*Existing ways of gathering information required to manage Canadian postsecondary educational institutions and systems are not adequate. A carefully planned national information system for higher education is needed to provide decision-makers and policy formulators in institutions and in provincial authorities with management information. The proposed system will require up to five years to implement, but it will not be expensive in comparison to huge present and projected expenditures that it could make more effective. The proposed national system is described by the information it would provide, an illustration of the type of data collected, and the steps necessary for its design, development, implementation, and maintenance.*

BERNARD S. SHEEHAN*

# Proposal for a National Information System for Higher Education

## Deficiency of Management Information in Higher Education

Canadian universities and other postsecondary educational institutions have grown very rapidly over the last decade. Funds to support this growth have always been hard to find, but few in education or government doubted the high priority of reported need. Thus, monies were expended and little accountability was demanded in return. Now actual and projected escalation of the total need for funds has reached such proportions that people are rightfully and responsibly asking why costs are so high and what benefits are to be gained from further increases in expenditures on postsecondary education.

In the extreme, the institutions are being accused of not contributing to society in accordance with needs and wishes of the country; of producing highly trained but unemployable people who become disillusioned and then discontented citizens; of being a haven for people who would destroy our society; of inefficiently using institutional space and facilities; of misappropriating operating funds with disproportionate support of graduate studies resulting in poor teaching practices at the lower undergraduate levels; and of engaging in expensive research in esoteric fields unrelated to present needs of the nation. The disturbing thing about these charges is that information required to objectively determine whether they are true or even relevant is not available. Yet there is evidence that many people believe them to be fair criticisms and are

*Director, Office of Institutional Research, The University of Calgary.

prepared to act to cure real or supposed ills. Whether or not this particular set of charges is just, the realities of Canadian higher education as the situation has developed over the past three decades are that the whole society must accept responsibility for the present state — good, bad or indifferent — of postsecondary education. If so, what has been society's policy for higher education over these decades? What have been the plans followed to implement this policy and what mechanisms have been set up to determine whether higher educational systems met the expectations? In other words, what has been the basis on which our eleven governments have been expending what now approaches ten per cent of the nation's tax dollars? The answer is that both universities and governments have made plans and taken decisions based on information available to them. Now, because of the total magnitude of costs, the escalation of these costs, the number of people involved and the fact that postsecondary education is a basis of fiscal transfer between federal and provincial governments,[1] the information available simply is not good enough.

It has become clear as the need has been realized that information to answer adequately the most fundamental questions about Canadian higher education is not available. Among the important categories of unknowns are those related to sources of all institutional funds; how total resources of postsecondary systems and individual institutions are allocated; the success institutions have had in achieving their objectives as a result of these allocations and the extent to which these allocations have furthered goals of individual Canadians, the provinces and the nation.

*Sources of Institutional Funds*

Differences in accounting practices followed by universities, provinces and federal government agencies and departments make it impossible to determine sources of funds annually expended by institutions. Granting agencies do not follow standard practices in channeling funds to the institutions, provinces do not report their contributions uniformly, and institutions handle their books differently. Definitions, procedures, even fiscal years, differ across the country. Each institution knows where each dollar of revenue came from, but classifications are different. Thus comparisons are impossible. Even such general terms as "research," "training," "capital" and "operating" are not sufficiently standard terms to permit their use to categorize funds received. In connection with the Peitchinis Report,[2] information on federal grants expressly for support of research and graduate students was sought from several sources. These include the Department of The Secretary of State, the Association

[1]"Federal-Provincial Fiscal Arrangement Act, 1967," *Statutes of Canada,* 1966-67, Ch. 89.

