on the observations and recommendations of the Review Committee. Certain broad issues have emerged from the report of the Review Committee and we have placed our considered views on each of these after having carefully analysed the suggestions of the Review Committee. The Administration has prepared a detailed note on each of the recommendations summarized in the report and we broadly agree with its comments. The Administration's comments are given separately.
- 3.2 Certain recommendations of the First Review Committee, which were implemented by the Government, have had serious repercussions on the character of the Institute. Specifically, we have in mind here the delinking of the Institute from the Perspective Planning Division of the Planning Commission and the separation of the NSS. As a consequence of these events, the systematic involvement of the Institute with the wider problems involving national development processes has visibly diminished. The Institute seems to have become inward-looking. While this has its advantages in the pursuit of individual research, it poses the danger of the ISI retreating from problems of national development and welfare. We have noted that the Institute has undoubtedly maintained its high academic stature and even made its mark internationally in certain new fields. We feel, however, that a judicious balance must be struck between individual academic work on truly fundamental

problems and work that is directed towards a greater engagement with the social and economic problems facing the country. We have made certain suggestions aimed at achieving this balance. Some of our suggestions, if accepted by the Council, will necessitate changes in the Memorandum of Association. In certain other cases, especially with respect to constitution of new committees that will promote work on problems of national development, details regarding their interrelationships will have to be worked out by the Council.

- 3.3 We feel that the main thrust of ISI's work should be to emphasise the role of statistics and mathematics and their relevance to the general problem of the development process of the country with reference to perspective planning, model building etc. All on-going depth studies of the process of change in India should continue and in this connection ISI should have close links with not only the Planning Commission but other Institutions and Government departments like CSIR, Department of Science and Technology which are engaged in a similar task. ISI should actively participate in the process of transformation - social, economic and political- taking place in the country and demonstrate the relevance of its work in this transformation. The importance of statistics in such depth studies of the process of transformation should be articulated. For this purpose, economists, ^{with} broad vision, who will promote the application of statistics in areas like perspective planning, multilevel planning, regional imbalances etc. ^{are essential.} The scientists of ISI should not engage themselves merely in post-facto analysis of information, but undertake projects which will have decision-making implications at the national level. The aim should be to improve the utilization of the available resources in the country at minimal cost and to increase



productivity. We believe that statistics, and hence ISI, has a big role to play for the country's prosperity, and if the statisticians and the scientists of the Institute working in other disciplines could jointly make efforts to bring this about, then the vision of Nehru and Mahalanobis in developing the Institute would be realized.

3.4 The Committee is of the view that the vision and philosophy that informed Professor Mahalanobis's development of the Institute should continue to be the guiding principle for future development. According to this, the scientific activities of the Institute were to be integrated with statistics with a view towards the mutual development of both. Indeed, this is one of the objectives stated in the Memorandum of Association. The ISI should do everything to encourage those scientific activities in which statistics has an important role to play or has a potential for such a role. It is desirable for the different scientific disciplines to increase their interaction with statistics, for, otherwise, the very distinctive character of the Institute would be lost and would result in making it indistinguishable from many universities in the country. It must be recalled that ISI was declared to be an Institute of National Importance by an Act of Parliament because of its pre-eminence in the field of statistics. It therefore follows that statistics must remain the core activity of the Institute.

3.5 Statistics is egregiously difficult to define precisely. At the Institute, it has been and should continue to be understood in its broadest connotations. At one extreme it forms part of the higher reaches of mathematics, at

the other it is concerned with real life problems. In the solution of these problems, however, ^{often} statistics uses theories and tools from fairly abstract mathematics, e.g., from the theory of group representations. The infusion of new ideas from contemporary mathematics and the advent of the computer have caused statistics to overflow its classical boundaries. Classical statistical theory evolved when computation was both slow and expensive. The modern computer is capable of computation that is both fast and cheap. This facility for intensive and inventive computation has provided freedom from two limiting factors that have dominated statistical theory from its beginnings: the assumption that the data conform to the normal distribution and the need to focus on statistical measures that are easy to compute and whose theoretical properties can be analysed mathematically. The result has been a surge in the development of new statistical theories and methods that depend on the use of the computer, e.g., bootstrap and projection pursuit regression. Another fallout from these new developments has been that the line - one so difficult to draw - between theoretical or mathematical statistics and applied statistics has become blurred to the point of extinction. In all future decisions regarding new lines of work in statistical theory and methods, the Institute will do well to keep in view the rapidly changing nature of the subject.

