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# Factorial management of global information systems

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## ABSTRACT

*The growth of worldwide competition and expansion of business markets especially in Eastern Europe and the third world have triggered several formidable problems for the global information systems (GIS) manager. Numerous multinational corporations have failed to meet their objectives beyond their national borders. This study identifies the major recurrent problems and critical influencing factors, discusses their symptomatic characteristics and impacts on the corporate business and information systems management, streamlines appropriate recommendations for combating each problem, and finally, develops a matrix of factors, characteristics, domain classifications, and suggested recommendations for easy reference for managers.*

## INTRODUCTION

The information explosion, coupled with technological advances and the increasing globalization of the world economy, has fostered the continued growth of transnational organizations (Barlett & Goshal, 1989). Numerous organizations, for strategic advantage, have already become involved in multinational businesses, carrying their businesses across their borders. Even many more are planning to do so in the near future (Keen, 1989; Flynn, 1994). Tremendous opportunities, therefore, have been created for many organizations, and formidable hindrances have been amassed against others. Business failure rates among these transnational organizations have increased. What are the impacts of business globalization on the multinational corporation (MNC) in general, and the global information systems (GIS) management in particular? A GIS is a distributed data processing system that is spread in different countries. A few recent studies indicate that GIS managers are fast resorting to client/server (C/S) technology for effective implementation of GIS (Flynn, 1994; Kizior, 1993). Looking for new cost effective implementation of multinational IS, to maintain central control at business headquarters while providing for flexibility to adapt to local business culture(s) reminiscent of multinational business activities, the IS managers found in C/S a solution. How can an IS manager successfully implement a C/S-based information system in a global environment?

When a company goes global, management begins to face additional problems. It begins to face multilingual and multicultural climates, different legal systems and governmental regulations, different political environments, and widely varied bureaucratic processes. It will find different currencies, multiple time zones, and many different approaches to business information systems implementation and education. When a firm enters the global market, all managers struggle with the severe strain on the organization. However, it is the GIS manager or management information systems (MIS) professional, who additionally is expected to alleviate many of these organizational problems generated by the globalization initiatives. Adding to the difficulties of C/S-based MIS is the problem of rapidly changing technologies within both the computer and telecommunication industries. The infancy of the C/S technology also complicates the situation even further. The would-be successful managers not only must be able to cope with present problems but also must know when new technology is needed to enhance the operation of a GIS.

### **PURPOSE AND METHOD**

This study will focus on identifying the factors at stake to managers in the effective implementation of global C/S-GIS among the MNCs. These factors will be examined in four broad categories or domains with respect to their impacts on business and IS management, namely: general management factors, IS management factors, cultural factors, and environmental factors. Based on the identified problems and factors, the dominant factors, and the results of the factor analysis, this study will streamline a set of recommendations for managing these critical factors, to enable a successful IS implementation and management in an MNC. These recommendations will enable C/S-GIS managers and professionals to adequately deal with these very recurrent problems and factors. It is postulated that through the identification and analysis of these factors, the MNC IS managers will become more aware of them. Additionally, the C/S-GIS implementation and management guide will enable GIS managers, who are exposed to it, to become fully equipped to deal with these factors which can sometimes be the sole factors that determine the success or failure of a global business venture. If the C/S-GIS managers are adequately prepared to deal with these factors, C/S-GIS implementation costs and global business failure rates will certainly be reduced.

