

## STAFF TRAINING ON THE MULTI-NATIONAL SCENE

One of the problems faced by organizations that operate data centers in developing countries is obtaining a trained staff. As multi-national data processing operations expand to more countries, the problem is compounded. In some instances, companies have solved the problem by their own internal training program, but at a substantial expense. In this report, we discuss the role of national computer institutes in meeting staff training needs, based on what a number of national centers in Europe have been doing.

Last month we discussed the variety of problems that face an organization which operates, or desires to operate, data centers in multiple countries. We termed this subject "multi-national data processing" (MNDP). The problems centered around differences in laws and customs, labor relations policies, languages and character sets used, technological differences among countries, vendor support differences—and differences in the availability of trained personnel.

The "availability of trained personnel" can be a key problem, particularly in the developing countries where computers are just being introduced.

We have come across several alternative approaches that are being used to attack this problem, with varying degrees of success.

*Intra-company solution.* With this approach, when a company wishes to set up a new data center in another country, it first sends a task force of trained staff to work in the new center for awhile. It hires nationals in the country in which the center is located, and sets up a training program for them. And it selects some key people from the

center to be sent to headquarters, or to some other installation, to get additional training and experience.

Such a program is expensive and can make the start-up of a new center a rather slow process. But it has been the only practical solution in a number of instances, we have been told.

Even when other means are used for staff training, companies may still want to use some aspects of this approach, for meeting specific needs.

*Computer vendor solution.* With this approach, the multi-national company depends on one or more computer vendors to provide the needed training services for a new data center. This approach is only partially effective. The user is at the mercy of the vendors' time schedules, biases, and sales orientation. The vendors may have as much trouble finding qualified instructors in the country, as do the users.

The coverage of subjects may not be as complete as the user desires. And the literature which is used may not be in the local language.

*Commercial seminar solution.* Companies following this approach encourage the suppliers of

commercial seminars to begin offering them in the country of interest. These are often the “professional development” types of seminars, ranging in length from one to three days. Such seminars usually give an overview of a subject more than they teach a capability to use new technology. The instructors may not be able to speak the local language. Also, the literature provided to the students may not be in the local language.

*National institute solution.* With this approach, a national computer institute (also known as national computing center, or national informatics institute) is set up as the focal point for data processing training in the country. It is usually supported financially by the government of the country, and may also receive financial support from other organizations within the country. It puts together an education and training program for both novice and experienced data processing people. Courses are normally taught in the local language. Also, hand-out material for students, and perhaps even textbooks, are translated and printed in the local language. The institute may set up a service bureau operation to help subsidize one or more computers that can be used in the training program.

National computer institutes would thus seem to offer a number of advantages over the other approaches, for solving the staff training problem. We would like to discuss what some of those advantages are, as well as what some of the problems are with this approach. To set the stage for this discussion, we will briefly describe the background of some of the national institutes now in operation in Europe; some, in fact, have been in existence since the early days of computers.

A point to keep in mind: the goal of most national institutes has been to be the focal point for the introduction of computer knowledge into their countries. With this as a goal, they have developed many products and services in addition to their education and training services.

We will start the discussion with Studiecentrum NovI, the pioneer of national institutes, in Amsterdam, The Netherlands, as described by Mr. A. C. Groothoff, Managing Director.

### **Studiecentrum NOVI**

Studiecentrum NovI was founded in 1958 by some professors at Amsterdam University in The

Netherlands. The original name was Research Centre for Business Automation; as the name implies, the emphasis was to be on research. In 1959, the Centre offered its first training course program. In 1960, it began publishing its monthly journal, *Informatie*, and in 1961, its monthly abstract journal, *New Literature on Automation*.

During the early 1960s, the Studiecentrum began conducting examinations for professional certificates in data processing. In 1964, the Dutch government provided its support for this certification program, and in 1965 the first of the AMBI certificates was awarded. (“AMBI” is the Dutch acronym for “automation and mechanization of management information processing.”) This has turned out to be a most important program for the Studiecentrum and has had a wide effect on data processing in The Netherlands.

In 1966, the Centre’s name was changed to “Netherlands Research Centre for Automation of the Administration.” And in 1970, it was changed once again, to “Netherlands Research Centre for Informatics.” It was about this time that the Centre began to be referred to as “Studiecentrum Informatica,” and the term “Studiecentrum” has become the popular one for referring to the Centre. At the time of this last name change, the training activities of the Centre were separated from the other activities, and put under the Netherlands Training Institute for Informatics (NovI).

By the end of 1971, it was apparent to management that the new organization—with training separated from the rest of the activities—was not working well. The Studiecentrum and NovI were essentially going their separate ways. A substantial financial deficit occurred for the year. So in 1972, the Studiecentrum and NovI were consolidated organizationally, and are now referred to as Studiecentrum NovI.

What are the goals of Studiecentrum NovI? As Mr. Groothoff describes them, they are: (a) addressing the needs of society not yet being provided for, as well as (b) for the benefit of its members, and (c) restricted to activities for which men, means, and money are available. The “needs of society” activities are often financially unattractive. For instance, true research in data processing problems can be very expensive as well as financially unrewarding. The result has been that the research activities of the Studiecentrum gradually decreased, to the point where the Research

and Study Department was finally discontinued.

