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On the Problems of Information Technology Management in Developing Nations

Adnan H. Yahya[1]

Department of Electrical Engineering
Birzeit University
Birzeit, West Bank

Abstract

Many developing nations treat information technology as a high priority item in their economic planning. The pace of computer introduction and the span of computer-based systems are expanding rapidly. This emanates from the realization that information technology has a great potential for the economic development of third world countries. However, it is our view that the often poorly managed computer resources tend to complicate the decision making process due to the introduction of new uncertainties. The problems of the industrial infrastructure, personnel issues, political and social factors are important elements hampering the sound management of information technology resources in many developing nations. In this paper we study the manifestations of information technology mismanagement, the factors hampering the proper management in a developing nation context and point to some of the potential solutions to these problems based on the experience of several nations in this field.

[1]Address for correspondence:
Dr. Adnan H. Yahya
University of Maryland Institute for Advanced Computer Studies (UMIACS)
University of Maryland at College Park
College Park, MD. 20742.
Phone: (301) 405-6720
Fax: (301) 314-9658
email: yahya@umiacs.umd.edu

1 Introduction:

Computerization started at a fairly late stage in many third world countries. The distinct characteristics of the economies and computer markets of these nations created many problems for the introduction of information technology products. In many cases the economic returns of computerization are not evident and the process is frequently ill-planned and poorly managed[1].

Some of the problems facing efficient use of information technology in developing countries are objective. They result from, among other factors, the high costs of imported systems, the lack of trained personnel and deficiencies in the industrial infrastructure. On the other hand, we believe that many of the encountered problems have their sources in the way computer resources are managed. The unsound practices of computerization are a major factor delaying the introduction of computers into the various sectors of the economy of developing nations. In many cases, rather than utilizing information technology products to improve the management of other resources in different economic sectors, computers themselves are turned into another poorly managed resource. This mismanagement is evident on the various stages of the computerization process: hardware acquisition, software design and implementation and the running and maintenance of computerized systems.

In this paper we discuss the problems associated with information technology management in developing nations. We trace the sources of these problems and point to the possible solution paths. We argue that even with the restricted resources available, computerization can be much more successful and can give better returns on the frequently substantial, by local standards, investments allocated to information technology. To help understand the topics addressed in this paper we also give an overview of the characteristics of computerization in developing countries.

The material presented in this paper is based on the observation of the computerization process in the several developing countries[1, 2, 5, 7]. It is true that certain developing countries made substantial progress in absorbing information technology products into their systems and therefore some of the material may be less applicable to them. However we think that many of the concepts advanced here are of a sufficiently general nature to require attention.

2 Characteristics of Computerization in Developing Nations:

To appreciate the context in which computer systems and professionals function in a third world organization we give a brief summary of the basic characteristics of the computer market in these countries. The following are among the most important of these characteristics[5, 7]:

The hardware and most software components are imported from richer industrial countries. This usually means a relatively high cost of information technology products for end users especially in poorer countries and difficulties in system maintenance and running. The imported products often lack features necessary for their introduction into the local environment a fact that limits their use.

The small size of the market makes it sensitive to fluctuations in demand and supply, price rises, fluctuations in the job market and other unpredictable circumstances.

The weak industrial infrastructure including power supply problems and communication networks limitations. This results in added costs for power back-up systems and difficulties in accessing computers from remote locations or outside the regular working hours of the institution.

The limited connections and contacts between systems and users in the absence of networks and forums to address the encountered problems and the absence of publications in local languages to address the computer-related issues and especially environment specific matters not usually covered in imported publications[8] .

The lack of sufficient legislation on the intellectual property protection issues with the resulting anarchy in the market and excessive effort spent on copy protection of locally produced software products. Software piracy is rampant with the associated risks to the systems safety resulting from viruses and the ambiguity of the systems to the users[9].

A large degree of nonuniformity in the level of computer introduction and computer literacy based on geographical, economic and other factors are observed within a single developing country[1].