- 3.6 Apart from the routine matters to be covered by the Review as stipulated in ISI Act, 1959, the Government have chosen to include certain questions under item (iv)

of the terms of reference to the Review Committee which reflect some misgivings about the legitimacy of certain activities of the Institute in areas other than development of statistical theory and techniques and their practical applications and also the liability of the Government to finance the activities of the Institute in these spheres. Such references serve only to create a sense of insecurity in the minds of the scientists working in areas other than statistics, doubts about their future in the Institute and about continued financial support by the Government for their scientific activities. The Government had accepted the research work of science units as a legitimate activity of the Institute and conveyed their approval as far back as 1962. We are glad that the Review Committee has supported the Institute's view on the scope and nature of ISI work. We also welcome the recommendations of the Review Committee that the academic work of the ISI should continue to be financed wholly by the Government and that the Institute should not be asked to change its academic character with a view to reducing its reliance on the public exchequer. We hope that these issues are now settled once and for all and that the Institute will be free to pursue research in disciplines belonging to the natural and biological as well as social sciences with the assured financial support of the Government. As was forcibly argued by Professor Mahalanobis, the Institute has a special responsibility to support fundamental research of high quality even in areas other than statistics. It is seen from the history of the development of statistical methods that it has been difficult to predict at any given time the new areas of science with which statistics would interact fruitfully. The Institute should

therefore have provision for the accommodation of very brilliant scientists engaged in work that could have important links with statistics in the future.

3.7 While endorsing the role of the science units in widening the scope of the application of statistical methods to the mutual advantage of statistics and the concerned discipline, the Review Committee has suggested that the Institute should review from time to time and decide as to which units are necessary and which may be redundant. We agree that such periodic review should take place, but we feel that certain criteria must be evolved to decide which of the units have served the purpose intended of them and which have not. In this connection we refer to our note on the history and development of the Institute in Chapter 2 in which the object of establishing the science units has been explained. So long as the science units fulfil the objectives, they must be allowed to continue. Professor Mahalanobis had formulated some criteria for the evaluation of each research unit. These, in summary, are produced below :

- i) whether the unit is actually supplying, or is likely to supply in the near future, suitable observational and experimental data for teaching and research purposes;
- ii) whether the unit is engaged on work of a pioneering nature - this does not necessarily mean work of great significance for the advancement of science but it does mean something which is not merely imitative;
- iii) the extent to which studies on a thematic programme could be undertaken by collaboration between two or more units within the Institute or in collaboration with other research institutions and universities.

We endorse the above criteria for evaluation of the small research units and agree that suitable decision on the continuance, or otherwise of the unit should be taken on the basis of such an evaluation.

3.8 We cannot agree with the recommendation of the Review Committee that the Institute engage in consultancy with a view to generating funds to finance some of its activities. We are of the firm opinion that introduction of consultancy for commercial purposes will inevitably lead to distortion of the academic values of the Institute and give rise to serious administrative problems. The Institute has so far been free from some of the problems that plague educational organizations which offer consultancy services on a commercial basis. It is desirable that the Institute should be free from these troubles. It has been argued by the Review Committee that the installation of a new computer will lead to idle time, which could be rented out to other organizations along commercial lines. Elsewhere in this report, we have argued that we foresee a great increase in computer usage by the Institute in view of the new computer-intensive methods in statistics that are being developed. We are therefore opposed to the use of ^{the} computer for commercial purposes.

3.9 We welcome the recommendation of the Review Committee by way of its response to the query of the Government whether the audit of the accounts of the Institute should be entrusted solely to the Comptroller and Auditor General of India. The Review Committee has categorically rejected the suggestion and reiterated that the present system of audit by a Chartered Accountants firm selected by the Comptroller and Auditor General of India should continue.

In this connection, the statement of Pandit Nehru while piloting the bill before the two houses of Parliament, given in Chapter 2, may be recalled.

4. Organization of scientific activities.

- 4.1 We suggest below the formation of a number of research committees with well-defined aims. The function of these committees will be to direct, coordinate and motivate research in specified areas. We believe that these committees will help in lending sharper focus and direction to the different scientific activities of ^{the} ISI. The Committees will also be able to canalize the ^{the} resources of ^{the} ISI into problems connected with national development and welfare.
- 4.2 The ISI has expertise in a wide range of fields - in economics, in geology, in fluid mechanics etc. Towards intergrating these activities and playing a greater role in national development, the committee is of the view that the ISI undertake two or three major inter-disciplinary studies of significant national issues. We agree with the Review Committee's suggestion that an Interdisciplinary Research Committee be constituted, whose function it will be to promote and undertake such cross-cutting studies. Since according to the Memorandum of Association interdisciplinary research is an item of concern of the Academic Council, the exact relationship between the proposed Interdisciplinary Research Committee and Academic Council will have to be worked out by Academic Council and Council. We suggest that ^{the} ISI give serious consideration to undertaking thematic studies, two examples of which, are mentioned below :