Studiecentrum Novi provides a variety of products and services. Perhaps foremost is its educational and training program. Courses are generally four to six weeks in length, and are offered in Amsterdam as well as in other cities around the country. About 60% of the students attend in the evening.

The examinations being offered include a COBOL certificate exam and the AMBI exam. Other certificate examinations are under development, including one on ALGOL/FORTRAN. The AMBI program is modular, with six general subject areas. There are from two to five courses offered in each of the subject areas, and each course consists of from 10 to 30 lesson units of 2½ hours each. The student has reasonably wide latitude in selecting the modules which best fit his or her interests. The certificate is awarded upon the successful completion of a prescribed minimum number of courses. The Dutch government, and a good many Dutch companies, have adopted progress in the AMBI program as prerequisites for hiring, raises, and promotions. (We discussed the policies of the AMRO Bank on this point in our August 1975 issue.)

Studiecentrum Novi's publications activities include *Informatie, New Literature on Automation*, and a series of textbooks that support the certificate examination program.

Studiecentrum Novi has an extensive, specialized library on informatics subjects. It includes a substantial amount of documentation from computer hardware and software suppliers, about their products. Services include a book loan service, query answering service, bibliographic search service, and photocopy services.

Studiecentrum Novi is financially supported by the Dutch government as well as by over 700 other organizations in The Netherlands. About ten years ago, such sponsor fees and contributions represented over 80% of Studiecentrum's total income. Today, these fees and contributions represent less than 20% of the total. (Almost three-fourths of the total income now comes from their education and training program and from examination fees and subsidies.) The number of sponsoring firms has almost doubled during that ten-year period—but annual income has increased by a factor of 11 during the same period. Since 1973, after the most recent reorganization, Studie-

centrum Novi has operated well in the black.

So Studiecentrum Novi, perhaps the first of the national institutes, continues to grow and to serve the Dutch data processing community.

### **International Computer Education Centre**

The International Computer Education Centre, located in Budapest, Hungary, was originally organized in late 1969 as the Hungarian Computer Education Centre. In 1972, its role was expanded to provide computer education courses for the COMECON countries, primarily in the RIAD 10 computer which is manufactured in Hungary. In 1973, it was renamed The International Computer Education Centre, when an agreement was signed with the United Nations Development Program whereby the Centre would provide computer education services for a number of the developing countries. Finally, in 1974, it was amalgamated with the Hungarian Computer Information Office, and the name changed to International Computer Education and Information Centre. But the popular name for the Centre is Számok, the Hungarian acronym for its official name.

Számok's main activities include computer education and training, service bureau services, information center services, publishing, and software development to support its educational activities.

Számok offers both public courses and in-house courses. These courses include both computer education for management as well as training courses for computer professionals. The technical courses offered include programming, data base management, software engineering, and system analysis and design. Computer management courses are also offered, including computer center management, management by objectives, and computerized production control. Some of the courses provide basic training for novices, while others are upgrading or refresher courses for experienced personnel.

Course duration ranges from few-day short courses to full-year programs of study which encompass a number of courses.

In 1970, Számok signed an agreement with Control Data Institute whereby CDI licensed Számok to use its relevant instruction material. In addition, Számok sent a number of its instructors to the CDI institute in Frankfurt, West Germany,

to gain experience with the instructional material. This agreement continues through 1977.

In the publishing area, the Centre publishes notes and instructional material for students, a monthly periodical, a quarterly periodical, and books to support the education program. A number of these books are translations of books from other countries, through translation agreements with the publishers.

Számok now provides an extensive information service. Abstracts have been published for some 400 periodicals and some 6,000 books. The Centre also offers a library lending service, a bibliographic search service, photocopy services, and a library of computer manufacturers' literature.

For their service bureau activities, Számok has both an IBM 370/145 as well as the Videoton (RIAD 10), one of the line of COMECON RIAD computers that is manufactured in Hungary. Later this year, they expect to install a DEC PDP-11 time sharing system with 16 terminals.

Számok has over 300 full-time and 200 part-time co-workers for conducting the above activities.

#### *United Nations program*

For the past eight years, the United Nations Development Program has been supporting various types of computer centers in a number of countries of the world. The first support program began in 1968 when an agreement was signed with a center at Bratislava, Czechoslovakia, to perform research and development in the use of computers in central statistical offices. In 1971, a support program was started with the Israel Center for Information Systems. As mentioned above, the program with Számok began in 1973. And during 1975, negotiations have been underway for various types of support for centers in the Philippines, Burma, Japan, and Lebanon.

In all instances, we were told, the initiative has come from the countries involved with the cooperation of the United Nations; the UN itself does not initiate these programs. Also, these programs do not involve the use of *additional* UN funds but rather an allocation of a share of each country's UNDP target development funds. Each country, in turn, usually allocates some of its own funds to its program. The agreements are for specific periods of time (say, five years), with the possibility of

one extension time period (say, two years). At the end of that time, it is expected that the centers will be self supporting.

The UN program with Számok will illustrate what the UN hopes will be accomplished by these agreements.

First, Hungary has agreed that a stated percentage of its UN target funds will be allocated each year to Számok. For the five-year term of the agreement, this will amount to about \$2,250,000. In addition, the Hungarian government is putting an even greater amount of internal funds into the program.