### **SURVEY OF LITERATURE**

For their inherent advantages, C/S systems have, in an unprecedented manner, rapidly swept the IS implementation and operation in businesses in many parts of the world. Several recent studies indicate that more and more businesses have either implemented or are planning to implement C/S systems within the next few years (Anyanwu, 1994; Schultheis, 1994; Kim et al., 1995; Aggarwal, 1994). This C/S growth has, to a large extent, been limited to national business operations (Anuanwu, 1994). However, as corporations compete in international markets, attention has begun to shift to the utilization of C/S technology to enhance competitive advantage beyond the national borders (Schultheis, 1994). Now, a large number of these organizations are

embarking on global business initiatives (Flynn, 1994; Aggarwal, 1994; Kizior, 1993). Furthermore, there is a growing recognition in the literature that managing IS in an international environment poses unique and difficult challenges (Cash, 1992; Deans & Kane, 1992; Khosrowpour, 1995). Companies want their managers, usually referred to as decision-makers, to understand the needs of the global customer and the global environment early in their careers (Aggarwal, 1994). Numerous studies appear to cluster their data analyses along two concerns: the importance of globalization in organizations and the role of the information technology in its management, and the corresponding reflection of this internationalization in the business school curricula (Hedlund & Rolander, 1990; Omaha, 1989; Reich, 1990; Senn, 1991; Stair, 1992; Thurow, 1992). Additionally, beside the Data Processing Management Association (DPMA) and the Association of Computing Machinery and Institute of Electronic and Electrical Engineering's (ACM/IEEE) emphatic recognition of diversity (an inclusion of global characters of business) in business/IS curricula, the Association for the Accreditation of Colleges and Schools of Business (AACSB) in its April 1992 report on standards for the accreditation of business schools and their curricula, clearly underscored the importance of ethical and global factors in business curricula. While the two biggest barriers to C/S system implementation in 1993 were tools and skills and retraining, in 1994 the two biggest barriers were systems management and management of change, according to users at the 1994 Uniform Technology Managers' Conference sponsored by Hurwitz Consulting Group, Inc. (Alper, 1994). This shift of problem perception to IS management underscores the increased concern in this area. Some of the current factors in the literature include: communication, decision making, data, and management, technology being the driving and enhancing force in all four barrier areas (Aggarwal, 1994).

### CRITICAL INFLUENCING FACTORS

The distribution of the numerous end-users in a myriad of transnational organizations across the national borders is often uneven with respect to the end-users' socio-cultural heritages, political affiliations, legal and economic environments, and levels of technological know-how. In their attempt to develop, control, and directly use the information systems, these users interact among themselves and with this complex variety of systemic differences. This uneven mixture of end-users increases the complexity of the problems traditionally faced in the management of end-user computing, namely, information integrity and security, information privacy and accessibility, and information management effectiveness. In addition to these traditional factors, there are a few contemporaneous and increasingly recurrent factors. Based on literature, these emerging factors include cultural variety, user needs and satisfaction, information management effectiveness, communication ineffectiveness, economic volatility, regulatory standards, resource availability, host country expectations, network and system security, and system outsourcing. Interestingly, these factors can be either business hindering factors or motivating ones, and some can even be both depending on how they are managed. Following the discussion of each factor, a recommendation to the C/S-GIS manager is made as to the more effective and safer control approach to this problematic business environment. Finally, a matrix of problems/factors, characteristic concerns, major causative factors, and suggested solutions is developed for easy C/S-GIS managerial reference.

## **CULTURAL VARIETY**

The degree of cultural homogeneity or heterogeneity in the C/S-GIS professional/user team affects the dynamics of the team and its ability to achieve results. Cultural factors affect the perceived relevance of the task facing the team and its uses of available resources such as time, money, information, technology, etc. People interpret messages and instructions in the context of their cultural heritages. Cultural diversity can be a complex problem as well as critical strength in the survival of a business organization. If and when cultural diversity is properly managed, problems are avoided or at least minimized, and strengths are exploited to the maximum advantage of the organization. A C/S-GIS manager must have a global perspective. The key is the recognition of diversity. Understanding cultural differences among C/S-GIS professionals is essential.

