# Global Information Systems: Problems, Solutions, and How to Manage Them

**ABSTRACT:** The rapid changes in Information Technology (IT) have helped U.S. companies grow into Multinational Corporations (MNCs) and have been the driving force in the building and operation of global Information Systems (IS). Present training in the U.S. in Management Information Systems (MIS) has focused on building the IS within the country. When MNCs expand the IS globally, a whole series of new problems must be faced. These include different cultures, languages, currencies, laws, as well as the amount of money spent on IS and IT. Different levels of competency are found in different countries and both IS and IT education may vary greatly.

In order to solve these problems IS managers must begin to think globally, yet become more aware of each local situation and be willing to accept a less than perfect solution. Top management of MNCs must be aware of the strain that is placed on the IS manager who has to solve these problems while coping with the constantly changing IT and yet must build an IS that will keep the company competitive.

Educational reform is needed to meet this challenge. Multinational corporations, rather than domestic ones, should become the norm for all management studies. IS managers will tend to be less technical but must then have help from both technical and legal assistants.

**KEYWORDS:**. *Global Information Systems, Information Technology, Multinational Corporations*

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## INTRODUCTION

The majority of the world's large corporations are now engaged in international business activities and many are earning a good share of their profits from these activities. Firms so engaged are forced to find problem-solving techniques which are unique to global business activities. Information technology (IT) is playing an increasingly significant role in the worldwide marketplace. New technologies have brought radical changes in organizations, and management must learn how to handle the organizational anxieties which this brings as well as how to use the proliferation of data effectively. Many businesses, such as airlines and financial institutions, rely on global information networks. Curricula must be developed which address the international dimensions of global information systems (IS) and, by association, address the constantly changing IT upon which the IS depend. Globalization and advanced technology have a large impact on the way global business is conducted and will require changes in both management and organizational thinking for success. How new IT and IS are used in the global marketplace may mark the future success or failure of the global organization.

International business will be defined here to include any business activity which crosses national borders. In particular the paper will deal with U.S. multinational

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corporations (MNCs) that have one or more foreign affiliates or production facilities which are involved in international management in Europe. The scope of Management Information Systems (MIS) in MNCs will provide the global link with subsidiaries, suppliers, customers and competitors.

Many U.S. firms evolved into MNCs over time. This may have begun with orders from abroad. As these orders increased, marketing departments established sales offices abroad. As this market grew, firms may have begun overseas production or services. As business continued to increase, partial or autonomous subsidiaries were established. Finally, in order to take full advantage of their position, firms try to coordinate all their operations through a global IS. Telecommunication networks are set up which connect a MNC's sites both nationally and internationally. These networks act as data highways linking the firm to both their suppliers and customers wherever they are located. The IS manager must be aware of these linkages and the many factors that affect the transfer of data.

In the 1970s many U.S. MNCs allowed a great deal of autonomy to their foreign subsidiaries. Some subsidiaries evolved independently to serve local needs, and this frequently resulted in the use of local hardware and software. These local IS bore little resemblance to one another or to the IS back in the U.S. In some cases the only information shared was high-level financial information. In the 1980s some U.S. NMCs began to seek greater efficiency in their global IS. The firm began to impose corporate-wide IT on all its subsidiaries. For some companies this headquarters-driven solution brought about some reduction to IT budgets yet it did not overcome all the difficulties and gave little

motivation for improvement. Later, control was returned to the local subsidiaries and central headquarters used incentives rather than controls to develop an efficient system. Finally, pressure from global customers for more consistent global service became the key for a common system. A worldwide architectural plan was drawn up, and hardware and systems software compatible with the hardware were installed for all. Applications software may differ, but common reports are customized throughout the whole system. (1)

## PROBLEMS

When a company builds an IS in the U.S., management is dealing with a single language, a fairly homogeneous culture, one set of government regulations for a well developed infrastructure, a common currency, a fairly common educational system, and a single geographic area. When that company moves into the European area, management now faces multilingual and multicultural climates, many different governments with different regulations and political systems. It also finds different currencies, multiple time zones, and many different approaches to IT and IS education. Adding to the difficulties of MIS is the rapidly changing technologies within both the computer and telecommunication industries. For managers to be successful they must not only be able to cope with present situations, but also be aware when newer technology is needed to enhance the operation of a global IS. A managerial position under these circumstances is a high risk venture as new technologies must be implemented in order to keep up with information needs, although top management may question the increased expenses. (2) When a firm enters the global market, all managers have to cope with severe strain on the organization, but the IS manager is expected to alleviate many of the problems while facing all the technological problems globalization brings. (3)