The UN has agreed to locate computer technology experts in other countries who will come to Hungary for periods ranging from a few weeks to a year. These experts help develop and teach courses, help develop software, and help to introduce new technology. The courses they teach are generally about one month in length, although some shorter courses are offered. These courses are most often taught in English, although other languages could be used.

The UN also has agreed to circularize the UN-supported courses offered by Számok in other countries of the world. For a one-month course offered in 1974, representatives from some 16 different countries attended. People from 19 countries attended the 1975 course on computer center management. These other countries may use portions of their allocated UN funds for sending people to these courses.

Finally, the UN has agreed to arrange for members of the Számok technical staff to visit and work in other countries (such as the U.K. and the U.S.) for periods of time of up to one year. These fellowships have proved to be very successful in exposing staff members to advanced technology in computer use.

Since the program has been underway at Számok, the UN has arranged for some 25 to 30 experts per year to visit Budapest. Also, from 8 to 12 Számok staff members have been sent per year to other countries on the long-term fellowship program. Further, as evidence of the international nature of the program, the attendees at the UN-supported courses have come from Asia, Africa, Middle East, South America, and the Pacific.

Számok thus may well be the first of the truly international computer institutes, aimed at being the focal point for introducing computer knowl-

edge in a number of the socialist and some of the developing countries of the world. Most course attendees, as might be expected, have been from Hungary and other socialist countries.

A main use of advanced computer technology in these countries has been to improve social statistics on economic and political activity. In this connection, it should be mentioned that the Conference of European Statisticians (a sub-group of the UN Statistical Commission) has played a significant role in fostering Számok. This Conference is working on the difficult problem of promoting better, more comparable statistics from both the socialist and the capitalistic countries. The U.S. has participated in this Conference and has contributed significantly to Számok.

#### **Other national institutes**

*The National Computing Centre*, located in Manchester, England, was founded in 1966. It is supported by the U.K. government plus over 1,200 member organizations. There are three types of membership: (1) major computer manufacturers, (2) computer users or intended users, and (3) suppliers of computer goods and services. In addition, associate memberships are available for individuals. About 42% of total income comes from the government, another 8% from membership fees, and the remaining 50% from the sale of products and services.

The people at NCC feel a strong obligation to provide needed (but otherwise unfilled) services. "If we don't do it, who will?" they say.

NCC provides a full range of services. These include education and training—in both basic and advanced levels, and for managers as well as for professionals. (We discussed the widely used NCC basic systems course in our August 1970 report.) The Centre provides advisory services, such as conducting feasibility studies and developing specifications for application system requirements. It promotes and establishes installation standards; its documentation standards are now in use at installations in some 20 countries. Its publications include reports and studies, a journal of computing literature abstracts, and a regular journal. It has a library and performs information services for members, including information retrieval and bibliographic searches. The library maintains extensive files of comparative information on computing hardware, software, training

course offerings, and service bureaus. And NCC does some software development work. For instance, over 350 copies of their FILETAB software package have been sold.

*The National Research Institute*, in Norway, was established in 1958 to promote the use of computers in Norway. The Institute is research oriented, serving both government and industry.

During the 1960s, members of the Institute developed the SIMULA programming language, for simulation problems. During this time period, the Institute offered a service bureau service, with a Univac 1107 computer. The service bureau operation was closed down in 1970 because of the growth of service bureaus in private industry. Current emphasis at the Institute is on the quality of use of computers.

During the 1960s, about 85% of income was earned and 15% came from grants. Today, about 30% comes from grants and the remaining 70% is contributions toward or earnings from projects.

*The Statskonoret*, in Sweden, is operated under the Ministry of Finance of the Swedish government. It buys all computing equipment for agencies of the Swedish government, develops application systems for government agencies, offers service bureau services to government agencies, and provides consulting services. It cooperates on research and development projects with other government agencies as well as with private organizations. For instance, one large research project currently underway is on the subject of data security.

Statskonoret, with an annual budget of some 30 million krona, aims to promote the efficient use of all computers in Sweden.

In *Denmark*, during the early 1960s, the Danish EDP Council helped to develop the country's EDP education program. However, this function of the EDP Council has been taken over by the Danish government. In 1960, Datacentralen was organized to provide service bureau services for the government. This activity has continued to grow and now has about 900 employees. It develops and runs application systems for government agencies, and now handles about 70% of all such EDP applications for the government.

The *GMD*, in St. Augustin, West Germany, was founded in 1968, to provide research, education, and consulting services for federal and state governments in the Federal Republic of Germany.

There are other organizations providing similar services in the FRG, but GMD is the largest of these. GMD conducts a variety of research activities in such areas as decision systems, computer architecture, program structures, graphical data processing, modular data base management systems, and information systems. GMD also operates three computer centers.

In *Yugoslavia*, there is no central institute. Instead, there are a number of institutes for research, development, and education operated at universities. Some of these institutes conduct joint projects with private industry. One such project, for instance, is being conducted with a subsidiary of ITT on a computer-based telephone system.

As can be seen from these brief descriptions of a number of national institutes in Europe, there is a wide variety of such institutes, many with different purposes and with different combinations of activities. However, if there is a central theme among these institutes, it is the theme of practical education and training for computer professionals.

So, while there are significant differences among the institutes, it is still worthwhile to ask: how might national computer institutes aid in staff training for multi-national organizations?