- A. Resources Development and Management : Throughout the world, there is an increasing concern about national and global capacities to produce sufficient quantities of renewable resources (e.g. ^{energy,} products of agriculture, forestry, water etc.) and about the finite stocks of nonrenewable resources (e.g. fossil fuel, non-fuel minerals). These concerns are also related to environmental problems such as resulting from energy use, deforestation etc. Since the seventies, studies on various aspects of the resource situation have gained increasing importance. Many of these problems are quantitative in nature. This is a vast area of research, encompassing a variety of subjects in the natural and social sciences, and needs a wide array of techniques. New techniques of information gathering in respect of resources, merged with older techniques, promise enormous amounts ^{of} data, which need to be organized continuously in a manner conducive to guide decision making. The problems have to be tackled at various levels, e.g., economywise and resource sectorwise levels. To take the water resources area alone, the problems which have to be tackled include Water Research Project Scheduling, Flood Control, Hydropower generation, Water quality control and management, and conjunctive management of ground and surface water. These problems require integrated expertise of chemists, biochemists, physicists, agricultural scientists, statisticians, OR specialists, economists and others.
- D. Information and Communications Technology : This is another theme which permits fruitful collaboration of scientists of different disciplines.

The theme includes topics such as the Mathematics of Computer Science, Software development for various applications, Artificial Intelligence including Pattern Recognition and Data Base Management, Information Theory. Some of these topics, e.g., application of pattern recognition to satellite pictures, are also useful tools for the Resource Development Projects. Since this country has quite correctly invested in putting up its own satellite, it is necessary to have the appropriate programmes for utilization of this facility, including Remote Sensing.

- 4.3 Survey methodology has traditionally been a forte of the Institute. Indeed, Professor Mahalanobis's deep contributions to sampling techniques were in no small measure responsible for putting the ISI on the statistical map of the world. It therefore goes without saying that work on survey methodology should be an important activity of the Institute. The Committee is aware that, for advancement of methodology and also to meet the needs of government agencies, a certain number of surveys have to be undertaken by the Institute. But great care must be exercised in the choice of these surveys so that they do not degenerate into routine collection of information, which in any case other agencies are better equipped to do. It cannot be stressed too much that a survey done by the Institute should either enhance the subject in which it is being done or lead to a contribution in methodology of publishable quality or both. Survey methodology should be developed as an integral part of the development of statistical theories and methods in the Institute. For this purpose, we propose the setting

up of a Survey Sampling Advisory Committee whose functions will be to advise in choice of surveys, be responsible for the design and analysis of all surveys done in the Institute, including those carried out by the specialist science units like anthropometry, sociology etc. in their respective disciplines and interact with the NSSO in the solution of technical problems thrown up by its work. In sum, we envisage the role of the Committee as being not unlike that of the Design Section of the NSS when it was part of the ISI.

- Team work
many updates*
- 4.4 All applications of statistical theories to other disciplines have been achieved by statisticians working with specialists in the subject disciplines. This is of course the *raison d'être* of the scientific units in the natural and social sciences in the Institute. Collaboration with the scientific units has yielded subject-enhancing applications of statistics to anthropology, geology and sociology. Individual scientists and small organisations often need the services of specialist statisticians in analysis of their data. Collaboration of statisticians and scientists should extend to this situation also. Thus, to extend the scope of such collaboration, the Committee is of the view that statistical consultancy services be provided by the Institute to individuals and organizations engaged in research in the different sciences. We understand that at present such services are provided, though not on an organized basis. The Committee recommends the constitution of a Statistical Services Advisory Committee for the purpose of coordinating, supervising and selection of such items of work. An additional function of the Advisory Committee will be to establish contact with organizations like the All India Institute of Medical Sciences, National

Institute of Communicable Diseases, Remote Sensing Agency and similar other organizations so that statisticians of the ISI can analyze the data of these organizations in collaboration with their scientists.

- 4.5 The Institute should engage itself to a far greater extent than appears to be the case at present in providing psychometric testing services and in the development of test methodology. The opportunities for this type of work have increased tremendously in this country in recent years with organizations like the UPSC, UGC, CSIR and such agencies having adopted objective-type testing for purposes of recruitment. Moreover, many public & private industrial organizations have adopted such tests for recruitment and assessment of both technical and managerial staff. Regrettably, though the ISI was a pioneer in the introduction of this type of testing in this country, today it enjoys less than its share at the national level for this type of work. It is therefore necessary to revitalise the activity. Since psychometric research involves the methods of multivariate analysis to a large extent, we feel that more statisticians with expertise in multivariate analysis should be involved both in test construction and analysis. We propose the constitution of a Testing Services Advisory Committee whose role will be to help UGC, UPSC and other similar organizations in test construction, analysis and to provide through the analysis feedback to the organizations to help improve the test procedures. We suggest that PISU be reconstituted into the Psychology Research Unit, with the personnel engaged in routine aspects of test construction and analysis becoming part of the proposed Computer and Statistical Services Centre.

