The Effect of National Culture on IS: Implications for International Information Systems

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The objectives of this article are 1) to make a comparative analysis of previous international and cross-cultural studies, 2) to incorporate the variables specific to cultural environments into a general framework of information systems, and 3) to examine the implications of the findings for global information systems research and implementation.

One result is a list of national cultural variables affecting information systems. These variables are classified into three main groups—economic, demographic and socio-psychological. These three groups are integrated into existing frameworks of IS research.

The variables were further classified into "constants" and "changeables." This classification identifies those variables which can be adapted by the execution of national and organizational IS policies.

Another result is a compilation of findings from cross-cultural and non-US research into IS. This research is characterized on two dimensions so as to facilitate classification and integration of research findings.

The study indicates a need for considerable research effort in the field of international information systems to facilitate IS technology transfer, for constructing indigenous IS, and for formulating national IS policies.

When addressing information systems (IS) internationally, two different points of view are common. One point of view considers the globalization of organizations, corporations, and corporate alliances and the consequent need for information systems spanning many diverse political, social, and cultural environments. The second point of view relates to the differential development of indigenous information systems in disparate cultures. (We use the word "culture" here in the broad sense of "The totality of socially transmitted behavior patterns, arts, beliefs, institutions, and all other products of human work and thought characteristic of a community or population." *The American Heritage Dictionary* 1982. The terms *cultural* and *national* are used here interchangeably in referring to national culture.) Studies in international IS generally adopt one of the above points of view; however, the results of studies with one point of view are clearly relevant to work adopting the other and studies from both perspectives have been reviewed here.

We are currently witnessing the intensive development of multinational corporations, of joint ventures, and of strategic alliances between firms in different countries. This development has given rise to informa-

tion systems which cross national boundaries and span diverse cultures. These global information systems are intended to coordinate and control international operations and to provide local and international managerial tools.

From an historical perspective, multinational organizations first appeared about two hundred years ago, but computerized information systems to serve them were initiated only in the late 1960s (Roche 1992). These global information systems have exhibited impressive development in recent years thanks to developments in information and communications technology. Information systems which bridge between plants, markets, legal systems, and cultures of different states and nations have been termed *Global Information Systems* and *Transnational Information Systems.*

A global information system may be defined as a computerized system which supports the business strategy of a multinational organization and deals with components of the international market as a single market and not as individual markets. (Palvia et al. 1992) This implies that a global information system may be used by people belonging to different national cultures. Cultural differences may be expressed in one or more factors which constitute a national culture and will be delineated later. They frequently employ electronic data interchange (EDI) technology to transfer information between organizational constituents (Clarke et al. 1992). For many examples see Holland et al. (1992) and Thierauf (1990). The global reservation system of an international airline is a classic example of a system of this type (Robey and Rodriguez-Diaz 1989).

Global information systems are generally developed in one location and applied in other locations and states. Thus the problem may often be usefully seen as one of technology transfer from more to less developed constituents of the multinational entity. The design, development, implementation, and management of systems and the degree to which they accomodate national differences are key issues. The design and development process may, or may not, take cultural differences into account, respectively involving or ignoring local users in development and application. A general model addressing such technology transfers is that of Kedia and Bhagat (1988).

From the point of view of information systems within countries, virtually all research until recently has centered on data gathered in the United States and on concepts generated within the U.S. culture. In recent years there have begun to appear articles examining characteristics of information systems in other national environments. The *Communications of The ACM* has even initiated a regular section entitled "International Perspectives" which examines the state of information technology and related issues in various countries and regions. There has also been a small number of cross-cultural comparisons of information system variables. Precisely because the momentum of globalization is increasing, with consequent visions of realization of the global village, it is important to stress that the world is by no means homogeneous and there are great disparities in the availability and level of use of information technology in different countries (Goodman 1991).

In the case of indigenous information systems, there is no planned technology transfer between elements of a single organization. In these cases, the local organization independently adopts technologies from other countries, with or without technical assistance. The main questions in terms of global information technology then relate to the degree to which the specific characteristics of the adopting countries influence the desire to adopt and the success or failure of adoption and to what extent do those differences render incorrect or irrelevant those models and prescriptions accepted in the technology-originating countries. For example, in their evaluation of computing in several Middle Eastern countries, Goodman and Green (1992) suggest that cultural and political factors may explain the paucity of computer networking in those countries. Western assumptions—that users are relatively indifferent to personal versus technology mediated contact and that there are no political barriers to the free movement of information—are violated in the context of some Middle Eastern cultural environments.

The present study has reviewed the literature pertaining to both the points of view outlined at the beginning of this article—the global and the indigenous—in order to suggest a general model relevant to both approaches. Such a model may serve to identify a comprehensive list of relevant variables and to integrate findings from the two approaches. Thus, the objectives of this study are 1) to make a comparative analysis of previous international and cross-cultural studies and to identify the relevant variables, 2) to incorporate the variables specific to national environments into a general framework of information systems, and 3) to examine the implications of the findings for global information systems research and implementation.