#### **National institutes: why, what, how?**

We attended a seminar on "policies and functions for national informatics institutes," presented by the IFIP Applied Information Processing Group (IAG, former name IFIP Administrative Data Processing Group) in June 1975 in Vienna, Austria. The seminar was conducted by Mr. R. J. McQuaker, Chairman of IAG and one of the founders of the National Computing Centre in the U.K. Our discussion will include some of the points raised during the seminar.

Typically, when a national computer institute is organized, the purpose is to help the country catch up rather quickly in the use of computers. Usually, the government of the country desires that the institute become the focal point for introducing computer knowledge into the country.

To accomplish this purpose, the national institute typically begins a program of education and training, for both management and staff members, and at both novice and advanced levels. A library is usually set up, specializing in selected computer field literature as well as comprehen-

sive data files on available hardware and software. Further, to help disseminate knowledge, the institute establishes a publications department, for publishing a journal, course material for students, and perhaps translations of selected books.

In undertaking these activities, the national institute usually is set up so as not to compete with established organizations such as the universities. For instance, the institutes may be constrained from offering complete computer science education programs.

These activities are aimed primarily at users and prospective users of computers. These users may be in the private sector as well as in government. But the national institute may see its constituency in broader terms. The constituency may include the major computer manufacturers, other suppliers of goods and services in the computer field, other educational institutions, general management of organizations, labor unions, and so on. Also, the institute may undertake research activities in challenging technological areas, on the assumption that the results will be beneficial to a good number of users within the country. (However, as discussed earlier, these research activities may fade away, when results do not come up to original expectations.)

We have said that these are "typically" the goals and the activities. The discussion earlier in this report illustrated that there can be variations in both goals and activities. For instance, an institute may be set up to perform one specific function, such as education and training, or to provide service bureau services. In the more typical case, the management of the national institute may have quite broad leeway in choosing the constituencies it will serve and the goods and services it will offer, subject to constraints such as not competing with the universities. But where the institute has been set up to perform one specific function, management does not have the same latitude.

But in any case, it appears that institute management typically sees its constituency as an aggregation of individuals or individual organizations. It then selects the goods and services to offer which it feels have the best chance of being accepted by the constituencies. One might call this the "bottom-up" approach to structuring the activities of the institute.

What activities are chosen? Following is a list

of the goods and services most commonly offered by national institutes, as far as we have been able to determine.

#### ACTIVITIES OF NATIONAL INSTITUTES

1. Education and training program in computer usage, for managers and professional staff, and for novices and experienced people.
2. Qualifying examinations and the issuance of certificates, for meeting requirements of professional competence.
3. Information services, including a library service, abstracting service, search services, etc.
4. Supplier information repository, for comparing the characteristics of competitive brands of equipment, software, and services, for both domestic and foreign suppliers.
5. Supplier *evaluation* service, for comparing and evaluating competitive brands of equipment, software and services; benchmarks may be used in performing the evaluations; this service is still more of a goal than an achievement.
6. Publications, including monthly and/or quarterly journals of technical papers, abstracts of periodical and book literature, books (including translations of foreign books) and course material to support the education program.
7. Service bureau services, for government as well as perhaps for the private sector.
8. Applications system development and operation, for the government and/or for members of the institute.
9. Software package development, to support the operations of the computer center as well as for possible sale to others.
10. Development of installation standards, for use by members of the institute as well as for sale to others.
11. Promotion of national standards for data processing, data communications, etc., perhaps by having staff members participate on both domestic and international standards committees.
12. Advisory (consulting) services, for the government and for members of the institute.
13. Joint projects with government agencies and/or with private organizations, for the development and installation of new technology.
14. Conferences, perhaps in conjunction with other organizations, on specific technical subject areas.
15. Research projects on challenging technological problem areas.

We are not sure that any of the national institutes that we have talked to perform all of the above activities, although some seem to come very close. Generally, the activities are a subset of this list, we believe.

There are a number of problems associated with structuring the activities of the institute in this bottom-up manner. One difficulty in many countries is that private enterprise soon gets into the more financially attractive of these activities. The institutes then must either compete with private enterprise or retire into areas where the eco-

nomics are not so attractive. Another difficulty arises when computer knowledge spreads and the institute is no longer the focal point for introducing new technical knowledge in computers. Members then tend to drift away, or to provide less support for the institute. A related difficulty arises when members become sufficiently experienced with using computers to begin demanding services to meet their particular needs. They then either replace or supplement the institute's services with others more suited to their needs.

The net result of these difficulties is that the national institutes find it harder and harder to perform their role as the focal point for introducing computer knowledge. They may find it ever more difficult to keep income ahead of expense. And they may be frequently trying to enlarge their constituencies or broaden their services, in an attempt to make income greater than expense. The point may come where institute management is more concerned with "making a profit" than it is with fulfilling the original purpose of the institute.

A possible solution to this dilemma is for management to take the top-down approach to structuring the activities.

#### *The top-down approach*

McQuaker, at the IAG seminar, proposed that institute management should take the top-down view.

The purpose of a national computer institute, he said, should be to maximize the benefits—both economic and social—of use of computers within the country.

This is a deceptively mild statement. It can change the whole approach to choosing the activities of the institute.

