INFORMATICS IN IRAN: PROBLEMS AND PROSPECTS

FARHAD MAVADDAT and BEHROOZ PARHAMI

Arya-Mehr University of Technology
Tehran, Iran

Abstract: This is a preliminary report on the state of informatics in Iran. What distinguishes the case of Iran from those of many other developing countries is its dedication to modernization and use of computers with very little budgetary restriction. The Government's commitment to industrialization and its clearly stated policy of computerization have created many problems unique to Iran which intensify the difficulties faced by other developing countries. In this report, the major problem areas are enumerated and analyzed, and a few measures for coping with them are proposed.

1. INTRODUCTION

Some musical instruments such as pianos and accordions do not produce the undesirable harmonics and, therefore, they can be pleasing to the ear even when played by beginners. While certain others, notably string instruments, do produce these harmonics and can have unpleasing results even with semi-skilled players. The ability of beginners to produce pleasing effects has also been the case with movie cameras and more recently with computers.

Computers are easily played instruments because of their tremendous power, speed, and accuracy. They can produce interesting output; well justified, nicely formatted, carefully analyzed and sorted. While in many parts of the world, highly trained ears and eyes have made it difficult for non-expert musicians and movie makers to impress the public, most recipients of computer services are ignorant of the state of computer art, and pleasing them is still not so difficult. This fact is thoroughly exploited by non-skilled computer players around the world, particularly in developing countries where the users of computer services have minimal knowledge of computing.

This ignorance has also caused problems of an opposing nature. Influenced by non-responsible advisors, usually recruited by foreign firms flooding the country in search of petro-dollars, many of our data processing managers are talking about or have committed themselves to projects which are well beyond the present state of computing art, even in highly developed countries with an established tradition of automated systems and no shortage of expert manpower. The result has been the creation of a number of large, ongoing projects

with no significant results imminent in any foreseeable future.

Taking these two factors into account, the present state of informatics in Iran can be summarized by the two classes of existing projects. First are those applications with very little or no real computing substance, dealing mainly with modified, retouched, or summarized listings of input data in volumes which would impede processing and critical evaluation by hand. Second are those far-fetched projects attempting, without success, to push the frontiers of computing art.

As one can easily see, what is lacking is a class of modest, well thought-out projects of medium scale created with the objectives of usefulness, overall system efficiency, and suitability for our special environment in mind and in the framework of a national plan of informatics development.

In the rest of this report, we will attempt to propose ways of improving on the current situation. The proposed framework for action is the establishment of an Informatics High Council with two supporting but independent organizations in charge of educational planning and professional activities. In the following sections, we will examine the responsibilities of each of the proposed organizations. We will also point out the ways in which these organizations may help solve our current problems.

2. NATIONAL PLANNING FOR INFORMATICS

The unfortunate situation, summarized in the previous section, points to a strong need for national planning in the area of informatics development. We feel that an Informatics High Council, if formed cautiously and staffed by the right people, is a desirable organization for such planning. Although this kind of high-level planning and control is often undesirable in developed countries, it has been found to be a prerequisite for modernization and industrialization in developing and socialist countries.

2.1. The Informatics High Council

It is our strong belief that the Informatics High Council (IHC) should be placed very high in the governmental hierarchy if it is to have the needed jurisdiction to exercise tight control. This position can be easily justified by taking into account the volume of payments to foreign manufacturers and consultants, the extent of capital investment in terms of manpower training and physical development

and finally, the Government's clearly stated policy of computerization as a cure for many of our present shortcomings such as lack of information for proper planning, shortage of skilled manpower, and excessive governmental bureaucracy.

IHC will have a number of committees which provide executive support and technical advice to the Council's decision makers. These committees comprise a number of full-time personnel and possibly part-time advisors. Following, is

a discussion of the aims and responsibilities of the three committees which we envisage as the principal components of IHC. These committees are responsible for project coordination, standardization activities, and research and development, respectively.

2.2. Coordination of Informatics Projects

Many organizations, overwhelmed by the computerization craze and in rivalry with others, have started the introduction of computers into their operations. Even when this is done out of real need and with the best of intentions, most decision makers are not aware of the many difficulties and pitfalls on the way to true computerization. The Project Coordination Committee (PCC) of IHC will have the task of advising organizations which plan to use computers and its consent will be required prior to making any financial commitments. Typical avenues of action for PCC are summarized in the following paragraphs.