- 4.6 It will obviously be necessary to coordinate the work of the different committees suggested above. It seems most desirable to designate a single person as the leader of these groups. But we are not very happy with the suggestion of the Review Committee that the leader be designated as Deputy Director (Research). In our opinion that would introduce another level in the hierarchy in an organisation which has traditionally been free from different hierarchical levels. We believe that the position of coordinator of different committees will be sufficiently attractive professionally to make the creation of a special post, with additional emoluments, unnecessary. The question of creating the post of Deputy Director for Consultancy Services does not arise, since elsewhere in this report we have argued against ISI taking up consultancy on a commercial basis.
- 4.7 In the present structure of the Institute, there exists a multiplicity of units of varying sizes, quite a few of them being one-man units. It appears to us that not infrequently the same type of research is pursued in different units. Also, the very names of some units have a tendency to define their activities in a narrow and limiting sort of way, creating artificial boundaries between closely related subjects and leading to a loss of coherence in the overall aims and objectives of the Institute. The Committee is of the opinion that, ideally, each unit should have a minimum size for its work to have any impact on the subject. This view is amply borne out by the fact that it is precisely the larger units that have made the greatest impact on the national scientific scene and have been most successful in fulfilling the

second objective in the Memorandum which envisages a symbiotic relationship between statistics and the other sciences. We believe that merging some of the existing units and bringing them together under the umbrella of broader scientific activities will not only increase interaction among different disciplines but also induce individual scientists to widen the scope of their research and free them from the fetters of narrow specialization. Our proposal for internal reorganization is based broadly on disciplines, on an understanding of the activities of different units and on the need for a more rational use of the infrastructure. As has sometimes happened in the past and is likely to occur in the near future, the departure of heads or leaders of small units due to retirement or other reasons leads to the following difficulties : (i) replacing them by scientists of stature in exactly the same specialization, (ii) redeployment of junior scientists and technicians, and (iii) utilization of expensive equipment. Apart from academic considerations, the constitution of larger units would largely preclude these difficulties. In our meeting with scientists of the Institute, some of them expressed fears about loss of academic freedom if changes were introduced in the existing structure. We do not foresee any loss in academic freedom resulting from our proposal for reorganization. Our proposal, which is somewhat different from that of the Review Committee, is as follows :

- 1) Statistics and Mathematics Division: with one Unit each located at Calcutta, Delhi and Bangalore, consisting of the present Division of Theoretical Statistics and Mathematics, the statisticians (lecturer upwards) of the Applied Statistics, Surveys and Computing Division and

the members of the Theoretical Physics group in the present Electronics Unit, the inclusion of the latter being justified not only by the fact that there is already a Theoretical Physics group functioning vigorously in the present Division of Theoretical Statistics and Mathematics but also by the fact that Probability Theory and Stochastic Processes are being used increasingly in Theoretical Physics.

ii) Natural and Biological Sciences Division, comprising the following units :

- a) Applied Physics Unit, consisting of the existing Physics Unit and the group working on the physics of fluids in the existing Electronics Unit.
- b) Geological Studies Unit
- c) Plant Sciences and Agricultural Sciences Unit, combining the present Botany Unit, Crop Science Unit, Leaf Protein Unit and Chemistry Unit, which consists of a single Soil Chemist.
- d) Embryology and Biochemistry Unit, combining the existing units of those names.
- e) Human Biology Unit, combining the present Anthropometry and Human Genetics Unit with the Biometry Unit of the present Applied Statistics, Surveys and Computing Division. This unit will include the sole entomologist who is now working on epidemiological problems in relation to the vector mosquito.

iii) Social Sciences Division, consisting of the following units :

- a) Economic Research Unit, combining the present Economic Research Unit with the National Income Research Unit.

- b) Planning Unit at Delhi
 - c) Economic Analysis Unit at Bangalore
 - d) Population Studies Unit, combining the present Demography Unit and Pre-Census Population Studies Unit.
 - e) Sociology Research Unit
 - f) Psychology Research Unit : This will comprise the research psychologists of the present Psychometric Research and Services Unit, with the personnel engaged in the construction and routine analysis of tests forming a part of the new Computer and Statistical Services Centre.
 - g) Linguistic Research Unit
 - iv) ^{& Informatics} Computer Science Division, without any units, consisting of the existing Electronics and Communication Sciences Unit; research workers in Computer Science belonging to the present Computer Science Unit, together with the group in the existing Electronics Unit working on digital techniques and computer science.
 - v) Statistical Quality Control and Operations Research Division, as presently constituted.
 - vi) Library, Documentation and Information Science Division, as presently constituted.
 - vii) Computer and Statistical Services Centre
 - viii) Teaching and Training Division, as presently constituted.
- 4.8 The Computer and Statistical Services Centre will consist of computer engineers and other computer maintenance personnel in the existing Computer science Unit, systems analysts, programmers and other data processing personnel, statistical technical assistants, computers, field investigators etc. belonging to the existing Applied Statistics, Surveys and Computing Division and personnel engaged in