How does one use this top-down approach? Start with the overall view of the country's economy, says McQuaker. What benefits might be obtained within the country by the use of computers? This should be a macro-economic view and, as much as possible, should be based on accomplishments elsewhere. For instance, in industrialized countries, work-in-process inventories and finished goods inventories might be reduced by better inventory control methods. In agricultural countries, yields might be improved by a number of tested computer methods. This

macro-economic view says: look at the overall economy; where within this whole economy could computers be used where the benefits would be the greatest?

Having identified where the greatest potential benefits lie, the next step is to determine what must be done to realize those benefits, says McQuaker. The needed actions might go well beyond computer technology. But computer technology should play an important role, if the program is to be related to the national institute.

Then, having determined what the needed actions are, the next step is to identify which of these actions can best be done by the national institute.

This top-down view, says McQuaker, leads to a set of activities that are in harmony with the basic purpose of the institute. Institute management should no longer become preoccupied with "making a profit" at the expense of fulfilling the basic purpose of the institute.

As McQuaker pointed out, this top-down view might lead to a radically different perception of the role of the institute, from what is seen from a bottom-up view. Management may see the institute's role in a much broader light, comparable perhaps to national efforts toward road safety or some such recognized activity.

From the standpoint of the multi-national organization operating within a country, it may well be that staff training is better served by the bottom-up approach. If the organization's goals are in harmony with the goals selected by the top-down approach, well and good. But it seems quite possible that the top-down approach could lead to a set of activities that would best serve the country but which might not tie in with the needs of any given multi-national organization.

#### *Method of operation*

McQuaker reviewed several ways in which a national institute could conduct its activities.

The most obvious way is through full-time and/or part-time employees. This approach gives the maximum degree of control over what is accomplished—although part-time employees normally represent a lesser degree of control. This approach also may be the most expensive of the alternatives.

Another way is to obtain the services of volunteers, as is typically done in the professional so-

cialties. The cost is low, but the control over what is accomplished or when it is accomplished also is low.

Still another way is to buy the needed efforts, by buying the time of consultants, software houses, or such. This method avoids the excessive growth of staff but can be fairly costly.

Then there is a combination of these methods. For instance, the institute might have a relatively small professional staff, make extensive use of volunteer help (as the professional societies do), and then buy outside services for specific projects.

The institute may follow a more passive role than is implied by any of the above methods. It may desire only to act as a catalyst, to persuade other organizations to conduct the desired activities. Such a role has relatively little control over what is accomplished, says McQuaker, and it may lead to vague objectives.

Finally, the institute may choose the role of simply aiding in the exchange of experience—along the line of the "user round tables" that were so popular in the late 1950s and early 1960s. The institute would simply provide a meeting place where users could exchange experiences. Again, little control and the possibility of no tangible results are implied.

It seems to us that national institutes would normally prefer to conduct their activities with their own employees, or by a combination of employees, volunteers, and outside services. The main determinant in the decision would seem to be financing.

If several multi-national organizations were operating within the same developing country, they might find it to their advantage to supply needed funding at the outset, so that necessary staff could be obtained.

#### *Funding of national institutes*

There are really three sources of funds for most national institutes, says McQuaker.

One of these is subscription funds, or membership fees. This income is used to provide services to the subscribers (members), with any surplus transferred to the general fund.

Another source is the trading funds, earned from the sale of goods or services to clients. These funds also include contributions from the government or others for specific projects. Again, any surplus can be transferred to the general fund.

Finally, there is the general fund. It includes any surpluses mentioned above, plus any grants received from the government, from foundations, or others who simply wish to support the work of the institute. The general fund is used to pay the overhead, as well as to conduct any research or high risk projects that the institute wishes to undertake.

As we have pointed out in this report, the relative amounts obtained from these sources generally changes radically over the first ten or so years of life of the institute. At the outset, government subsidies and membership fees tend to dominate. Then, as the activities build up, earned income tends to dominate. The main problem, as we see it, is that the national institute should not get itself into a position where the need to earn income largely distracts management away from the basic purpose of the institute.

This discussion has touched on only a small fraction of what McQuaker presented in his seminar but it perhaps gives an idea of the content of the seminar.

#### **The role of international institutes**

A number of the national institutes that we have contacted have sold at least some of their products to people in other countries. Does this make them "international" institutes? If a national institute seeks to be the focal point for introducing new computer knowledge into its country, what is the comparable role for an international institute?

It seems to us that when a national institute develops its goods and services to serve its domestic market, it does not become international just because it sells some of those abroad.

One of the necessary characteristics of an international institute, it seems to us, is the *intent* to serve multiple countries, in addition to the country in which it is located. Its goal should be to serve as the focal point for introducing computer knowledge in those countries. Ideally, it should play no favorites among the countries. In practice, it is likely that the country in which it is located will receive preferential treatment.

There is another necessary characteristic of an international institute, it seems to us. This is that the governments of the countries it desires to serve acknowledge its role. It would seem that the decision to be an international institute cannot be

a unilateral one (other than being an international institute in name only, of course).

*Why* have an international institute? The pro and con arguments follow the familiar pattern of centralization versus decentralization of computer centers. On the "pro" side for international institutes are the arguments of economy of scale, more efficient use of scarce resources (particularly knowledgeable people), greater likelihood of reaching the "critical mass" point where really good quality service is delivered, and so on. On the "con" side are the arguments of difficulties in meeting local needs, nationalistic feelings of wanting own national institutes, and likelihood of language problems.