## **USER NEEDS AND SATISFACTION**

What are the interests of users, and how can those interests be determined? Unfamiliarity with the users' beliefs and value systems and their consequential effects on employee motivation and job satisfaction is a major hindrance to productivity and effective C/S-GIS management. How will an organization, in its strategic posturing, lock in to its customers/users who now have widely differing value systems? How does a manager draw up a road map to satisfy all these customers? Will he do well to selectively pick what customers in what countries to satisfy? A broad and participative view of the situation is preferred. A task force of international users, C/S-GIS professionals, legal experts, etc. should be created to search for a balance of user needs and interests versus the business objectives of the firm. One must accept the fact that different levels of technological implementation, workable local solutions, and sensitivity to people in each area can bring about a satisfying situation of global competitiveness.

## **INFORMATION MANAGEMENT EFFECTIVENESS**

The often parochial approach to management of information technology (IT) in many MNCs has become a major liability to the achievement of the organizational strategic objectives. Cognitive and communication styles of management that often make user interfaces more or less acceptable and effective are important factors to grapple with. Other information management sub-factors include: managing the acquisition of end-user C/S computing technology for the purpose of transborder integration, compatibility and economies of scale while recognizing local differences in vendor viability and support; the variety of definitions for "desirable" in decision making and conflict resolution; and the differences in people's attitudes and behaviors which determine leadership styles. Additionally, according to Regina Bento, a particular problem with leadership in cross-cultural teams is the factor of cultural dominance - the "disproportionate power vested in members of one culture over those of other cultures" (Bento, 1995).

Managing change is, and should continue to be, a focal point in CIS-GIS management. Managerial control through coordination is the solution. Coordination of tasks involve: 1) the analysis of how similar or linked activities are performed in other countries; 2) management of the exchange of information and information technology; and 3) the sharing and use of information on the firm by its different facilities. The target objective in the C/S-GIS management by coordination should always be to enable: i) flexibility in response to competition in different countries, ii) effective scanning of markets around the world, iii) operational effectiveness in the business organization, and iv) preservation of diversity in final products and production location. In recent times, the advances in technology have greatly reduced the coordination costs by reducing the communication and information processing and delivery time and costs. The GIS manager must think global. Any theme must be considered from diversity and global perspectives. The factors are not necessarily mutually exclusive, and neither are their solutions.

### COMMUNICATION INEFFECTIVENESS

It is said that only about one-tenth of everyone's culture (the major reason why each person behaves the way he does) is "visible" on the surface. Communication is a critical managerial skills, and even more so for the GIS manager. It is also critical to the functionality of the CIS-GIS team and the overall business productivity. The lack of much of it has become a problem recently with many MNCs that baffle with marginal operability with users or employees of mixed cultures. Interpretations of the elements of communication are often superficial without a knowledge of the underlying culture. The ability or inability to communicate in the local language can alone determine the success or failure of a business venture, since communication, whether internal or external to the organizational environment, is key not only to management success but to business success as well. It is impossible to penetrate another culture, to comprehend the differences in values and belief, without knowing the culture's language. Otherwise there is only parochial interpretation of communications. The language variations carry with them unique implications on the information exchanged. Computer programs should be written to be language independent. Alternative communication channel(s) may be sought for more effective tele- and nontelecommunication.

### ECONOMIC VOLATILITY

Political and economic instability, which often precedes economic insolvency in most of the third world is a critical business and C/S-GIS management concern. For instance, how does a manager, from a business perspective, deal with an internationally isolated and protean dictatorship, which has triggered economic depression on the host country? How does the firm with little or no bargaining leverage handle host country investment nationalization initiatives? Variations in exchange rates can be a major problem and must be tracked. This problem is even complicated further by frequent economic instabilities around the world. Currency-robust systems should be developed.

## **REGULATORY STANDARDS**

Working within regulations and standards is not new to the G/S-GIS manager. These regulations and standards are often and conveniently built into the software. However, when the regulations and standards vary with country and proliferate even at the spur of the moment, they become a liability. How do you articulate business or C/S-GIS management policy which will incorporate all the different national regulatory standards pertaining to business activities and information access and distribution without compromising on the organizational business discipline and information security and integrity? Regulations governing types of information and technology or the use and dissemination of them certainly differ in many countries. Users should be expected to make these kinds of local adjustments to enable full compliance to regulations. For instance, there are as many methods of taxation as there are countries around the world. Even in one country, there may be several methods as well as levels of national, regional, and local taxation. Method-adaptable multilevel taxation systems should be developed and used. The applications of these systems should be modified or customized to meet local needs and regulatory requirements. Standards, rules, and policies governing the characteristics of data and technology (software/hardware) acquired or developed by the firm should be established.