construction of objective type tests and their analysis, working in the existing Psychometric Research and Services Unit. If the Institute is to engage itself on a larger scale than at present in the study of problems of national development, then it will be necessary to introduce new cadres, having attractive pay-scales, of professional statisticians and computer personnel who will belong to the proposed Computer and Statistical Services Centre and whose function it will be to help in the collection and statistical analysis of data, maintain the computer, provide programming services to scientists of the Institute and develop software packages of interest to the scientists of the Institute. For greater use of the computer, it is recommended that a modern computer with an interacting system of terminals be installed at the Institute. The present punched card input system appears to be a strong inhibition for most scientists and statisticians of the Institute to use the computer. With the installation of a new and more versatile computer, it is to be hoped that the statisticians of the Institute will be able to use computer-intensive methods in statistics that have been developed in recent years. The computer itself should be managed by a Computer Advisory Committee^{which} will supervise equitable allocation of time to the different units of the Institute.

- 4.9 We are unable to support the view of the Review Committee that the Delhi Centre of the Institute must be developed as an exclusive research centre for econometrics and planning and that the faculty members of the Stat-Math Unit of the Delhi Centre should be transferred either to Calcutta or Bangalore. It is our considered view that the core activity of the Institute should continue to be in

statistics so that the core discipline must exist in all centres - Calcutta, Delhi and Bangalore. Further, the Delhi Centre runs an academic course for the M.Stat degree; moving the Stat-Math group from Delhi will mean discontinuation of this academic activity in statistics in Delhi. We do not therefore favour the idea of transfer of the faculty belonging to Stat-Math Unit at Delhi. We would go further and suggest that statisticians of an academic bent of mind should be posted in small numbers in the SOC Units of the Institute scattered all over the country, in order to tackle the various technical problems that crop up in the actual applications of SOC techniques in industry. We therefore see no anomaly in the existence of members of the Stat-Math Division at the Madras and Hyderabad SOC Units.

- 4.10 The Committee is of the view that in our country there is a lack of appreciation of the critical importance of mathematics and mathematical statistics. This is unfortunately reflected in the approach of the Review Committee in recommending the transfer of the Stat-Math Unit from Delhi. We have noted that the Delhi Centre has within it some distinguished mathematicians and mathematical statisticians. At the same time one would need to have a proper balance between mathematics and mathematical statistics on the one hand and applied statistics and the relevant areas of the social sciences on the other. It is our earnest hope that, in the coming years, a balance will be struck between the two by the adoption of appropriate recruitment procedures. We are of the opinion that the social sciences can grow and develop in Delhi without recourse to any of the drastic measures suggested by the Review Committee.

- 4.11 Regarding the plea for autonomy to Delhi Centre, the Review Committee had suggested delegation of more powers to the Head of the Centre. We feel that in the broad areas of personnel policies, emoluments and standards or recruitment, there cannot be autonomy for any centre. On the contrary, uniform standards must be maintained in all these spheres at the different centres of the Institute. However, the Head of the Centre should enjoy enough powers to carry on the day-to-day administration smoothly. This has been ensured by proper delegation of powers to the Head of the Centre by the Director.
- 4.12 It is our view that the Institute should take immediate steps to strengthen the statistics faculty at the Bangalore Centre by recruitment or deployment of existing faculty at other centres or both so that a critical mass, sufficient for the purpose of starting the M.Stat course as well as courses leading to the Ph.D. programme, is attained. Once this is achieved, the Institute should try to develop a group in stochastic analysis and related mathematics. We also suggest that a strong group in Computer Science be developed in Bangalore.
- 4.13 We welcome the suggestion of the Review Committee that the Bachelor of Statistics Course should continue. Every effort is already made in the Institute to recruit students to the B.Stat and M.Stat courses from all over the country. Students are selected on the basis of examinations held in more than a dozen major cities in the country. We agree that there should be an increase in the number of students admitted to the M.Stat course,

provided that this can be achieved without any dilution of our standards. But it must be pointed out that to attract a larger number of good students to our courses the stipends have to be considerably enhanced. We understand that there has been no enhancement of stipends for students of some courses since 1974. Not only must this be done as expeditiously as possible, but we also feel that all students must receive stipends, pace the suggestion mooted by the Review Committee that only fifty per cent of the students be stipendiary. The principle of paying stipends to all students is justified by the fact that admissions to our courses are granted on the basis of stringent examinations held on an all-India basis. We are opposed to the suggestion of the Review Committee that external examiners be used for both setting and grading examination papers. Such a procedure would be an expression of lack of confidence in the faculty and hence would be a step which would sap the vitality of the Institute. This system which exists in the Universities in this country can hardly be considered to have succeeded. We propose instead that at the end of each course the students be subjected to an oral comprehensive examination in all the statistical topics that they have studied in the entire course. External examiners could be members of the panel for conducting these oral comprehensive examinations. We should point out that in the Institute question papers are even now moderated, though not set, by external experts.