We see a range of approaches to international cooperation on the introduction of computer knowledge, with the true international institute being only one of the approaches.

At one extreme would be the *periodic meetings of the directors* of national institutes, to exchange experiences and solutions to common problems.

Another approach might be likened to a *cartel of national institutes*, in which they agree among themselves which non-competing goods and services they might offer in each others' markets.

Another form of relationship, and one that has been used, is for the *national institutes to sell their products to other national institutes*, for resale. For instance, we understand that the National Computing Centre's basic systems course has been sold to a number of other national institutes.

Another way of cooperation would be for *ad hoc groups of national institutes to join together on projects* to develop new products or services that they can then offer. Not only would such an approach split the development costs among the institutes but it would also tend to promote common products and services. For instance, national institutes within the European Economic Community might undertake projects supported with EEC funds.

The next approach, in the spectrum that we are listing, is that of the *international institutes* that perform at least some of the services listed earlier in this report for each country in their markets.

The next approach on the list is based on the concept of a *supra-institute, set up to serve multiple national institutes*. Its charter would be to develop goods and services for the national institutes that it serves. Such a supra-institute would

aim at developing “portable” goods and services, much as portable application systems are developed. (This is contrasted with the goods and services that are developed for a domestic market and then offered internationally.) The supra-institute could also act as a source of highly skilled technicians and instructors who could visit the national institutes on a periodic basis.

Finally, there would be the concept of an *international institute cooperating with national institutes* in the countries it serves. The international institute would offer some of the needed goods and services, and the national institutes the rest.

#### *Why should DP management be interested?*

It seems to us that directors of information services for multi-national organizations should be particularly interested in the subject of cooperation among national institutes.

As we have been pointing out, the national institutes can play an important role in helping to train the data processing staff in developing countries. It would seem advantageous to multi-national organizations to promote “portability” of goods and services, and “common approaches” to system analysis, design, and programming, among the national institutes. It would be more likely, then, that common procedures and common software could be used in the data centers in the several countries. (We are not saying that 100% compatibility can be achieved in this manner, but rather that compatibility can be enhanced.)

#### **The future of national institutes**

What may lie ahead for the national institutes already in existence, mostly in the industrialized countries?

It is relevant at this point to ask: why is there no national institute in the United States? The closest we have to a national institute is a function within the National Bureau of Standards. In the early and mid-1950s, NBS developed the SEAC computer in Washington and the SWAC computer in Los Angeles. While NBS played an important role in furthering computer knowledge, particularly in hardware, there were just too many other places where development was taking place for NBS to become *the* focal point.

In 1965, as a result of the Brooks Act, NBS

formed the Center for Computer Sciences and Technology, which became one of the four NBS Institutes in 1973. The ICST now provides standards, guidelines, and advisory services to promote the effective use of computer, automation, and information technologies throughout the federal government. In carrying out its technical program, it also conducts joint activities with professional societies, such as ACM and IEEE; we discussed the NBS/ACM conference on data security in our January 1974 report, and the NBS/Mitre conference on privacy in our November 1975 report.

The point is that, while NBS began its role in the computer field very early and has continued to play an important role, it has not become a true national institute in the sense that we have been discussing such institutes.

The reason, it seems to us, is because there are just too many other centers of advanced computer knowledge in the U.S. Further, most of them have been active in this area about as long as NBS has. These include the universities—M.I.T., University of Michigan, University of Illinois, University of California (at several campuses), as well as many of the participants in the ARPA Net, to name some. These centers of knowledge also include research institutions—such as Rand Corporation, Mitre Corporation, System Development Corporation, and Stanford Research Institute. And, of course, these centers of computer knowledge include private industry—such as IBM’s Thomas J. Watson Research Laboratory, General Motors Research Laboratories, and Bell Telephone Laboratories.

So, in the U.S., there has been resistance to the idea of *one* focal point for introducing computer knowledge. Instead, many dispersed centers of knowledge have developed. It seems highly unlikely that a single national institute will develop in the U.S.

It appears to us that, in the industrialized countries where national institutes have been set up, the dispersal of computer knowledge will make the situation somewhat like the U.S. That is, resistance might well develop to continuing the national institutes as the focal points of computer knowledge. Some of the functions performed by the national institutes might be taken over by regular channels—such as education and training, publications, and library functions. A variety of

flexible, responsive commercial offerings may be set up which meet specific user needs better than the more general purpose offerings of the national institute. Users may become more demanding in asking for products and services tailored to their specific needs.

Last month, we discussed the four possible stages of growth of multi-national data processing, based upon the ideas of Gibson and Nolan (*Harvard Business Review*, January-February 1974). The same general pattern of growth might also apply to national institutes. As in the case of the multi-national organizations, we have seen no studies on this point, so the following pattern is only conjecture.

The *first stage* of growth for a national institute might be an educational and training program for systems people and programmers. This often is the most urgent need within the country that is starting to use computers. The institute provides the focal point for introducing practical knowledge of computers into the country. The *second stage* is the proliferation of goods and services, to include many of those listed earlier in this report, and for the reasons discussed earlier. With the arrival of the *third stage*, competition sets in and computer knowledge becomes dispersed. Customers of the institute become more demanding. Finally, in the *fourth stage*, the national institute settles into its long term role. It gives up a number of its goods and services to regular channels, such as turning over basic training in computers to the regular educational system. We will have more to say about this long term role shortly.