The rapidly changing role of the IS manager in an organization will demand a different type of Chief Executive Officer (CEO) in MNCs. The CEO will have to change from local or national strategies to international ones to meet increased international competition through advancement in technology and the speed of change. (4) Going global imposes severe strain on the managers who must cope with it, but more so on the IS managers. They are expected to knit together the fabric of global telecommu-

nications while facing the problems of organizational and technological change. Global business systems often fail, not because technological solutions are not available, but because critical international issues are not

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fully understood and adequately addressed. Issues dealing with transborder data flows may mean that MNCs will have to train IS managers to insure that the firm complies not only with U.S. and European national laws but also with international laws. An ethical approach to this multitude of regulations must be strictly adhered to.

One of the first differences MNCs must examine are the cultural differences between the U.S. and Europe. The European market is not a homogeneous one, and, by and large, the national characteristics in Europe are more important than transborder characteristics. MNCs entering the European market must put as much research into their entry as they would if they were entering a new U.S. market. (5) Europeans are more aware of the cultural differences in Europe than Americans are. American management has operated within the culture of a "melting pot" nation and does not always understand the differences among European countries. Management styles as well as workers' attitudes differ from country to country. European workers, even those with the shortest paid vacation, have more time off than their counterparts in the U.S. The U.S. MNCs are much more technically driven than are European firms. The U.K. typically lags a year or more behind the U.S. on new technology. (6) Professional workers in Europe are usually bilingual and are surprised that U.S. professionals frequently are not. European managers tend to be much more formal than Americans and do not tend to manage by phone, but prefer to put orders in writing. Europeans tend to stay in their home town or city and do not like to be transferred away from their native area. (7) Europeans are aware of the fact that in any large organization they will be dealing with people from neighboring countries

and, therefore, with other languages and cultures. Some Americans feel that Europeans do not show as much urgency to get things done as quickly as Americans do. Europeans tend to stand around, discuss the situation and then gradually begin to work on a solution. (8) In the U.S. if computer response time begins to slow down, management will try to solve the problem by acquiring a larger mainframe. In the U.K. management tends to put more emphasis on cooperative processing solutions with more input from the users. (9)

From an economic point of view one of the first factors to examine is the difference between different levels of IT investment across the European continent. These range from a high of 4% of its gross domestic product spent on IT in Germany to a low of 2.5% in less industrialized countries such as Greece and Spain. U.S. managers cannot assume that levels of IS ability, experience, or practices across Europe will be uniform. German companies spend a large percentage of their IS budget in outsourcing (turning over some IS operations to third party operators) or in using packaged products. In the U.K. companies still spend a great deal of time and money on in-house IS solutions. Different bookkeeping methods and data definitions abound in European countries. Customer information and credit-rating is collected on different basis in different countries. German filings of company information are for tax purposes while British filings are for stockholder protection purposes. Presently it is necessary to create a system that has the flexibility to handle multiple currencies as well as different tax regulations and reporting procedures. Within the European community there has been great uncertainty regarding a single monetary unit, and opposition has come from the U.K. and the Netherlands. (10) Other economic factors that must be evaluated are the wide range of salaries, the differences in the cost of living in these countries, and the differences in the tax structures.

Consideration must also be given to the political and legal differences among European countries. A major stumbling block is the national or regional Postal, Telephone and Telegraph Authorities (PTTS). The PTTS are very strong organizations and can set their own rates for IS use which may vary greatly for U.S. companies in a country. (11) Many MNCs are encountering obstacles from the existing national infrastructure for telecommunications