[2]Bernard S. Sheehan, "Federal Government Support of University Research and Graduate Students, 1966-70," prepared for the study *Financing Postsecondary Education,* Stephen G. Peitchinis, Director, Calgary, Alberta. (In press). To be published by the Council of Ministers of Education.

of Universities and Colleges of Canada, the Canadian Association of University Business Officers, two sections of Statistics Canada, and two recent independent national surveys (Bancroft and Peitchinis) of provincial government departments responsible for postsecondary education. Published and other material from these sources was considered and discussions on the information sought were held with senior people in some of these organizations. The conclusion reached was that no reliable source of uniformly comparable data exists. This is not to imply criticism of these organizations but to point out that there is no *system* for gathering, classifying and disseminating planning and management information of this sort in Canada.

Although expenditures in Canada on postsecondary education have recently exceeded two billion dollars annually[3] and the operating cost of postsecondary education has been a basis for federal-provincial fiscal arrangements since 1967,[4] there is no national system for financial accounting. The situation is so hopelessly muddled that the provinces and the federal government have not settled accounts that are more than three fiscal years old. Certainly, universities' books are audited, but only in the most general way has any effort been made to standardize procedures so that comparative information would result. Only in a few provinces and in a few institutions have there been efforts to establish means of determining benefits or outputs which might be set alongside these huge expenditures.

*Allocation of Resources within Institutions*

University financial statements do not indicate how — that is, for what purpose — resources are allocated internally. Breakdowns of departmental expenditures into items such as professional salaries, support salaries, supplies and equipment are useful for the management functions of operation and control. This information is sterile for long and short-range planning and resource allocation at institutional, provincial and national levels. Resources are not dollars, even though that medium is used to describe them. Knowing a professor's salary does not tell one how that resource (his time and talent) is used to educate students or to achieve research results. Management information shows what resources are allocated to obtain what result.

Recently there has been much interest in the cost of graduate studies. No national total information exists on this subject, and perhaps it is not an overstatement to say that few, if any, institutions know the true costs of even their own graduate programs.[5] Determination of these costs, which are important to decision-making and planning, involves a detailed analysis of how all university resources are allocated to various

[3]Dominion Bureau of Statistics, *Advanced Statistics of Education 1970-71,* Catalogue No. 81-220 (Ottawa: Queens Printer, August 1970).

[4]"Federal-Provincial Fiscal Arrangements Act, 1967," *op. cit.*

[5]In 1966-67 a study of costs of university programs in Canada was sponsored by the Association of Universities and Colleges of Canada, Canadian Association of University Business Officers and Canadian Association of University Teachers.

university activities. Costs of these activities must then be assigned to graduate students in proportion to benefits they receive from these activities. Thus, for example, the amount of money spent on library books is not important in this analysis, but the cost attributable to graduate students for informational services they received from the library is important. Questions of costs of academic programs cannot be answered until information is available on how resources are expended within institutions. The lack of information is not limited to financial matters. During the study mentioned previously,[6] five sources of information on numbers of graduate students were consulted. Again, it was evident that information gathering, even in this basic area, is much less than satisfactory for planning and funding decision-making. Similar difficulties were reported by Macdonald[7] and his colleagues.

*Institutional Success in Achieving Goals*

Logical allocation of any resource must be in pursuit of some end. If those who allocate funds to universities cannot see what the nation is getting for its money, they have a legitimate reason for concern. Universities and governments have not done much of the type of academic policy formulating and planning that yields guidelines and programs which can form the basis of fiscal and physical facilities planning and of future operation. Thus, there is practically no information that shows how expenditures in institutions have moved the institutions toward their goals and how legitimate provincial, regional and national interests were thus furthered. Traditional and general answers given to these sorts of questions are no longer good enough. Cold, hard data — proof — is needed.

Existing mechanisms for obtaining management information in post-secondary education relate to another era. There are, however, many individuals and organizations in Canada and abroad who have recognized the situation; and much good work is being done to improve it. The Council of Ontario Universities research staff is working on information problems in that province.[8] In Quebec the Groupe de Recherches et d'Elaboration d'un Système d'Informatique de Gestion Universitaire is developing informational systems and standards.[9] In the United States,

---

The report of this study, "An Exploratory Cost Analysis of Some Canadian Universities," published by the AUCC in Ottawa in 1970, is an important contribution to the continuing search for acceptable methodologies for determining educational costs. The final cost figures for academic programs, the only national data available, have not been endorsed by two of the sponsors of the study. Other cost studies have been conducted but only in individual institutions, faculties or schools.