As far as multi-national organizations are concerned, the problem we are discussing in this issue is the training of people in data processing technology mainly in developing countries. In the industrialized countries, a pool of trained people already exists; national institutes may play a role in upgrading capabilities of staff members. Multi-national organizations may be quite interested in how the long term role of such institutes can benefit them.

Probably, though, it is the role of national institutes in the developing countries that would be of more immediate interest to multi-national organizations. In the developing countries, a pool of trained people does not exist. Means are needed for providing the education and training, and national institutes are one method of doing this. Fur-

ther, such national institutes would be in the early stages of growth. The problems that they will encounter in the third stage of growth (assuming that the pattern is valid) are still a number of years away.

So if multi-national organizations decide to support national institutes in the developing countries, as a vehicle for staff training, the complications of growth stage three would seem to be a number of years in the future. Note that we are not saying blanket support should be given automatically to all such national institutes. Each one should be considered on its own merits. But private enterprise has supported the national institutes in the U.K. and in The Netherlands, for example, as we discussed earlier in this report. And private enterprise might well support national institutes in developing countries. At least, it is an approach that we feel should be given serious consideration.

But what of the possible long term role of national institutes?

#### *The long term role of national institutes?*

It is too early to say if the services currently offered by the national institutes (as listed earlier in this report) will be taken over by regular channels. We suspect that a number of such services *will* be taken over.

In any case, we think that there are services that national institutes would be in a particularly good position to offer. If such is the case, these services might well form the nucleus of what the national institutes provide in the future. We will describe two services which we believe fall into this category.

#### *Comparative evaluations*

Comparative evaluations of hardware, software, training, and other goods and services will continue to be needed in all computer-using countries. This point was brought out at the Vienna seminar sponsored by IAG, discussed earlier.

The closest thing to these evaluations that we have in the U.S. are the Auerbach and Datapro services. These services give the characteristics of many hardware and software products offered in the U.S. market. Generally, these are factual reportings, based upon information provided by the suppliers of those hardware and software prod-

ucts. While there are often some general evaluatory statements given in the write-ups, there is generally no attempt made to validate the characteristics claimed nor is there an attempt to compare two or more similar products or services.

There was some attempt in years past to make such evaluations. For instance, one of the published services developed a set of simple benchmark problems. Each new computer system was timed out and costed out against these benchmarks. But the benchmarks were not too representative and, as far as we know, this feature has been dropped. Also, there were commercial simulation services, such as we discussed in our April 1968 issue, which would time and cost out a number of hardware/software configurations on a set of user-defined processing operations. The use of these services became more difficult with the advent of multi-programming. Whatever the reason, the use of such specific case evaluatory services appears to have diminished.

As we say, there continued to be a need for more general evaluatory services. Moreover, on the international scene, the need is for an evaluation of the goods and services available in any particular country. This evaluation should include the support given for both hardware and software products. So while the U.S. and U.K. (for example) published services can be helpful in other countries, they probably are not sufficient in themselves.

It seems to us that national institutes are in a particularly good position to fill this need. They might make arrangements with the U.S. or U.K. publishers of hardware and software characteristics to use the material; perhaps some type of bulk subscription might be entered. To this material would be added material developed on a local basis.

It might even be possible to develop valid benchmark problems for making comparative evaluations. (The development of such benchmarks, which is not an easy task, might be handled by joint projects of several national institutes, or by a supra institute.)

We suspect that the economics of this type of enterprise are such that the U.S., U.K., or other existing suppliers (of such information) would not be interested in special analyses on a country-by-country basis. The demand in each of the coun-

tries might be low enough in numbers that these suppliers could not afford to set up the staffs to do the job. Local private suppliers might be faced with the same problem. But national institutes very possibly could handle this type of service economically.

#### *Advanced training in using computers*

We recently sat in on a part of the Summer Institute offered by the University of California at Santa Cruz. We think the type of program offered by UCSC should be brought to the attention of all data processing managers. And, moreover, it is a very practical type of program that would seem to fit in *very* well with the concept of national institutes.

The concept of the UCSC Summer Institute in computer science is simply stated. A set of intensive short courses, from one to two weeks each in length, is offered. Each course uses outstanding faculty members. Each course is designed so that students will acquire an *immediately useful* increment of knowledge and skill. Not only are general principles taught but also hands-on experience is given by means of laboratory periods.

In our June 1974 report, we told how two programmers from the U.S. Bureau of Customs attended the Summer Institute (in 1973) to learn structured programming. At the end of two weeks of intensive work (in the order of 16 hours per day), they felt capable of using structured programming methods. Both immediately started applying what was learned on their jobs. For instance, one programmer used what she had learned to redesign and reprogram a large on-line file update program which had been causing undue maintenance problems. The resulting program turned out to be highly trouble-free, and only one non-trivial bug was found in the program during debugging.

We talked to another participant at the 1975 Summer Institute. He works for the U.S. Bureau of Labor Statistics and had attended the 1971 Summer Institute. At the time, his Bureau wanted a non-procedural language for producing statistical tables that the Bureau's statisticians could use. None of the commercial languages they looked at met their desires. This participant was basically a statistician who for several years had had experience in applications programming. He

and one other Bureau employee attended the two week compiler writing course. Using the skills acquired in the course, they went back to their jobs—and developed the Table Producing Language (TPL). They developed TPL as a language that statisticians could use, and then wrote the compiler for producing object code. TPL has been very well accepted by statisticians, we were told—not only at the Bureau of Labor Statistics but also in other U.S. government agencies and in organizations in other countries.