Through publication of pamphlets, organization of management seminars and direct contact with responsible authorities, it must be emphasized that the successful operation of a computer-based system is totally dependent on the personnel which run it, even when the best in hardware and software is available. In particular the false impression created by the mass media and manufacturer representatives that the introduction of a computer will solve all management problems must be rectified by pointing out that adding an informatics division may easily compound management problems and headaches, rather than reduce them, if not properly planned.

Organizations must be advised on the selection of required hardware and software, and alternative solutions such as the use of idle capacities on other installations should be pointed out to them. The availability of required manpower in terms of quality and quantity within the organization must be demonstrated in order to ascertain that a new installation will not add to the already high demand for computer experts.

Ongoing informatics projects (including those relegated to foreign consultants
and software houses due to shortage of qualified personnel) must constantly un-
dergo critical evaluation in order to assure progress of work and quality of
service. Any project which is no longer deemed useful or feasible should be
abandoned immediately, regardless of the amount of previous expenditures.

2.3. The Need for Standardization

Many of the problems associated with the present state of informatics in Iran
are due to a lack of compatibility among various existing systems. Incompati-
bilities whose causes are international will not be discussed here except to
point out that their damage is felt more strongly in a developing country due
to manpower shortage. Following is a discussion of incompatibilities unique
to our country which must be dealt with by the Standards Committee of IHC.

The Farsi character set (and its coded representation) provides an outstanding
example of overdue standardization. This problem must be considered at once,
before further damage is done [1] .

Drastic changes are unavoidable in a developing country. New laws are continu-
ally introduced and organizational changes are made in search of the optimum
arrangement. Such abrupt changes can easily parallize existing computerized
systems. The Standards Committee can be instrumental in minimizing the effects
of such changes if consulted in advance.

Significant savings in financial and manpower resources may be achieved through
the establishment of national codes for items of information frequently needed
in the design of computerized systems. Examples include geographic location
codes, educational level and area codes, and codes to identify organizations at
a national level.

Finally, the highly centralized organization of governments in most developing
countries renders national data processing systems feasible. The importance of
standardized national systems for payroll, accounting, job classification and
so on in view of our severe shortage of informatics specialists should not be
underestimated.

2.4. Research and Development

There are many informatics projects that are too costly (with respect to the
expected return) for undertaking by any single organization while at the same

time being important as components of an infrastructure for informatics development. Due to limited resources and expectation for fast return of investments, the private sector normally does not get involved with such projects. This is in contrast to the situation in developed countries.

We believe that in informatics, as in many other areas of activity in developing countries, it is the government's responsibility to undertake such projects. Following is a discussion of some such problems which can be dealt with by the proposed Research and Development Committee (RDC) within IHC.

A nationwide data communication network for linking of various computer systems can have significant effects on the activities of organizations such as commercial banks and governmental sectors with regional offices. This in a good example of a costly project which can benefit a large number of users and the country in general by enabling extensive cooperation and sharing of resources.

Through the formation of regional service bureaus operating on a nonprofit basis RDC can be instrumental in providing computer services to organizations needing limited access to a large computer installation. Otherwise, these users may be forced to acquire their own computer system, thus creating significant idle capacity and compounding the manpower shortage problem.

Presently, major problems in communications with computers are caused by the unsuitability of the current technology of peripheral devices for dealing with Farsi script [1] . Promising technologies for this purpose do exist but the research and development costs have been prohibitive to manufacturers. Again, the whole country will benefit if RDC supports such research and development projects.

3. PLANNING FOR INFORMATICS EDUCATION

The proposed Council of Informatics Education (CIE) will in general be responsible for planning and coordinating all informatics educational programs at a national level. Before enumerating the problems that CIE will be faced with and some of their solutions, it is appropriate to review briefly the present state of informatics education in Iran.

3.1. Present State of Informatics Education

The present state of informatics education may be summarized by the three types of programs offered by (1) colleges and universities, (2) private institutions,

and (3) manufacturers and consultants. Each of these will be discussed briefly.