## **RESOURCE AVAILABILITY**

Unlike the domestic distributed information systems, the GIS covers more than one country. It is exposed to a wider variety of business environments and faces differing levels of resource availability with much more encompassing technological and regulatory environments such as standards and transborder data flow. In many countries data may be neither reliable nor even available. How does a manager cope with the disparaging technological (hardware/software) platforms and compatibility often found across borders? To what extent will a national deficiency in technological know-how be compensated without the introduction of foreign cultural dominance in the teams? How can a C/S-GIS manager maximize efficient use of resources by minimizing wastes, while availing user resource flexibility to meet their various information needs? The lack of balance in, and sensitivity to, country-specific business practices (usually reflecting past IT investments) renders the shareability of product and business operational information impossible. More particularly, the frustration of C/S-GIS managers in finding country-specific applications of IT has emerged as a barrier to a successful IT implementation. A business approach in testing, accepting, and adapting new technologies is essential for a competitive edge in C/S-GIS. Reorganization of data processing to conform with country-specific applications may become advisable. One should be prepared to accept less than perfect solutions in some countries that develop a GIS.

## **HOST COUNTRY EXPECTATIONS**

Usually, the economic imperatives pushing a firm to achieve large economies of scale by worldwide product standardization coexist with political imperatives pushing it in a different direction. Government, users, and customers in each country want the firm to respond more adequately to local needs. The firm wants to focus on its business objectives and make profits. Occasionally, these divergent forces inevitably put a strain on the firm and often become un-

berarable to the firm. It must be sensitive to local needs and give them a high priority of consideration. Powerful databases and access languages that are flexible for local and rapid application development should be strongly encouraged.

## NETWORK AND SYSTEM SECURITY

One of the traditional functions of the IS manager is to protect the information system, make information available to authorized users, and maintain high information integrity. This goal has not been an easy one to C/S-GIS managers generally. Complicating this problem further is the introduction of the multinational factors into the equation. Battling with threats to information integrity, security, and privacy while assuring user accessibility to information and a sense of local autonomy has been a big headache to MNC C/S-GIS managers. Incrementally leveled technology transfer (where necessary) is the way to go. Software piracy and intellectual copyrights, hardware compatibility, and congruency of database formats must be carefully monitored. Managers must utilize batch transfer of files, reports, orders, etc., between major cities. They must also incorporate interactive consultation with central database or applications in responses to requests and use messaging systems that include e-mail and electronic data interchange (EDI) between employees, sites and business partners. The basic rules include: 1) reach out to every user; 2) establish a people network (friendly, culturally sensitive and adaptable); 3) install localizably regulation-adherent systems (conformable to local rules and policies); 4) persevere to succeed even in the face of adversities or minor failures; 5) maintain a tight security within and without the C/S-GIS system; and 6) endeavor to know all the costs and options before a selection. For extended information accessibility as well as security, remote computing services, data reduction, and data and systems duplication techniques should be incorporated. Data and technology must be updated frequently. A global data dictionary should be developed for all users to follow. A solution to these problems may involve a balance of the strengths of both the centralization and decentralization of the system, rather than one or the other (Bento, 1995). Table 1 below illustrates the popular C/S-IS control strategies.