including cost, transborder data regulations, international standards and vendor support. Legal restrictions on the transfer of data from one country to another may pose problems. (12) In dealing with the PTTS in different countries, the level of technological development and the issue of standards must be taken into account. Since the 1980s a system to connect exchanges within the telephone system, T-1, has been commercially available in the U.S. More recently Integrated Services Digital Network (ISDN) has become the carrier as this technology integrates voice, video and data of all types for transmission. Even as the ISDN technology is being implemented, doubts have arisen about its effectiveness. More recently a new technique, known as Asynchronous Transfer Mode (ATM), has become the new network hope for multimedia transmission. (13) At the same time five European carriers from the U.K., France, Germany, Spain, and Italy have agreed to build a pan-European ATM network to provide high speed services for MNCs. (14) These developments promise to connect local area networks (LANS) and wide area networks (WANS) which connect computers. (LANS and WANS are usually distinguished on the basis of the distance over which they operate.) When these networks are to be maintained using communication technology, then some type of standard has to be developed. At the present time IBM has set up its IBM Systems Network Architecture, Digital Equipment Corporation set up its own Digital Network Architecture, the U.S. Defense Department uses ARP net Protocol TCP/IP, and others use an American National Standards Institute (ANSI) communication control. The U.S. MNCs hope to have all of these fit under the International Standards Organization's Open Systems Interconnect Standard (OSI). The purpose of OSI is to describe a network architecture capable of interconnecting different types of computers, networks, and communication technologies into an open or integrated network. Unfortunately in Europe there is disharmony, invisible barriers and administrative restrictions set up by different PTTS along with the impact of massive deregulation of PTTS in Europe. To add to the problem, the European Telecommunications Standards Institute (ETSI) has set up a policy that requires computer companies to sign away fundamental legal rights to their intellectual properties. The ETSI is a private organization of dues-paying members, but it

is funded by the European parliament. IBM has refused, calling this document compulsory licensing. (15)

Another serious problem is data privacy in transborder data flows. Data privacy laws focus on automated systems. France has a law limiting private or governmental decisions based on automated data. MNCs may wish to build large databases which need information that will not be recorded on any balance sheets but will be needed to make informed decisions. In Sweden all public and private organizations must register their databases and are restricted from sending out of the country certain types of data relating to individual citizens. National data protection laws may vary significantly in their enforcement. In the U.S. enforcement is accomplished through self-compliance and reinforced through judicial action if a violation is detected. In Norway an administrative commission has the authority to issue licenses to organizations that collect data in automated systems. In the U.K. there is an enforceable code of ethics and conduct. There is the further problem of the distinction between a real person (a citizen) and a legal person (a corporation). In some European countries data privacy protection is extended to both real and legal persons while in the U.S. and some other countries it is not. The inclusion of the legal person in data privacy laws could reduce U.S. competition in information goods and services in Europe.

Software programs have not been standardized internationally. Many different word processing programs are in existence. The same is true for spreadsheets and for computer languages. The American Standard Code for Information Interchange (ASCII) has been the standard in the U.S. for some time and is the way some computer languages were exported internationally. However, ASCII is based on the English alphabet and on symbols used in the U.S. It leaves out the pound sign for the U.K. and leaves out accent signs used in many European languages based on the same alphabet. It does not take into account any variations in the English language noun/verb constructions when the native language is other than English. The use of computer languages not based on the English alphabet means that more standardization would have to be developed. Many software packages have different licenses in different countries which make them difficult to manage in a global IS.

It is also important to look at the background of Europeans who are employed in IS. Many have been trained as computer scientists with little training in management. In the U.K. many institutions of higher learning have been increasingly concerned with computer education. Very little attention has been given to IS education. The result is that the number of IS specialists is badly out of balance with the need. (16)

Much different is the history of computer education in Ireland. During the past decade Ireland has moved from a traditional society emphasizing farming and domestic markets to one whose economy is now heavily dependent on IT. Ireland is representative of a society which is moving from an agrarian to an information economy. Ireland's history as a republic when it was partitioned from the industrial north, left it without an industrial base. In the 1960s through the work of the Industrial Development Authority, foreign firms that were not dependent on natural resources were attracted to the country. Among these were several electronic firms related to the computer industry. In order to better serve these firms the government significantly upgraded its telecommunications network with satellites and fiber optic technologies. At the same time, the government changed some of its traditional approaches to higher education. The university had as its principal focus a classical education, and, because there was little or no industry, there was no vocational education. The government was able to establish a series of technical colleges to support an information economy. The government also created two new universities, the University of Limerick and Dublin City University, whose focus is on technical and professional education. Students are offered degrees in computer science, computer engineering and in IS. Both universities have added an international dimension to their programs, have an exchange program with some continental universities and have strong emphasis on the study of foreign languages, cultures and economies. This is important, as the country is small, and any start-up company must enter the international market at a much earlier stage of corporate growth than companies in the U.S. One result of the educational change has been that MNCs, such as IBM, have located software development groups in the country and the information processing activities of many U.S. and European MNCs in insurance, publishing,

and financial services are also located there. Now the young IS professional who emigrates may do so to gain work experience before returning to work in Ireland. (17)