Very few colleges and universities offer degree programs in informatics. However, a small number of courses for non-majors as well as evening extension classes for retraining are quite common. The programs that do exist, usually do not follow a specific plan based on needs but are often developed around the interests and skills of a few full-time faculty members and part-time instructors.

The courses taught by private institutions are often low-level introductions to various programming languages. Such classes are formed either on an individual enrollment basis or through a contract with governmental (and occasionally private) organizations. The level of instruction varies drastically, even within the same institution, from one course to the other, depending on the availability of instructors. Unrealistic and misleading advertisements in the mass media have become trademarks of many of these institutions.

Classes organized by computer manufacturers and consultants address the specific needs of current users and potential customers. Many such classes may not be considered as basic training in informatics as they teach the sutudents techniques for performing specific tasks on specific machines. In the case of foreign consultants, the general tendency has been a lack of sufficient emphasis on educating their Iranian co-workers, for obvious reasons.

The above factors have contributed both to a shortage of needed skills on the part of informatics professionals and a lack of proper judgement and appreciation on the part of managers and high officials. Unfortunately, accurate statistics do not exist on the extent of this manpower shortage. Existing statistics classify people with drastically different backgrounds (from only one course to graduate work in informatics) as "computer experts." However, even these statistics clearly indicate the need for placing emphasis on informatics education in a broader scale.

3.2. Educational Programs and Structures

Part of the problems of higher education in this area are caused by the fact that informatics is not yet widely accepted as a scientific discipline in Iran. This is similar to difficulties faced by more developed countries a few years ago before computer and information science programs were established. Hence, computer science programs within colleges and universities are frequently

attached to departments where the students do not have the required motivation and abilities.

One main contributor to this situation is the present method of admission of students into colleges and universities which is through a centralized national decision process. Enforcement of uniform admissions criteria for each university, based on a small number of parameters, causes many motivated and capable students to be allocated to schools and departments of their third or fourth choices.

Retraining programs for governmental organizations suffer from a different problem. Frequently, employees with very little interst or motivation are sent for training just becauses so many people are needed. Also, in the selection process, a misconception exists that anyone successful at his present job is a good candidate for computer training. To compound the problems, the trainees are not provided with sufficient relief from their responsibilities in order to devote time to their studies.

Possible activities of CIE in the area of educational programs include studying, proposing, and maintaining appropriate courses and subjects for different educational programs (e.g., undergraduate, graduate, professional training) based on our national needs and priorities, encouraging (and possibly funding) publication of educational material, and promoting public appreciation of the potentials and limitations of informatics through the mass media and popularized publications [2].

3.3. Language-Dependent Considerations

Foremost among problems in this category is a serious lack of educational material for informatics in Farsi. The number of computer texts in Farsi is small and only a handful of them are of reasonable quality. Our resources are clearly too limited for writing books on all aspects of informatics. Translation of foreign sources is also impractical because of the dynamic nature of our field (books become outdated rapidly) and the formidable task of selecting the "best" book in each field of informatics.

The bulk of reference material in informatics is generated in English. Even though knowledge of a foreign language (mostly English) is a requirement in all educational environments starting with high-school, the level of proficiency is frequently not high enough for efficient use of manufacturer-supplied reference

material; after all, even native English speakers have trouble in understanding such manuals!

The shortage of Farsi-speaking specialists has created the need for using foreign instructors. In most such cases, the language barrier has proved to be insurmountable. A related problem is caused by the fact that educational programs modeled after the curricula at American and European institutions are not necessarily the best for our special environment and background.

Finally, severe educational problems are caused because of the use of non-uniform terminology which is a mixture of Farsi, English and other terms. The Language Academy is placing too much emphasis on proposing pure Farsi terms which are unfamiliar and are probably never used. The question of acceptance for the new terms, which is mainly psychological, has never been dealt with [3] . Instead, widely accepted terms have at times been discarded for not being pure Farsi.

Clearly, it is both proper and acceptable to use foreign names such as "computer" in Farsi. However, direct use of English verbs and constructs such as "de-energize" and "structured programming" in the middle of a Farsi sentence is quite unacceptable. We strongly urge that undue emphasis be taken from what words we use and be placed on rapid standardization of a reasonable set of needed terms, free from nationalistic biases. Meanwhile, thought must be given to the relative priorities of developing means such as Farsi programming languages versus the promotion of better foreign language education as a soution.