The structure of the spenditure on computing has its special features. At the system planning stage hardware costs are the dominant item and little attention and resources are allocated to software acquisition and service. The

structure of the running costs is usually dominated by the cost of service contracts, personnel training, hardware costs and consumables. Labor costs are usually much lower than their counterparts in the industrial nations.

It is often the case that computer systems are copies of their manual predecessors and do not exploit the full potential of computers. Little effort is made to design innovative and qualitatively new services using the capabilities of the available technology. Little use of direct input devices and machine-readable media leads to reliance on human data entry with the associated errors and need for verification of entered data which leads to further degradation in the overall system performance.

Computer systems are not utilized to a reasonable extent. The level of utilization of the system as a whole and its various components is not satisfactory. Very little utilization of CPU time is made. One usually observes bottle-necks in the peripheral devices. No proper mixing of jobs or preplanning (short or long term) to improve the situation is made. Often computers are running far below capacity. The norm is one shift a day. Not all potentially computerizable systems are automated. The computerized systems lack proper communications among themselves and have less than satisfactory interfaces to the user. Advanced technologies such as expert systems, decision support systems and others are rarely employed. Systems usually serve longer than their natural lifetimes with the associated higher costs of maintenance and operation and limited access to more modern systems.

Bad synchronization of computer systems acquisition and personnel training often results in systems not being fully functional during the first periods of their purchase covered by the warranty, a fact that results in added costs to end-users.

The effects of computerization on the staffing of departments is often unclear. It is not uncommon that after computerization an institution adds personnel to its pre-computerization staff to accomplish the same amount of work. Computer and manual systems may be running simultaneously for longer than needed periods, a reflection of the lack of trust in computerization.

The work of information technology departments is rarely evaluated on sound scientific and economic grounds. Therefore incorrect operation practices tend to linger for substantial periods. The limited evaluation performed is of qualitative rather than quantitative nature[12].

It is not only true that the structure of the organization is generally not

affected by the introduction of computers but the effect of computers and their role in this structure does not figure in the planning of computerization. This is reflected in the frequent shifting of responsibility over computer operations from one branch of management to another.

The roles of the different employees of the computer center is vaguely defined. Team effort is minimal and not well organized. Coupled with fast turnover of computer professionals due to competition this creates major problems to the organization as a whole.

Computerized systems follow the existing structures and patterns of data exchange and processing inside the organization. No objectives in terms of improving the overall efficiency of the organization are set for the computerization process. Little attention is paid to migration from one system to another.

3 Sources of Information Technology Management Problems:

While some of the sources of the problems encountered in managing computer resources in developing nations are of objective nature and are beyond the control of individuals involved in the computerization process the majority are subjective and can, in our view, be corrected at nominal costs to the interested party. Here we emphasize the latter.

3.1 Managerial Issues:

The lack of a common reference points for communications between computer professionals and management personnel due to the insufficient understanding of each party of the needs of the other and the potential and limitations involved is the computerization process. Management people often ask for systems with unrealistic characteristics and are usually reluctant to provide sufficient information needed by computer professionals. Computer professionals on the other hand find it difficult to understand the details of the functioning of the systems they intend to computerize.

The information processing departments are usually managed by people at the lower echelons of the organizational structure. Their decisions can be overruled by a large number of interested individuals and their ability to set

priorities for the work of the computer center is greatly limited. Computer centers are viewed only as service departments whose job is to respond *immediately* to any requests by the departments being served. Their role as centers for producing new, more effective computerized systems and improving the existing ones is often overlooked. This results in development activities being performed at the randomly available *free time* of computer centers. This time is always in short supply due to the poor quality of the existing systems, their ad-hoc nature and their need for continuous monitoring and servicing.

Management decisions on the computer operations are usually taken under conditions of severe restrictions on the availability of hardware, personnel training, software and servicing. The number of suppliers is very limited and the reliability of their services is unknown. The suppliers are characterized by their short lifetimes in business. Many of them are dependent on a very limited number of contracts and the termination of a small number of these contracts may mean going out of business for the servicing company. The absence of real competition reduces the quality of services offered. This is particularly true for the larger computer systems since the small computer market is dominated by a very limited number of suppliers of minis and mainframes[10, 12].