[6]Sheehan, *op. cit.*

[7]John B. Macdonald *et al., The role of the Federal Government in Support of Research in Canadian Universities,* Special Study No. 7, Science Council of Canada and the Canada Council (Ottawa: Queens Printer, 1969).

[8]Committee of Presidents of Universities of Ontario, Research Division, *Proposal for Central Data Bank on Students and Resources of Ontario Universities* (Toronto: CPUO, 1969). (CPUO is now Council of Ontario Universities.)

[9]Groupe de Recherches et d'Elaboration d'un Système d'Information de Gestion Universitaire, various reports of 1970 and 1971 (Montreal: GRESIGU).

the Western Interstate Commission for Higher Education's National Center for Higher Education Management Systems is developing standards, including data element dictionaries and computer simulation models, which will eventually be used in many American universities.[10] There are many other examples[11] to show that the problem has been recognized; however, the full magnitude of the problem in Canada, and particularly the fact that it is a national problem, does not seem to have been given sufficient attention.

The nation has awakened to the fact that it can no longer afford to escalate expenditures on higher education at the current rate, and worse, it cannot prove expenditures of this sort to be warranted. The "obvious" values of postsecondary education to society and to individuals become suspect as educational demands for funds begin to seriously challenge society's manifest needs for housing, health care, transportation, and in many other fields. Time and research may net information which will be useful to decision-makers and planners faced with critical decisions. Committee, task force, or royal commission reports will provide a basis for decision-making. But it is not sufficient to suggest that more research is needed to ferret out the information required to manage Canada's multi-billion-dollar postsecondary educational industry. The time is due to go directly to the kernel of the problem. A precondition for understanding, leading to practical decisions and policies in postsecondary education is that fundamental, timely, management-oriented information be continuously available.

## A Proposal for a National Information System for Higher Education

It is recommended that immediate steps be taken to establish a Canada-wide network of information-gathering systems which would collect comprehensive and comparative information on postsecondary education.[12] The network would be made up of independent institutional informational systems coordinated within each province. Provincial systems would be designed to meet institutional and provincial needs and, at the same time, each would be compatible in its essential elements so that information in the several provinces could be assembled to provide comparative national data. The resultant network may be considered as a federation of postsecondary education information systems, which for convenience we will refer to as "NISHE," National Information System for Higher Education.

---

[10]Western Interstate Commission for Higher Education, *Objectives and Guidelines of the WICHE Management Information Systems Program* (Boulder, Colorado: WICHE, May 1969).

[11]Philip H. Coombs, *The World Educational Crisis: A Systems Analysis* (New York: Oxford University Press, 1968).

[12]The initiative could be taken by a number of national organizations, e.g., the Association of Universities and Colleges of Canada, the Council of Ministers of Education, and Statistics Canada.

Whatever vehicle is finally chosen to improve the inadequate state of the nation's management information on higher education, a detailed description of the proposed NISHE should help focus discussion on relevant factors. To this end, the remainder of this paper is devoted to suggesting what type of information needs to be gathered, to presenting an illustrative data base for the information system, to examining the steps involved in the development, design, implementation, and maintenance of NISHE, and to asserting cost estimates.

## Information Available from NISHE

The most critical problems facing institutions, provinces, and the nation are essentially ones of resource allocation. Informed decision-making and planning must, at the very least, be based on a knowledge of what resources have been allocated to what segments of the total postsecondary system, for what purposes, and with what results. NISHE must, therefore, supply management information in the following three general categories: inputs to the higher educational system; descriptors of the system and its component institutions; and outputs or benefits from the system. To be of practical use, these inputs, descriptors, and outputs must be specific and measurable quantities.