3.4. Conflicts in Interests and Aims

We have already mentioned some of the conflicts which prevent effective informatics education. Numerous cases of favoritism and other unlawful practices in all government areas have resulted in the enforcement of rigid laws which do not provide the desired flexibility. Promotions in governmental organizations are based on qualifications and certificates rather than accomplishment. The centralized admission of college and university students is another example of safeguards against inequity and is causing problems by allocating students to schools and departments for which they are not prepared.

Even though academic work is highly prestigeous in Iran, the financial rewards of the outside market is so tempting that few qualified individuals consider academic careers. Even those who work in academic institutions are in constant danger of spending too much time on outside projects which are of little academic

value. These conflicts can be handled by two complementary approaches: (1) encouragment and recognition of academic and research work; and (2) getting the universities involved with the industry through cooperative and consulting projects.

A similar conflict exists in the case of students. both graduate and under-graduate computer science students are sometimes tempted by the present job market and attractive salaries very soon after starting their work and, hence, either drop out or do not study seriously. Through research and development projects, students may be provided with on-campus jobs and research assistant-ships in order to enable them to devote more time to their studies.

Finally, a conflict now exists in the educational programs of our universities. On the one hand, students must learn subjects of immediate need in their jobs after graduation, which is usually at a very low level. On the other hand, they must learn about advanced subjects with no immediate application in order to obtain the necessary background for further graduate work in foreign countries. Clearly, the establishment of more computer science programs (especially at the undergraduate and junior college level) will result in specialization of each institution in one of the two categories.

4. PROFESSIONAL ETHICS AND ACTIVITIES

In order to maintain a high standard of work within the computing profession and to promote cooperation and exchange of ideas between computer professionals, we propose the establishment of the Iranian Computer Society (ICS). In the interest of impartial cooperation with all the organization and institutions involved with activities in informatics, ICS should be an organizationally independent unit. The aims and activities of ICS are discussed in this section.

4.1. Present State of Informatics Professionalism

The application of informatics technology, probably more than any other type of technology, has significant social and environmental impacts. Computer profes-sionals deal with or have access to huge amounts of information and the potential of misusing this information is an alarming one. Furthermore, the rate of tech-nical progress in informatics makes technical cooperation and exchange of ideas between experts a necessity. To compound the problems, lack of informatics know-ledge on the part of many managers and public officicals in Iran leaves them open to promises and false claims by opportunists who are taking advantage of the

current situation.

Professionalism in the field of informatics is virtually nonexistent in Iran. There is an abundance of self-proclaimed "systems programers" who have taken only a single course in FORTRAN or COBOL programming, high-ranking DP managers with little knowledge of data processing, and even university professors of computer science whose only acquaintance with computers is through writing large-scale application programs for their Ph.D. dissertation research. Thus the need for a professional society for informatics experts is established.

4.2. The Iranian Computer Society

An effort to organize ICS is currently in progress. What we will deal with here is a brief review of existing problems in the area of informatics in our country for which ICS may be expected to play a significant role in finding satisfactory solutions. It must be emphasized that we see ICS as an independent, non-profit scientific/technical/professional society similar in structure and aims to IEEE Computer Society and ACM in the United States and BCS in the United Kingdom.

Following the recommendation of ACM's Long Range Planning Committee [4] , we propose a division of ICS's activities into four Special Interest Areas:

SIA1 : Computer Science and Technology
SIA2 : Uses and Effects of the Computer
SIA3 : Computer Management and Personnel
SIA4 : Computer Training and Education

Whereas in the beginning, membership interest might be heavily concentrated in SIA2, we believe that eventually all four SIA's will have an equal share of membership interest and activity. We also believe that such a subdivision is fundamental in emphasizing the broad scope of ICS and avoiding the pitfall of attracting only academic and research-oriented computer specialists.

We see several important advantages in the rapid establishment of ICS. In the area of computer science and technology, ICS can be instrumental in the solution of specific problems caused by the application of an advanced and sophisticated science in a society with severe technological limitations. With respect to the uses and effects of computers, both our specific applications and unique social and environmental factors can be dealt with. As for computer management and personnel, involvement in certification programs and definition of responsibilities is foreseeable. Finally, in the area of computer education, ICS can

participate in short-term and long-term planning for training of our present
and future manpower needs as well as general considerations on the place of
informatics education in our present educational structure.