Throughout most other European countries most of the attention in computer education in universities is focused on IT rather than on IS. Many of the computer courses are housed in the engineering schools or, if offered in the business school, are taught by engineering faculty and are listed as IT. (18) IS education in many developing countries in Europe is not focusing on globalization but is using local case studies to look at the management process to insure local relevance. However, because of the presence of some MNCs in their country, they are becoming more aware of the need for global IS education.

## SOLUTIONS

The world of business has changed drastically with the increase of global competitiveness, and MNCs have been forced to develop global IS to stay competitive. How the company structures and manages that IS may determine the success or failure of the organization's future in the global economy. Managers of IS must begin to think in a global context which could mean following the general principle of thinking globally, acting locally, and implementing sensibly. Executives have seen domestic implementation of IS fail because the approach did not address the user's particular circumstances, needs and mindset. MNCs must be aware of the magnitude of developing a global IS with multiple economies, diverse cultures, different educational backgrounds, different languages, different currencies, and different levels for absorbing the new technology. A foundation for achieving success with a global IS is to establish a relationship which would include accepting less-than-perfect solutions in some countries that collectively create a successful global IS. (19) This compromise solution accepts the fact that different levels of technological implementation, workable local solutions, and sensitivity to people in each area can bring about an acceptable situation for global competitiveness.

MNCs usually set up organizational standards, that is, a set of rules or policies governing the characteristics of data, software and/or hardware that the firm may purchase, develop or maintain. This would include a global data dictionary for all to follow. When starting on an organizational standard, man-

agement should ask the following questions.

1. What benefits and costs should be anticipated?
2. What systems and technologies should be subject to standardization?
3. What factors determine the overall success of this effort?

After determining that standardization is worthwhile, management should decide on the systems and technologies that are amenable to standardization. These could include vendors, network hardware and protocols, operating systems as well as the network operating system, languages, CASE tools, applications packages, database management systems, and data architecture. Management will face certain hurdles in setting up this procedure. Software vendors may not support all the languages that the MNC desires. Hardware standards may be different for languages not using the English alphabet. Differences in laws, regulations, accounting practices, and other regional or national laws may make software customization necessary in some countries. New versions, such as Pan-European accounting systems, may help to lessen these differences. However, they are expensive and must be updated frequently. (20)

## WHO MANAGES THE GLOBAL IS?

With the introduction of a global IS into a MNC there is a need for a top-level information executive. This position, Chief Information Officer (CIO), should be separate from other executive positions. The role of the CIO is a high risk position since it is closely tied with IT. As advances in IT occur, new opportunities are created for global IS, but new pitfalls may arise also. Introduction of new IT must not only increase the flow of information, but also increase the competitive edge of the company. At the same time, the cost of new equipment must be justified by increased profit. The CIO cannot realistically be expected to be a top flight technician as well as a top-flight manager. In order to manage the global IS, the manager must be concerned about the information and how it is shared and used. The management style should be person centered and innovative, making use of video, voice, and data as well as computer information. Managers will find that building IS outside the U.S. is much more complicated than it is at home. There are significant differences in price, quality,

choice of services and installation times in each European country. Related concerns are how the system can be modified, what service contracts cover, and how two countries can be connected together. Managerial concerns must also cover software copyright, database usage, data protection, privacy, security, and health and safety regulations for hardware. For large MNCs beginning to set up a global IS, the best source of help for IT problems would be to hire, as a consultant, an international service carrier familiar with the foreign market. Hiring a U.S. firm with a good domestic record would not necessarily be the solution, but rather an international firm with foreign nationals or citizens as its representatives is needed. The foreign perspective must be addressed, and the best way to do this is to involve local people who are aware of the local situation. (21)