In complicated systems of higher education, input, system, and output parameters cannot be completely separated conceptually. Some elements play different roles depending upon the problem under study or upon point of view of analyst. However, for present purposes, let us agree that operating and capital funds and entering students are inputs; that system parameters include faculty, staff, academic programs, physical facilities and support services; and that outputs include the achievement of graduates, student enrolees in various academic programs, the results of research projects, and the various services to the community.[13] Since management information relates resources to outputs, relationships between input, system and output parameters must be known so that appropriate variables can be suitably combined to provide answers to managers' questions. The information required may be historical, projections on current trends, standard data needed regularly or new data not previously solicited. Whatever the need, a practical NISHE must be capable of gathering detailed, timely information and presenting it in formats which make it useful to those who make decisions.

In the final analysis, NISHE is capable of supplying, at most, only measurable facts and figures about postsecondary education. It cannot make decisions. This must always be the task of those people charged with that responsibility. Correctness of these decisions will depend on such human qualities as experience, intuition, knowledge, and wisdom.

---

[13]Ben Lawrence, George Weathersby, and Virginia W. Patterson (eds.), *Outputs of Higher Education: Their Identification, Measurement and Evaluation*, (Boulder, Colorado: Western Interstate Commission for Higher Education, July 1970).

FIGURE I

ILLUSTRATIVE DATA BASE — A Representative List of Categories of Data Elements to Support Proposed NISHE

*STUDENT INFORMATION*

- Admission Records
  - secondary school record or equivalent
  - level of general knowledge
  - level of knowledge in field of speciality
  - basic language skills
  - critical thinking and reasoning ability
  - general intelligence
  - family socioeconomic background
- Academic Achievement
  - level of general knowledge
  - level of knowledge in major
  - basic language skills
  - critical thinking and reasoning ability
  - general knowledge
  - grade point average (marks)
- Personal Characteristics Data
  - date, place of birth, marital status, sex
  - citizenship, home address, residence
  - earning power
  - self evaluation values
  - achievement motivation
  - satisfaction with educational experience
  - areas of career interest
  - awards, affiliations, avocations
  - stress
  - social activities on/off campus
- Alumni Data
  - earning power
  - awards/citations
  - flexibility of employment
  - other personal data

*ACADEMIC PROGRAM INFORMATION*

- Instruction
  - classes (number, name, description, enrolment, location and time)
  - graduate student programs

*ACADEMIC PROGRAM INFORMATION (Continued)*

- Research
  - institutes, laboratories
  - departmental projects/personal projects
  - university projects
  - assisted sponsored projects
  - conferences
- Public Service
  - extension, continuing education, non-credit courses and programs
  - cultural activities
  - student/faculty involvement in community
  - social criticism
  - product testing, health care, psychological testing, legal advice, counselling patients
  - community use of facilities for recreational/social activities
  - community real and psychic income
  - indirect community benefits, e.g. students available as employees, increase attractiveness of community for residence, desirable industry, large employer and large buyer of goods and services

*FACULTY INFORMATION*

- General Personal Data
  - normal payroll/employee data
  - citizenship/place of birth
  - employment record
  - date and university of degrees
- Assignment Record
  - classes, laboratories, tutorials
  - graduate students supervised
  - committees
  - administrative duties
- Academic Achievement
  - courses developed
  - teaching ability
  - students counselled
  - papers, books published, patents
  - honors, memberships, citations

FIGURE I

ILLUSTRATIVE DATA BASE — A Representative List of Categories of Data Elements to Support Proposed NISHE (Continued)

*FACULTY INFORMATION (Cont.)*

- Service Record
  - consultations, commissions
  - professional/public committees, projects
  - student nonacademic involvement

*SUPPORT STAFF INFORMATION*

- normal personnel data
- education, training, employment record
- job classification/assignment record
- professional achievement
- service record

*FACILITIES INFORMATION*

- Site, building, room, special facilities, equipment, inventories and characteristics.
- Site, building, room, special facilities, equipment, timetable and utilization.
- Site, building, room, special facilities and equipment, maintenance schedules and records.