4.3. Scope and Means of Activities

As in other professional societies, the activities of ICS will be carried out
through various committees. The function of each committee, along with a list
of problems it will be dealing with, is outlined in this section. These commit-
tees, along with the administrative and membership committees which are not
dealt with here, will, of course, be in close contact and will cooperate in
every way possible in order to promote their common goals.

The Publications Committee will be responsible for the initiation of newsletters,
scientific journals, books, and other publications which may promote exchange
of information between members and the informatics community in general. At
present, the lack of such channels of communication is felt very strongly among
professionals in this field. This committee can also cooperate with CIE in the
preparation of publications of educational value.

The Technical Meetings Committee will be responsible for planning of lectures,
seminars, workshops, symposia and conferences in various informatics disciplines.
An annual national computer conference and exposition may form the main activity
of this committee. Again with a handful of specialized technical gatherings
which we have had so far in the country, the need for organizing frequent tech-
nical meetings is a serious one.

The Education Committee will be responsible for planning in the areas of infor-
matics education and computer-aided education. Close cooperation between this
committee and CIE is suggested. Considerable emphasis must be placed on short-
term training courses and certification programs for computer specialists at
various levels in order to promote professionalism in the field of informatics.

The Research Committee will be responsible for encouraging research activities
in informatics. The committee can cooperate with organizations responsible for
funding, evaluation, and recognition of research projects. Also, direct in-
volvement through presertation of awards and certificates is foreseeable. In
this way, the committee is hoped to be instrumental in getting computer pro-
fessionals involved in research activities dealing with our immediate computing
problems and basic informatics research in general.

Finally, the Industry Liaison Committee will have the task of promoting the exchange of ideas and expertise between scientific and industrial centers in the country. An important part of this committee's reponsibilities will be involvement in standardization activities in cooperation with the Standards Committee of IHC. This committee is hoped to be instrumental in narrowing the exceptionally huge gap which currently separates the academic and industrial sectors of the informatics community in Iran.

5. CONCLUSION

The problems enumerated in this report are direct results of two factors. First is the Government's dedication to computerization [5] , frequently without the provision of adequate control measures and overall planning. Second is the general interaction between a highly advanced area of science and technology and a developing society, unprepared to adapt and with serious manpower shortage. The Informatics High Council is proposed to essentially deal with the first problem while the Council of Informatics Education and the Iranian Computer Society are envisaged as dealing with the second.

We do not claim to have pointed out all problems. Neither do we pretend to have all the solutions. Our suggestions should be viewed as based on the genuine interest of two computer scientists who cannot help but feel threatened by a potential backlash resulting from the current situation. We can only hope that the present poorly planned and mismanaged projects will not affect the Government's enthusiasm to support future projects of fundamental importance.

We believe that only with immediate action we can prevent further damage and plan for significant progress in informatics development. Application of the informatics technology can have significant effects in the progress of developing countries, if only the priorities are established correctly and very early in the process.

6. REFERENCES

[1] Parhami, B. and F. Mavaddat, "Computers and the Farsi Language: A Survey of Problem Areas," Proceedings of IFIP Congress, Toronto, Canada, August 1977.

[2] Lecarme, O. and R. Lewis (Editors), Proceedings of the Second IFIP World Conference on Computers in Education, Marseilles, France, Sept. 1975, North-Holland, Amsterdam, 1975.

[3]   Rajabi, P., "The Invasion of Foreign Words in Farsi: Problem Statement,"
        Tamaashaa, Vol. 6, No. 281, 2 October 1976, p. 14 (in Farsi).

[4]   ACM Long Range Planning Committee, "Recommended Future Directions for
        ACM," Communications of the ACM, Vol. 18, No. 2, Feb. 1975, pp. 77-90.

[5]   Plan and Budget Organization, "Informatics in the Sixth Plan," Report of
        the Joint Committee for Planning in Statistics and Informatics, Informa-
        tics Division, Plan and Budget Organization, Tehran, Iran, February 1977
        (in Farsi).