**Table 1. Global Information Systems Control Strategies**

Business Strategy/ Structure	Coordination/ Control Strategy	Coordination/Control Mechanisms	C/S-GIS Structured Strategy
<ul style="list-style-type: none"> <li>multinational/decentralized federation</li> </ul>	<ul style="list-style-type: none"> <li>socialization</li> </ul>	<ul style="list-style-type: none"> <li><i>hierarchies</i>; material &amp; services flow determined by managerial decisions</li> </ul>	<ul style="list-style-type: none"> <li>decentralized/standalone C/S-GIS database &amp; processes</li> </ul>
<ul style="list-style-type: none"> <li>global/centralized federation</li> </ul>	<ul style="list-style-type: none"> <li>centralization</li> </ul>	<ul style="list-style-type: none"> <li><i>hierarchy</i>; decision made &amp; control extracted by same managerial unit</li> </ul>	<ul style="list-style-type: none"> <li>centralization/centralized C/S-GIS databases &amp; processes</li> </ul>
<ul style="list-style-type: none"> <li>international &amp; inter-org. coordinated federation</li> </ul>	<ul style="list-style-type: none"> <li>formalization</li> </ul>	<ul style="list-style-type: none"> <li><i>markets</i>; material &amp; services flow determined by market forces</li> </ul>	<ul style="list-style-type: none"> <li>linked C/S-GIS databases &amp; processes</li> </ul>
<ul style="list-style-type: none"> <li>transnational integrated network</li> </ul>	<ul style="list-style-type: none"> <li>coopting</li> </ul>	<ul style="list-style-type: none"> <li><i>network of units</i>; representative participation in decision making</li> </ul>	<ul style="list-style-type: none"> <li>integrated architecture/shared C/S-GIS databases &amp; processes</li> </ul>



## SYSTEM OUTSOURCING

Outsourcing is another critical factor in transnational business and global information system management. Mehdi Khosrowpour correctly noted that outsourcing has become such an important factor for managers of information systems and technology for reasons which include the facts that increasing numbers of businesses are facing tougher competition in national and international markets, market share is dwindling while global pressures are increasing, and product life cycles are getting shorter, therefore prompting many organizations' sensitivity to efficiency and bottom-line results (Khosrowpour, 1995). Additionally, there is a tremendous shortage of skilled IS professionals, and this shortage is projected to increase even more sharply in the foreseeable future. As much as it is possible, in-house software should be developed. If outsourcing is the approach to systems development, then C/S-GIS management strategy with corporate information systems architecture (ISA) is very valuable in providing a guide for systems development. It also facilitates the integration of, and data sharing among, applications. Another benefit is that it supports the development of enterprisewide integrated data resource systems. In this area, the responsibilities for the C/S-GIS manager will include: 1) becoming aware of the firm's business challenges and sharing of the leverage of the IT for them; 2) articulating C/S-based global information systems development environment that reflects the firm's multinational posture; 3) preparing applications development portfolio that aligns with the firm's global objectives; 4) reflecting the firm's strategic global aspirations in the systems development project goals; 5) acquiring of multiculturally adaptable IT; 6) leading in the automation of the firm's internal and external data communication linkages; 7) designing C/S-GIS databases derived from the firm's value-chain activities; and 8) facilitating corporate restructuring through the provision of flexible business services. Each software should be developed to enable easy fine tuning to local needs while maintaining the same data processing and file format consistency throughout the enterprise.

## CONCLUSION

The identification of the major factors, the analysis and discussion of them, as well as symptomatic description of each of them, no doubt, enhances the preparation of the GIS or C/S-GIS managers for the formidable responsibilities that await them in their transnational business activities. Because all the problems may not necessarily manifest in any one MNC or business venture, the discussions and recommendations are individualized to each factor. As has been earlier discussed, more often than not, the problems or their causative factors overlap or compound one another. Very rarely do they exist in isolation of the other. Thus, although the individualized solutions are adequate remedies for each problem, holistic thinking is the approach. In Table 4 the problems are further classified into cultural, environmental, information systems, general management, and communication factors to enable managers to make appropriate selection of solution type. By the elucidation on, and analysis of, the factors, and with the suggested CIS-GIS solution alternatives, GIS managers will become more aware of the problems and methods of handling them. The success rates of CIS-GIS implementation and management will certainly be improved and costs reduced.