The type of organization will have a great deal to do with the way the MNC sets up its global IS. International experience has shown that manufacturing firms tend to decentralize their data processing operations when starting out. As their systems mature, these firms begin to move toward centralized systems for those countries that have similar characteristics in order to operate under a more centrally controlled system. By contrast, service organizations find it much more efficient to create centralized systems immediately. They can link all of their workers together if the IS is standardized. However, IS staff members may have to make some accommodations due to time zones. Successful centralized service MNCs have found that limiting their operations to one system vendor and one network service vendor has helped to make the global IS successful. (22)

## EDUCATING FOR GLOBAL IS MANAGEMENT

Curriculum specialists will continue to argue over both where and how global IS management is taught. Good arguments can be advanced for a separate course in Global IS for Computer Information Systems undergraduate program or in the Management Information Systems graduate program.

A slightly different approach is suggested here. Up to this time the domestic organization has been set as the norm for management courses. As we approach the 21st century, it is time to change that outlook. Given the widely recognized growth in international activities for a growing member of U.S. organizations, it seems to be

time to change the norm from the domestic to the global. Management should be able to build a model of the organization that would embrace all of the international issues that make it relevant to the entire world. This model would focus on common characteristics of all organizations for many countries, industries, and organizational structures. The differences that exist among these organizations can be treated as variations among a common set of variables. With this perspective a strictly domestic firm becomes the special case. (23) This strategy would have business school students introduced to global organizations in their management courses. Topics such as the changing international business environment because of cultural, legal, language, monetary, ethical, and political differences could be treated in management courses. At the same time part of the CIS courses could deal with topics that are specific to IT management that will enhance the efficiency and effectiveness of the global organization. Topics here include integration of technology and international standards, transborder data flow restrictions, postal telephone and telegraph monopolies, telecommunication infrastructure including price and quality, data security, and vendor selection. At the present time there are some global case studies (24, 25, 26 & 27) that could be used to enhance these topics. Incorporating a real world dimension into this program could be done by inviting speakers from the business community who work with global IS. The CIO of the global organization would then be able to focus on two main topics: management of the organization and management of the relevant technological issues. At the MNC headquarters the CIO would need two top-level assistants, one for the management of people and a second, more technical, assistant to deal with the technology. For the overseas headquarters the management approach would be different. As global organizations begin to centralize their system in culturally similar areas, the top manager should be from the domestic homefront. There are two major reasons for suggesting this.

1. Major problems in dealing with PTTS overseas often involve ethical issues. The headquarters policy on ethical issues would be clear to a manager from the home front and the manager would be expected to adhere strictly to that policy to prevent any problems. (28)

2. Many problems that arise in MNCs overseas must be solved in the framework of the company's home policies. These decisions can best be made by a manager with home experience. (29)

The overseas manager can then surround himself with a team of local experts to handle local issues. The team would include a legal assistant who is familiar with local laws for software licenses, transborder data flow restrictions, local service contracts, and vendor contracts. A second assistant, with a technical background, could handle the constantly changing IT and deal with changing standardization policies.

The danger of having a single IS manager for a global network should be made clear in business courses. The manager must have some technical background but it should not interfere with the job of making sure that the global IS is producing the information to keep the organization competitive. Train IS managers to think globally, act locally and implement sensibly.

## SUMMARY

The use of global IS has brought about a new level of global competitiveness. Many MNCs have been able to develop a transnational information technology-based strategy but have encountered many obstacles when trying to implement it. The fault frequently does not occur because of problems with the technology but because the critical international issues are not fully understood, or adequately implemented. The international issues are often overlooked while emphasis is placed on the technical implementation.

American Schools of Business are faced with the problem of creating a curriculum that will meet the needs of a rapidly changing world market. In order to implement global IS, future managers must be able to address the many variables when moving from a U.S. based IS to a global one. In order to accomplish this, management courses must move from domestic to global organizations as the model for the business organization. An International Information Systems and Technology Course should be added to the undergraduate program and finally, with help and the sponsorship of MNCs, graduate students should spend a semester at a European University where they will be able to live in a foreign culture, learn some of the language, and study the management styles of Europeans. American Schools of Business have done a

good job of educating for U.S. IS, but now is the time for them to move on to global IS education.

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