That is what the people at the UCSC Summer Institute mean by “acquiring an immediately useful increment of knowledge and skill.” The assumption is that the people who attend the Summer Institute are already experienced in computer use. The institute aims to give them a new capability that they can carry away and immediately use in their jobs.

It seems to us that this type of practical, advanced training is very much in harmony with the goals of most national institutes. Moreover, we see no reason why the same results cannot be

achieved at national institutes, given adequate access to qualified instructors and access to one or more computers for lab work.

What is the possible future role for national institutes? In this report, we have discussed two possible types of roles, which might well be complementary. One is to lay out and support a program by which computers will provide maximum economic and social benefits for the country, by way of a top-down analysis. National institutes would seem to be in an excellent position to do this. The other role is to develop services that are needed by an experienced computer using community. Comparative evaluations and advanced training are two examples.

As multi-national organizations expand into more countries, and particularly into developing countries, the problem of obtaining trained data processing staffs increases. We think that national institutes can provide a practical way for solving this problem. We suggest that multi-national organizations give this approach some thought.

---

*Professionalism in the computer field has been debated for years. Are systems analysts and programmers “professionals” or aren’t they? A good many people seem to adopt the attitude, “Who cares?” But the subject is important to data processing management. Some aspects of professionalism are definitely on the way, and these aspects might very well affect your selection of applications to convert to the computer and the way you build those systems. Next month we will discuss not only professionalism but also some other developments that tend to impose types of regulation on computer-using organizations.*

---

EDP ANALYZER published monthly and Copyright© 1976 by Canning Publications, Inc., 925 Anza Avenue, Vista, Calif. 92083. All rights reserved. While the contents of each report are based on the best information available to us, we cannot guarantee them. This report may not be reproduced in whole or in part, including photocopy reproduction, without the

written permission of the publisher. Richard G. Canning, Editor and Publisher. Subscription rates and back issue prices on last page. Please report non-receipt of an issue within one month of normal receiving date. Missing issues requested after this time will be supplied at regular rate.

## SUBJECTS COVERED BY EDP ANALYZER IN PRIOR YEARS

### 1973 (Volume 11)

#### Number

1. The Emerging Computer Networks
2. Distributed Intelligence in Data Communications
3. Developments in Data Transmission
4. Computer Progress in Japan
5. A Structure for EDP Projects
6. The Cautious Path to a Data Base
7. Long Term Data Retention
8. In Your Future: Distributed Systems?
9. Computer Fraud and Embezzlement
10. The Psychology of Mixed Installations
11. The Effects of Charge-Back Policies
12. Protecting Valuable Data—Part 1

### 1975 (Volume 13)

#### Number

1. Progress Toward International Data Networks
2. Soon: Public Packet Switched Networks
3. The Internal Auditor and the Computer
4. Improvements in Man/Machine Interfacing
5. "Are We Doing the Right Things?"
6. "Are We Doing Things Right?"
7. "Do We Have the Right Resources?"
8. The Benefits of Standard Practices
9. Progress Toward Easier Programming
10. The New Interactive Search Systems
11. The Debate on Information Privacy: Part 1
12. The Debate on Information Privacy: Part 2

### 1974 (Volume 12)

#### Number

1. Protecting Valuable Data—Part 2
2. The Current Status of Data Management
3. Problem Areas in Data Management
4. Issues in Programming Management
5. The Search for Software Reliability
6. The Advent of Structured Programming
7. Charging for Computer Services
8. Structures for Future Systems
9. The Upgrading of Computer Operators
10. What's Happening with CODASYL-type DBMS?
11. The Data Dictionary/Directory Function
12. Improve the System Building Process

### 1976 (Volume 14)

#### Number

1. Planning for Multi-national Data Processing
2. Staff Training on the Multi-national Scene

*(List of subjects prior to 1973 sent upon request)*

## PRICE SCHEDULE

The annual subscription price for EDP ANALYZER is \$48. The two year price is \$88 and the three year price is \$120; postpaid surface delivery to the U.S., Canada, and Mexico. (Optional air mail delivery to Canada and Mexico available at extra cost.)

Subscriptions to other countries are: One year \$60, two years, \$112, and three years \$156. These prices include AIR MAIL postage. All prices in U.S. dollars.

Attractive binders for holding 12 issues of EDP ANALYZER are available at \$4.75. Californians please add 29¢ sales tax.

Because of the continuing demand for back issues, all previous reports are available. Price: \$6 each (for U.S., Canada, and Mexico), and \$7 elsewhere; includes air mail postage.

Reduced rates are in effect for multiple subscriptions and for multiple copies of back issues. Please write for rates.

Subscription agency orders limited to single copy, one-, two-, and three-year subscriptions only.

Send your order and check to:

EDP ANALYZER  
Subscription Office  
925 Anza Avenue  
Vista, California 92083  
Phone: (714) 724-3233

Send editorial correspondence to:

EDP ANALYZER  
Editorial Office  
925 Anza Avenue  
Vista, California 92083  
Phone: (714) 724-5900

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City, State, ZIP Code \_\_\_\_\_