*FINANCIAL INFORMATION*

- Current/historical operating/capital budgets
- Financial statements of receipts/expenditures
- Current accounts payable/receivable
- Investment records
- Student loans
- Sponsored and assisted research funds
- Program budget, program costs

*ENVIRONMENTAL SUPPORT SERVICES INFORMATION*

- Food Services

*ENVIRONMENTAL SUPPORT SERVICES INFORMATION (Continued)*

- Student housing
- Workshops, Technical Services, Public Relations
- Theatres, Art Galleries, Recreational Facilities
- Ancillary Enterprises such as Bookstore, Vending Machines, Married Student Housing

*ACADEMIC SUPPORT SERVICES INFORMATION*

- Library
  - collections
  - circulation
  - retrieval services
- Computer Centre
  - software library
  - utilization of hardware
  - consultative services
- Communications Media
  - software library
  - equipment inventory/utilization
- Student Services
  - counselling
  - loans
  - scholarships
  - health records

*PROVINCIAL POST-SECONDARY SYSTEMS DATA*

- Resources used to manage system
- Inter-Institutional flows of students, faculty members, services
- Services offered by central office of the provincial postsecondary education system
- Inter-Provincial flows of students, faculty members, services
- Sources of local, provincial and national funds for postsecondary education

NISHE is primarily an information instrument in the hands of decision-makers.

## An Illustrative Data Base

Figure 1 shows a representative list of categories of data elements which could form a data base describing inputs, outputs and system characteristics in sufficient detail to support NISHE. This set of categories is given only to *illustrate* information that could be collected, stored and retrieved by the proposed system. Selection of data elements and data element definitions for the actual system to be implemented will require extensive research and study leading to eventual agreement on the part of principal users of the system. Only categories of data elements whose values can be measured with practical confidence are included in the illustration.

Numbers in the data base of a particular institution at any given time describe the institution. Comparability of information retrieved from these data bases is absolutely essential for network usefulness. However, since the diversity of the cooperating institutions is an invaluable national asset, final specifications of information retrievable from NISHE need not and must not force conformity of either the institutions organizationally or the educational experience of students. It is important to note also that most data elements and categories in the illustration describe information useful at the operating level within institutions. This suggests that management information required by institutions, provinces and other policy formulators and planners is calculable from the same fundamental information required by departments in institutions to run their day-to-day affairs.[14]

Questions of confidentiality and protection of individual privacy which naturally arise in consideration of information systems of this magnitude cannot of course be treated fully in a proposal of this length. However, because of the increased risk posed by an integrated national system, extra safeguards must be designed into the network. In fact, there is no network need for individual personal data. Management and planning information is inherently aggregate information compiled from individual statistics. For example, university student health centres will need records of student mental and physical health. However, the sort of medical information needed for planning student facilities or measuring trends in student health problems is average data which cannot be traced to any individual student. Similarly, student personal or family socioeconomic information is useful to planners and decision-makers as averages or trends, not in a form which discloses the identity of individuals.

---

[14]Bernard S. Sheehan, "Integrated University Management Information Systems," *Institutional Research and Communication in Higher Education,* ed. Patricia S. Wright (Univ. of California, Berkeley: The Association for Institutional Research, 1970), pp. 181-188.

In the final analysis, if confidential information is collected, the possibility exists that it can be misused. The only real security against misuse is the integrity of responsible individuals who have access to it. An information system can and should provide individuals with the best protection[15] technically possible through advanced computer techniques and of course that protection guaranteed under Canadian law. The proposed national network *per se* should not increase the possibility of misuse since personal information would enter the network from institutional subsystems in aggregate form. Moreover, since strictest security of all information will be an important network design criterion, it is likely that NISHE would increase the protection now offered individuals in institutions. That is, network standards and precautions higher than exist currently at many institutions will apply to all institutions cooperating in the network.