**Table 4. Matrix of Factors and Solutions**

<b>Factor</b>	<b>Domain<sup>1</sup></b>	<b>Characteristic Concern(s)</b>	<b>Suggestion(s)</b>
Work Habits	C	<ul style="list-style-type: none"> <li>Team's heterogeneous social &amp; work behavior</li> </ul>	<ul style="list-style-type: none"> <li>Think global</li> <li>Plan for cultural diversity</li> <li>Take advantage of the strengths of cultural diversity</li> </ul>
User Satisfaction	M, C	<ul style="list-style-type: none"> <li>Meaning of user satisfaction</li> <li>Differing user value/belief systems</li> </ul>	<ul style="list-style-type: none"> <li>Create task force to balance user interests &amp; business objectives</li> <li>Use workable local solutions</li> </ul>
Management Effectiveness	M	<ul style="list-style-type: none"> <li>Parochial management (mgt.) of IT</li> <li>Mgt. of tech. transfer &amp; integration</li> <li>Cross-cultural dominance in mgt. teams</li> </ul>	<ul style="list-style-type: none"> <li>Adopt mgt. through coordination style</li> <li>Consider themes from a global perspective</li> </ul>
Communication Misfire	C	<ul style="list-style-type: none"> <li>Incomplete or misinterpreted communication</li> </ul>	<ul style="list-style-type: none"> <li>Learn of other cultures &amp; languages</li> <li>Develop language-independent programs</li> <li>Seek alternative communication channels</li> </ul>
Economic Instability	E	<ul style="list-style-type: none"> <li>Economic volatility &amp; insolvency</li> </ul>	<ul style="list-style-type: none"> <li>Currency exchange rates must be tracked</li> <li>Currency-robust systems should be developed</li> </ul>
Regulatory Standards	EM	<ul style="list-style-type: none"> <li>Variant proliferation of standards &amp; regulations in host countries</li> </ul>	<ul style="list-style-type: none"> <li>Set up standards/rules for the acquisition/development of systems by the firm</li> <li>Method-adaptable multilevel taxation information systems should be developed</li> <li>Customize applics. to local needs &amp; regulation requirements</li> </ul>
Resource Availability	I, E	<ul style="list-style-type: none"> <li>Country-wise differential availability of resources (human, data, technology, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>Use country-specific or country-adaptable applications</li> <li>Be prepared to accept less than perfect products/solutions in some countries</li> </ul>
Host Country Demands	E	<ul style="list-style-type: none"> <li>Adequacy of response to local needs</li> </ul>	<ul style="list-style-type: none"> <li>Consider local needs with high sensitivity &amp; priority</li> <li>Database languages should be locally adaptable</li> </ul>
Network & System Security	I, M, E	<ul style="list-style-type: none"> <li>Information accessibility</li> <li>Threats to information integrity &amp; system security</li> </ul>	<ul style="list-style-type: none"> <li>Use user-friendly systems</li> <li>Monitor violations to security regulations</li> <li>Develop global data dictionary</li> <li>Batch transfer of files, etc. should be used often</li> <li>Use messaging systems between sites</li> <li>Update data &amp; technology frequently</li> </ul>
System Outsourcing	I, M, E	<ul style="list-style-type: none"> <li>Outsourcing in systems acquisition/development</li> </ul>	<ul style="list-style-type: none"> <li>Where feasible use in-house system development</li> <li>If outsourcing is used, incorporate the organizational information system architecture (ISA)</li> <li>Develop enterprisewide integrated data resource systems</li> <li>Acquire/dev. multiculturally sensitive or adaptable systems</li> </ul>

<sup>1</sup>"Domain" indicates the major area of user-work-life in which the dominant causative factors of the factor or problem exist. C- for cultural factors, E- for environmental factors other than cultural, I- for information systems factors, and M- for basic management factors. In some instances, there is a domain overlap. In such cases, the domain factors are listed in order of dominance.

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