Restrictions on personnel movement and reassignment and the lack of adequate retraining programs for individuals affected by computerization limit the benefits of computerization to individual departments and entire organizations.

The extremely nonuniform and frequently unplanned nature of computer activities. It experiences peaks and valleys at the various levels: during the daily activities, during the weekly activities, and during larger periods.

The distribution of computer resources and assignment of priorities between the various departments is a reflection of the power structure within the organization rather than the needs of specific departments.

The amount of attention granted by the higher administrative echelons follows an unsatisfactory from our point of view pattern. Despite the fact that the running costs of the computer center are much larger than the costs of initial hardware acquisitions (our estimates 30 and 70 percent respectively), close attention is paid only to major hardware acquisition decisions. Outside the short periods during which these decisions are made, practically no control is exercised over the operation of the data processing departments. Even major software acquisitions and decisions on computer center policies

receive marginal attention of the higher management.

The prestige associated with computers and the expanding use of computers lead to a state where no distinction is being made between computer professionalism and regular computer use. Skill in using a certain software package is frequently interpreted as manifestations of computer professionalism. Major policy decisions and large systems designs are often based on this misconception and the advice of nonprofessionals. The result is the creation of systems that do not meet the basics of correct design (for example systems with vast storage requirement as a result of underestimating the memory needs of indices, or the purchase of obsolete hardware.)

3.2 Education and Computer Literacy:

The educational system rarely has programs in Management information systems (MIS). Management of computer resources is not usually a part of the educational programs of computer professionals. Graduates of management programs lack substantial training in data processing or the peculiarities of managing information and computer systems. As a result a situation developed where both the staff of computer centers and the people higher up in the administrative hierarchy lack the necessary skills to efficiently manage the activities of the computer center.

Poor documentation is the norm. Word of the mouth frequently serves as the only description of the properties and operating procedures of fairly complex systems. Not much distinction can be made between advertising brochures and technical manuals. One of the reasons that this is acceptable to users is the widespread use of pirated software without (the relatively costly) documentation. This, with other factors lead to major difficulties in maintaining the existing systems and introducing any modifications to them. The modifications are very costly and frequently result in the violation of data integrity in the system due to failure to introduce changes wherever they are needed for a particular update. Another consequence is the uncalled for reliance of the organization on the individuals who implemented the system especially in view of the common practice of having a single individual responsible for all the stages of system design and implementation. As a result the practice of scraping the whole system and replacing it by a new one is fairly common.

3.3 Computer Policies:

Poor national standard maintenance policies result in the incompatibility of systems implemented by different vendors. Even the inadequate existing requirements on man-machine interfacing are usually ignored with the resulting systems being hard to deal with.

Only internal resources are taken into account in decisions about product acquisition. Access to external equipment and systems and collaborative arrangements are rarely considered. This particularly applies to large computer installations, backup facilities, system evaluation results and research and development efforts on localized applications.

The sequential nature of the planning and implementation processes and the absence of any strategic planning. It is often the case that parts of the computerized system are being implemented before other (may be strongly related) parts are studied. This leads to overlapping and incompatible systems. The last stage which is usually devoted to the integration of the various system components becomes very difficult and mandates major changes to already developed subsystems.

The absence of a national or even regional policies for computerization and measures to guide the acquisition of information technology products by various institutions despite the large spenditure in this field. The lack of a national strategy to develop the infrastructure necessary for reliable and economical functioning of information technology products and to govern the cooperation between various organizations in this area. The absence of a national effort to organize forums for information exchange and knowledge dessemination on the national level. All this leads to the adoption of incompatible systems lacking the ability to communicate with each other and duplication of research and development efforts and errors in different institutions.

3.4 Market and Infrastructure:

The small size and volatility of the computer market limits competition and works to lower the level of services offered. Large numbers of computer companies starts and failures with the associated movements of personnel introduce an element of uncertainty which tends to have major psychological effect on potential computer users. The unfair trade practices are a factor in

this regard.