## Proposed Steps for Design, Development, Implementation, and Maintenance of *NISHE*

### *The Council*

A large steering council needs to be established specifically to set out the goals and objectives of NISHE and to guide its development. Since the broadest possible representation of all segments of Canadian society should be involved in policy matters directly and indirectly related to higher education, Council should include representation from the following:

Council of Ministers of Education
Federal government
- — Education Support Branch
- — Department of Finance
- — Treasury Board
- — Statistics Canada
- — Tri-Council Coordinating Committee

Association of Universities and Colleges of Canada
Canadian Association of University Teachers
Labor
Municipalities
Industry

It must be emphasized that the proposed Council has the primary function of setting goals and objectives, that is, broad system specifications, for NISHE. It is not a national forum on the role of higher education. Council must concentrate on determining what information is

[15]See, for example, "Oasis System Description," Project Info (Stanford University, Stanford, California, 1970), and R. F. Boruch, *Educational Research and the Confidentiality of Data,* American Council on Education Research Report No. 4, Vol. IV (Washington, D.C.: American Council on Education, 1969).

required to support: rational decision-making and policy formulation in higher education at all involved levels in society and in institutions; long-range planning in higher education; long- and short-range allocation of resources both to postsecondary educational systems and within individual institutions.[16] Council members will undoubtedly recognize quickly the difficulty of their tasks. Each must assess what information he requires to logically make decisions on matters for which he or his constituency has responsibility or interest. Organization of Council planning and programming its work will be a formidable job. Success will depend upon the dedication and talent of people sitting on Council. It is one thing to make reasoned judgments in familiar situations — it is another level of abstraction to define informational needs to solve broad categories of management problems. These two talents do not always reside in the same people. The choice of Council members is critical to the eventual usefulness of NISHE.

*Systems Development Group*

A small group of knowledgeable, experienced professionals should work in support of Council, in the first instance to provide working papers and background information and also to solicit informational requirements of decision-makers in higher education. This group, herein referred to as the systems development group, could immediately begin a national inventory of informational systems related to or potentially related to higher education management.[17] This inventory would help Council in coming to an appreciation of the current state of the nation with respect to higher education management information and the gap between the present state and that required to meet proposed objectives for higher education information retrieval.

Based on general specifications set out by Council, the systems development group will translate objectives into a detailed proposal for system design. The detailed proposal would take into consideration existing informational systems, and will include: information retrievable from the network; data element definitions; cost and staff requirement estimates for implementation, centralized software and hardware specifications as well as operating and maintenance cost estimates; time estimates for implementation; minimum institutional requirements for participation; and provision for future modifications. In preparing the detailed proposal, the system development group would of course work closely with appropriate national organizations and associations which have a critical interest in the final proposal.

---

[16]Weakness in sources of management information which are tangentially relevant to higher education may become apparent as Council proceeds with this task. Council itself will therefore have to come to a final judgment on the scope of its interests and activities.

[17]An important document in this area is: David C. Munroe, "Statistical Services in Education for Canada: A Report to the Dominion Statistician on the Statistics Program in Education" (McGill University, April, 1968). Another is: JB Lon Hefferlin and Ellis L. Phillips, Jr., *Information Services for Academic Administration* (San Francisco: Jossey-Bass Inc., 1971).

*System Design and Development*

Following approval of the detailed proposal by Council and assurance by Council members of their continuing support and active participation in the project, the systems development group would begin detailed design, development, and experimentation. Because of the complicated nature of the system, arising not only because of intrinsic problems associated with information systems but in this case also because of the many institutions, agencies, and therefore people and points of view involved, design must include considerable on-site experimentation and testing. As far as possible, the system should be a set of subsystems or modules which may be designed and tested simultaneously or sequentially, but always of course within overall design specifications of the detailed proposal. The interested involvement of test universities will validate the practicality of proposed systems.

Council would meet regularly to review progress and to give advice to the systems development group. The importance of these regular meetings cannot be overemphasized. Members of Council represent potential users and the more intimately future users are involved in system design, the greater will be their understanding of it — and, therefore, the more and better use they will make of it.