- 4.14 We are of the opinion that teaching should be an integral part of the duties of scientists in the Institute. We understand teaching in its broadest connotation to include not only the giving of a formal course of lectures but also

to include guiding research students and giving seminars on the frontier areas of one's specialization for the benefit of one's peers and research scholars. Understood in this broad sense, teaching should be mandatory for our scientists. We believe that teaching is very essential for conducting research as it opens up new avenues for scientists by providing them opportunities to interact with the young. Teaching can be dispensed with only at the cost of weakening interaction between academic staff and succeeding generations of students, producing real but invisible losses. We agree with the Review Committee in suggesting that teaching should be taken into account during assessment for promotion, but, in our opinion, so should other activities like providing statistical assistance and analysis in projects, academic administration etc.

- 4.15 We do not see what will be achieved by introducing the type of self-assessment of scientists suggested by the Review Committee. Motivation in scientific work cannot be legislated. The ISI has periodic assessments of scientists at the time of promotion which should act as a spur for remaining active. At the time of these reviews, each scientist submits a detailed report on his work, with particular emphasis on recent work. We believe that this is satisfactory by way of self-assessment. Beyond this we can only hope that peer pressure might motivate scientists whose level of activity leaves something to be desired.
- 4.16 We do not accept the Review Committee's suggestion that the Institute library at Calcutta be developed into a National Library on Statistics. We feel that such a step would increase significantly the administrative burden of the Institute and also, because of the large increase in users that would result, create serious difficulties in the use of the Library for our scientists, who would have to share the services and facilities with a large number of outsiders. In this connection it may be

mentioned that students not belonging to the Institute can use the ISI library provided that they become student members. Besides, the library is open to academics & research workers of other organizations. We recommend that the ISI adopt procedures for periodic inventory of library books and journals which are current in other large libraries in the country.

4.17 We are happy to note that the Review Committee has expressed appreciation for the work of the DRPC. We advise the Institute to formulate proposals for extending the scope of work of DRPC and also to increase the interaction between DRPC and scientists in the Institute specializing in the Computer and Information Sciences.*

4.18 In any review of the activities of the ISI, one must note the high international stature of the Institute's Journal,^{*} Sankhyā. We are surprised that the Review Committee has omitted any reference to the Journal. Founded by Professor P.C. Mahalanobis, the first number of Sankhyā came out in the year 1933. The current year marks the publication of Volume 46 of the Journal. In the intervening years, some of the most important contributions to statistical theory and methods appeared in the Journal. The contributors to the Journal include almost all leading names in the field of statistics. Today it ranks among the first two or three of the international journals in the subject. This must be considered a notable achievement of the Institute.

* One member of the committee disagreed with this paragraph.

- 4.19 The Committee is of the view that projects submitted by individual scientists and groups of scientists to the DCSW/TAC for Institute funding should be subjected to the same rigorous screening as is done by agencies like ICSSR, DST, BARC and others. We agree with the Review Committee's suggestion that before funding the project proposals be examined by referees. This procedure will help eliminate projects of dubious value and also strengthen those that are accepted. We believe that there should also be a mechanism in the Institute for monitoring progress of Institute-funded projects. We recommend that projects derived from large and long-term themes of vital national importance be given priority.
- 4.20 We submit for consideration of the Council certain areas which the Institute needs to ^{strengthen} develop/in the immediate future. These include stochastic analysis, time series analysis, certain aspects of applied multivariate analysis, like pattern recognition, image analysis, data analysis, bio-statistics which includes both applications of statistics to biology and the stochastic modelling of biological phenomena, operations research, computer science and information science.

5. Constitution and Organizational structure.

- 5.1 We do not agree with the Review Committee that the size of the Academic Council militates against its effective functioning. We understand that less than fifty per cent of members attend a typical meeting of the Academic Council. We feel that on the contrary the size of the Academic Council should be increased to give representation to persons engaged in teaching the various courses

run by the Institute. We understand that a number of teachers' committees for the different courses already exists in the Institute and that it is their function to recommend to the Academic Council the results of different examinations. Our recommendation is that these various teachers' committees be given a formal status and be associated with the Academic Council in a manner to be worked out by Academic Council and Council. We envisage an increased role for these teachers committees. For example, these committees should be responsible for monitoring the progress of the different courses and for suggesting reviews in the curriculum whenever necessary. If these committees can play a dynamic role, the students will be able to keep pace with the rapid advances being made in the subject of statistics.