The rampant software piracy and unfair trade practices resulting from the absence of effective legislation and law enforcement in this area created a distorted picture of the relationship between the various components of a computerized system in which software and training are often treated as a free bonus for hardware purchases. This lead to the unwillingness of enterprises to invest the in software acquisition especially at the earlier stages of computerization.

The unreliability of power supply and communications systems create major problems to computer users. It adds to the operational cost and reduces the utilization of systems by limiting the access.

The relatively high cost of system acquisition and maintenance is often a limiting factor in decision making processes on information technology issues.

4 Possible Solutions:

We believe that much needs to be done to correct the current state of affairs in the management of computer resources to turn computerization into an economically viable venture for developing nations organizations. The following is a discussion of the things that can and need to be done in this regard:

4.1 The educational process:

We believe that education is the single most important component in improving the management of information technology in a third world context. This includes:

The inclusion of courses on information management in the curricula of computer science students at least as an option to guarantee that at least some of the graduates are familiar with the basic principles of managing information technology. An effort must be directed to familiarize the future computer professionals with the issues dealing with the local environment[11]

The inclusion of basic computer literacy material into the curricula of management schools to have appreciation for computer potential and limits, of law schools to ensure the familiarity of members of the judiciary with

the peculiarities of computerized systems so as to be able to deal with cases involving software piracy and other computer crimes[9].

There is also a need for continuing education programs for administrative staff and other members of society on the basics of computer literacy. The introduction of computers into the school system is an efficient way to educate the general public in this area. Of course the material offered must be carefully tailored to ensure the adequacy and broadness of material presented and its relevance to the local environment with a particular emphasis on the societal implications of the widespread use of information technology products as well as the ethical considerations involved[12].

4.2 The legal system:

In addition to education, legislation needs to be enacted to protect the rights of all individuals and bodies involved in the use of information technology. This includes measures to protect the privacy of individuals and to outlaw illegal access to data and unauthorized tampering with it, measures to protect the intellectual property in the computer field, and measures to regulate the trade practices in the computer market and protect users against fraud by computer companies.

Measures must be taken to ensure compatibility between legislation on computer related matters to avoid creating loopholes that enable violators avoid legal action. This is especially important in view of the global nature of potential computer crimes and the accessibility of information technology products from remote locations[11].

4.3 Computer Policies:

A need is evident for cohesive computerization policies on the regional, national and organizational levels. These can take the shape of guidelines for system acquisition and operation, steps to encourage cooperation between the various interested entities to share the costs of research and development, backup facilities, the creation of the necessary infrastructure, the creation of forums to exchange information and ideas on information technology products and their potential impact such as conferences, workshops and publications, to regulate the standard development effort to ensure compatibility of

resulting products and evaluate the various experiences gained. These policies must be supervised by the higher levels of concerned national institutions and must be accompanied by measures and incentives to ensure adherence to them by all the participants in the computerization process. The creation of centers of excellence where successful computerization experiences can be displayed can play an important role in countering the widespread misconceptions about computers being the sources of major inefficiencies and mistakes. Experiences of other nations in this area can be of great value[4]

In all this international cooperation is needed to protect the rights of the different participants of the computerization process. This can be motivated by the global nature of computer networks and the large cross-border trade in information technology products and exchanges of information, professionals and specialized publications.

5 Conclusion and Remarks:

It is difficult to overestimate the role of information technology to the economic development of third world countries. Information technology can become a productive economic sector especially in those nations with large numbers of highly qualified university graduates[1, 2]. The successful incorporation of computer products is vital for the efforts to catch-up with the technological development taking place in the world and can be an important factor in improving the economic status, the educational and health care systems for the rapidly growing population. Unsuccessful computerization effort can widen the technological gap between the industrial and developing nations and deepen the reliance of third world countries on the industrial nations not only for the hardware and systems but also for the information badly needed for their economic development which is very likely to be stored in databases maintained by the richer nations.

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