*System Implementation*

Implementation will require careful planning by Council and the systems development group. Beyond technical and financial considerations associated with information systems, there are the people problems which seem inherent to informational system implementation. These problems must be carefully thought through because no matter how intellectually pleasing or elegant the technical design of the system, and even if it is amply funded, it will not be effective if people who are to use it don't want it. Potential users will cooperate if they are sincerely motivated. For this reason, one-third to one-half of the systems development group's budget likely will be expended on education, training and orientation. The education program will take many forms depending upon the stage of implementation:

1. Initially, key people in institutions must become acquainted with the program and hopefully will be convinced of its worth to them, and thus motivated to commit their efforts and resources to its success.

2. Liaison committees within institutions should be established to interface with the systems development group. Many people on these committees (academic administrators, controllers, registrars, planners, student counsellors) will require orientation and training if they are to see the value of the system to their day-to-day work. It will be through liaison committees that principal users in the institutions will have their opportunity to become involved in system design and thus ensure that the implemented system will meet all their requirements.

3. "Prototype" institutions/agencies will need special attention in order that subsystems may be tested in their environment.

4. In latter stages of implementation, large numbers of users will need education/orientation programs and training packages.

Implementation will be difficult, even with good educational programs, and must be based on the following:

— Firm resolve of Council that implementation is possible and desirable;

— Practical nature of the proposed system, making it useful to all levels of users, but particularly to institutions in running their own affairs;

— Pledge of Council to respect institutional autonomy and individual rights to privacy and to ensure proper use and interpretation of data supplied;

— Institutions and their components must "trust" the system, understand it fully, and believe it to be of genuine benefit to them, higher education and society.

## Cost Estimates

It is difficult to estimate the cost of NISHE beyond saying that the project will be expensive and long-term. However, it may be reasonable to estimate that within three to five years of the formation of the systems development group, a comprehensive information system could be implemented at a total direct cost of $3,000,000. Critical assumptions in this cost estimate are:

— Small, very highly qualified professional staff (systems development group);

— Adequate technical support for professional staff;

— Support from most institutions and agencies in assigning people to liaison committees to work on institutional, agency aspects of the system and in covering their own overhead costs;

— Support in the form of computer time for the systems development group from host institutions;

— Most existing administrative systems currently in use in the institutions will not require extensive modification and each institution will assume responsibility for bringing their own basic data to the high degree of reliability required by NISHE; existing administrative systems being used satisfactorily in one institution will be exportable to other institutions needing such systems.

## System Maintenance

System maintenance must be considered in the first stages of planning. Although great care is taken in design and implementation, it is inevitable that maintenance will involve more than ensuring a fixed base of data elements is updated with current information. The proposed information system describes a set of dynamic institutions in a rapidly changing period of their history and that of the society of which they are a part. Therefore, there will be demands made on this model which cannot be foreseen at the outset. It is extremely important that as much flexibility as is practical be built into all aspects of the system to accommodate the future. Flexibility depends of course on the attitude of system operators and users as well as on associated software and hardware.

NISHE is a tool which, besides supplying information, shapes attitudes, procedures and appetites. If it successfully supplies useful information, users are likely to demand information of a more sophisticated type, which may result in modifications. Since a comprehensive and easily used source of information stimulates one to become more familiar with the organization he is managing, it is also a teaching aid. Highly advanced systems will even answer "what-if" type questions which permit the decision-maker to experiment with certain decisions or plans before he has to finally commit himself. Although the proposed system is envisaged as relatively simple technically, its design should allow for change as demands for new capabilities justify change. A good original design will permit these inevitable changes to be accommodated practically and at least possible cost.

## Conclusion

Society has decided to question the value, form and expense of postsecondary education in Canada. Each institution and each postsecondary educational system must prepare to run its affairs more efficiently and at the same time prove that continued expenditures on higher education are a good investment for individuals and all levels of government. The proposed NISHE will help provide management information which is essential to good management of the institutions and the provincial systems.