- 5.2 The Review Committee has suggested extension of the two-year term of the Dean of Studies and Professors-in-Charge and at the same time periodic change of Heads of Units. We accept the principle that there should be periodic changes in Heads of Units wherever feasible. At the end of a specified period, the Director may consider whether a change in the Head of Unit is necessary. Regarding the term of the Dean, there is no bar in the existing system to continuing the same Dean for a second term of two years in case the Academic Council and the Council of the Institute so desire. Only in the case of Professors-in-Charge and Head, SJC and OR Division is a second consecutive term barred by the Memorandum of Association. The Institute has not so far experienced any particular difficulty because of change of Professors-in-Charge once every two years. Perhaps

the matter requires consideration in the case of Head, SUC and OR Division who has to maintain liaison with outside organisations, but here again, it involves a change of the provision in the Memorandum of Association and it should be left to the Council of the Institute to consider the issue.

5.3 We are opposed to the suggestion of the Review Committee that the size of the Council be reduced. It may be pointed out that the present size of 25 is already a considerable reduction from that which obtained before the introduction of the new constitution in 1976. We are opposed also to any reduction in the number of internal members in the Council. We feel that the presence of the internal members, who represent the activities of the different facets of the Institute, is desirable for smooth functioning of the Institute. We invite attention to the remarks made by the present Chairman of the Council to the Review Committee that it is not desirable to extend executive powers to the Chairman. This will result in a multiplicity of sources of power which should be avoided. We are in agreement with these views. We feel, however, that Chairman of the Council should enjoy certain powers to be exercised in emergency situations, e.g. in a situation arising out of death or disability of the Director. For this purpose the present regulations may have to be amended.

5.4 We have made some recommendations, which, if approved, will need changes in the Memorandum of Association. Quite apart from the obvious lacunae in the Memorandum, which need urgent attention by Council, we feel that the Memorandum must be reviewed in the light of the experience gathered since its introduction. The Memorandum has certain unique features, providing through the

DCSW's a good deal of academic freedom to the scientists to pursue their own research interests. But, while academic freedom is entirely unexceptionable as a principle, we feel that unabridged academic freedom poses a dilemma for the Institute for it leads inevitably to a lack of cohesion in its activities. Resolution of this dilemma merits the serious attention of the Institute.

- 5.5 The Review Committee has suggested appointment of a policy and planning committee to review from time to time the policies relating to teaching, research, internal controls, evaluation of the organisation's functioning, scientist development, new directions etc. We feel that there is no need for a standing committee. Even now the Council appoints ad-hoc committees to consider certain specific issues as and when necessary and external members of the Council are always included in these committees. One of the advantages of an ad-hoc committee instead of a standing committee is that the Council retains the flexibility to involve different persons depending upon the nature of the issue to be considered and the specific areas of expertise of the concerned persons. Further, even if a policy and planning committee exists, its recommendations will have to be placed before the Council for approval and the Council will be free to accept or modify or reject the recommendations of such a committee, which, as envisaged by the Review Committee, will contain a disproportionately large number of non-employees of ISI. In other words, the committee can play only a recommendatory role and not a decision-making role. Therefore,

- 5.8 The Review Committee has stated that the post of Chief Administrative Officer is held in abeyance and should be revived. Though there is a full-time officer who looks after all the functions of the Chief Administrative Officer, we agree that the position should be filled on a permanent basis.
- 5.9 The Review Committee has recommended creation of a new post of Finance and Accounts Officer. It may be pointed out that there are already two Accounts Officers and a Senior Accounts Officer. We welcome the suggestion to create a post of Finance Officer to assist the Chief Administrative Officer and the Director in the preparation of budget, budget control and internal audit.

6. Statistical Quality Control and Operations Research.

- 6.1 We believe that the recommendation of the Review Committee suggesting that SQC and OR Division extend the scope of its work in industry on a commercial basis is misguided. We feel that the recommendation is based on an incorrect appreciation of the aims and activities of the Division. It overlooks the far more important and dynamic role that the Division can and should play in making industry aware of the benefits that accrue from the use of SQC and OR techniques. It is our opinion that SQC and OR should form an essential part of industrial and management systems in this country, just as they do in Japan. It is regrettable that management and production engineers of this country have by and large been less than sensitive to quality assurance, reliability and ^{the} aim of zero-defect

in the production process. Indeed even today quality is a weak area in industry. In this climate of indifference to quality control the ISI by itself can achieve little by way of meeting the needs of industry.

- 6.2 The Division is at present engaged in basic research in SJC and OR, teaching in full-time academic programmes like the Post Graduate Diploma Course in SJC and OR and the M.Stat. Course, conducting part-time evening courses, training personnel in industry in the adoption of SJC and OR systems and undertaking demonstration studies in industrial establishments. We feel that these activities of the Division should be intensified.

The specialized knowledge and expertise of members of the Division should be utilised to train a large number of persons in SJC and OR, making such trained personnel available to industry and thus generating a multiplier effect. The role of the ISI must be to assist industry in the introduction of scientific systems for the improvement of product quality and productivity. The ISI is unique in possessing the expertise necessary for the use and application of modern ideas and techniques which involve a higher level of mathematics or statistics than is generally understood in industry. The Institute's aim should be to make this specialized knowledge available to industry and thereby to make industry completely self-reliant in the continuing use of the techniques. We feel that the national interest will be better served in this manner than by frittering away the limited resources of ISI by offering consultancy services on a commercial basis to at best a small number of factories and plants. We cannot therefore agree with the Review Committee's recommendation that the Government

freeze its financial support to the Division at the present level and that the Division undertake expansion on a self-financing basis through earnings from consultancy.

- 6.3 The Review Committee has rightly stressed the need for training more persons in the SQC and OR field so that the Institute will be able to increase the strength of its own staff in the next years. The Institute runs at present only one full-time course in SQC and OR at Calcutta. We feel that similar courses must be started in as many centres as possible in order to achieve a higher turnover of trained personnel in this field.
- 6.4 It is regrettable that Government has not utilised the services of the ISI specialists in public sector industries to the extent desirable. The first Review Committee had specifically recommended that Government should make it compulsory for public sector industries to adopt SQC systems and methods for improvement of product quality and efficiency of operations; this recommendation was accepted by Government but nothing has been done so far to implement it. Government should think of utilizing the expertise of the ISI specialists in the larger interest of the country. We believe that this expertise, if used with imagination, can contribute substantially in strengthening quality efforts in the country. In this connection, we welcome the recommendation of the Review Committee to revive the Policy Advisory Committee and reconstitute the same.
- 6.5 We must differ from the Review Committee's contention that the ISI has failed in emphasizing the application

of OR techniques. We would like to draw attention to an impressive collection of OR applications made by the SUC and OR Division. This has been published in a book entitled "Applications of SUC and OR in Indian Industry - 160 Case Studies".

6.6 The Review Committee has suggested delegation of more powers to Head, SUC and OR Division in the matter of recruitment, promotion, transfer, hiring of premises and of residential accommodation, buying equipment etc. We reiterate our view that in all matters relating to personnel policy, e.g. recruitment, promotion etc., uniform standards must obtain in the Institute as a whole. We are therefore opposed to granting the powers, recommended by the Review Committee, to the Head, SUC and OR Division,

6.7 One of the factors inhibiting the growth of SUC and OR Division in different parts of the country is the inability of the Institute to provide living accommodation for staff in various cities. Wherever the Institute owns land, faculty quarters must be constructed and in places where the Institute does not possess any land, it must be allowed to hire accommodation and rent it to faculty under usual terms and conditions.

7. Miscellaneous

7.1 We welcome the suggestions of the Review Committee regarding development of the campus and construction

of new buildings. The land at Calcutta is inadequate for taking up any further developmental work. The suggestion to acquire the Gupta Nivas plot, and to take over SPS land and property, located at 204 B.T. Road, is also welcome. Besides, the Institute has to purchase land elsewhere in the city of Calcutta in order to meet the growing demand for staff quarters. We are in agreement with the Review Committee's emphasis on the need for the construction of additional faculty quarters in all the Centres and we hope that such construction will improve the prospect of attracting new scientists to work in the Institute and also facilitate transfer of scientists from one centre to another in accordance with needs. We agree that the maintenance expenditure in the Calcutta campus will have to be increased appreciably in order to improve the general conditions of the buildings, land etc.

- 7.2 We agree with the Review Committee's recommendation that the present EC 1033 computer system in Calcutta should be replaced by a modern and more powerful computer. The Institute should immediately prepare plans for the purchase of a new computer and initiate action in this respect.

- 7.3 We notice that the Review Committee has expressed the view that the quality of research work in most areas has been of a high order. The Institute should take adequate steps to strengthen the research work in areas where deficiencies have been pointed out.
- 7.4 The Review Committee has remarked that the ratio of the non-academic staff to the academic staff is very high in Calcutta and suggested that posts falling vacant in non-academic categories because of attrition, resignation etc. should not be filled up till a proper study of the requirements of the Institute is taken up and the needs are assessed. We were informed by the administration that the existing staff strength in each category was essential to meet the requirements and that it would be a serious obstacle to efficient functioning if the posts falling vacant were not filled up immediately.
- 7.5 The present system of release of grants is likely to create a situation in which the Institute will be left with no money at the end of each quarter and at the end of the financial year. Even if Government grants are received in time, at the beginning of each quarter, such a situation cannot be avoided. The Institute needs sufficient

revolving funds to overcome such a situation and also to meet the contingencies arising out of delay in release of quarterly grants extending upto two months. The Review Committee has appreciated the situation and recommended a one-time grant of Rs.30 lakhs to serve as revolving fund. In our view the amount recommended is hardly sufficient for the purpose and it should be raised to at least Rs.100 lakhs to enable the Institute to take care of contingencies due to delay for a couple of months.

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12 December 1984