Literature Review

Many disciplines beside IS deal with some of the same issues as those in this study. Thus, cultural psychology deals with individual differences across cultures; the organizational behavior and general management literatures deal with organizational differences; sociology and

economics address societal differences. Here, however, we are interested in *all* the multiple differences between national environments which may impact the nature of information systems. The comparative management literature shares a point of view similar to ours in terms of the breadth of its perspective but contains virtually no references to technology transfer (Kedia and Bhagat 1988). For the reasons outlined above and because of the focus of this study, only mainstream IS journals were surveyed as part of the literature review. As a background to this review is the general assumption, supported by the literatures mentioned, that national differences at the individual, organizational, and societal levels *do* have an impact on IS.

In view of the neglect in the international management literature of technology transfer generally and of IS specifically, it is not surprising that the IS literature survey yielded only meager findings. Those articles which were found tended to be concentrated in a small number of journals—especially *Information & Management* and *The Communications of the ACM.* Recent issues of *The Proceedings of the International Conference on Information Systems* (ICIS) have also contained relevant studies. In fact of the seventeen studies reported in Tables 2 and 3, twelve appeared in *Information & Management* two in *The Communications of The ACM* and two in ICIS *Proceedings.* It is encouraging that those are considered among the leading publications in the field. Thus, the issue of global information systems is not relegated to obscure journals; prestigious publications are showing the way and we may assume that others will follow. The recent appearance of two new journals devoted specifically to international information system issues—*International Information Systems* and *Journal of Global Information Management*—promises to considerably increase the amount of research in the field and to rapidly lead to interesting and robust findings.

The problem of paucity of research in the field to date was exacerbated, from our point of view, by the fact that not all the articles we identified as dealing with international IS issues were relevant to our purposes, although many were important in their own right. To reiterate, our purpose was to identify the relevant variables and to incorporate them into a general model of IS. One group of articles peripheral to our interest is those dealing with global IS strategies. These discuss the incorporation of global IS into corporate business and IS strategies, but do not deal with the specifics of execution, i.e. with problems caused by national disparities and their solution. Other articles describe indigenous infor-

mation systems, but do *only* that without specifying the causes of the states described—i.e. do not isolate the relevant variables.

The first objective of the literature survey was to operationalize the complex concept of culture as the independent variable and as a basis for the remainder of the study. The components of cultural context which were identified fall into two categories - those constituting the general national culture and variables, specific to the culture, but affecting different organizations contingently.

An additional categorization found useful was according to the degree of stability of the cultural factors. Factors inherent to the culture are stable over time, tend to dominate, and are almost impervious to change; we have termed these "constants." Examples are geography, language, currency, social norms, and traditions. On the other hand, factors which can be influenced and changed, more or less quickly, are termed "changeables." Examples are GNP, technology, employee morale, and average education level. This classification affects attitudes toward information system planning and implementation in various countries. The constants are not within the control of IS designers because they cannot be changed while the changeables can be affected at the level of the corporation or by national policy.

Table 1 exhibits the components of national culture according to the classification described. The table indicates three major groups of cultural variables—economic, demographic, and psycho-sociological. These are consistent with Goodman's (1991) indication that historical, social, cultural, and economic reasons explain disparities in the level of development of information technologies in different countries. (We have not included history specifically in our factors because it is always reflected in the other three.) For an analysis of the psycho-sociological factors see Sauter (1992) on which we relied heavily.

Framework Development

Following from the previous history of IS research, the existing IS literature defines information systems at the level of local organizations only. A number of frameworks have been published which suggest the variables which affect information systems. These include Mason and Mitroff (1973), Lucas (1975), Zmud (1979), Ives, Hamilton, and Davis (1980), Ein-Dor and Segev (1981a), and Delon (1983). For the purposes of

Cultural Factor	Organizational Factor	National Factor	Constant	Changeables
Economic				
Level of employment		X		X
Average income		X		X
Gross National Product		X		X
Balance of trade		X		X
Scope of international trade		X		X
Encouragement of international economic ties		X		X
Level of industrialization		X		X
Currency		X	X	
Natural Resources		X	X	
Demographic				
Average education level	X	X		X
Geography		X	X	X
Computer science education	X	X		X
Language and script		X	X	
Internal technical personnel resources		X		X
Psycho-sociological				
Values	X	X	X	
Beliefs	X	X	X	
Symbols	X	X	X	
Tradition	X	X	X	
Ceremonies	X	X	X	
Ideology		X		X
Leaders	X	X	X	
Family status in firms	X	X	X	
Life style		X	X	
Opposition to change	X			X
Importance of job security	X			X
Employee morale	X			X
Diligence and efficiency	X			X
Attitudes toware technological progress	X	X		
Interpersonal relations and social commitment	X			X
Significance of concepts of time and space		X		X
Perception of concepts	X	X		
Social norms	X	X	X	

Table 1: National Cultural Factors in Information Systems

this study the authors have adopted the framework developed by Ein-Dor and Segev (1981a); as has been shown elsewhere (Ein-Dor and Segev 1981b), all the frameworks exhibit a high degree of similarity and national cultural variables could doubtless be added without difficulty to any of the frameworks mentioned.

The framework employed is exhibited as Figure 1 which is a summary version of a system of over one hundred variables. In it, the variables are grouped into subsystems dictated by the intrinsic structure of IS. The overall information system consists of three subsystems—structural, procedural, and behavioral. These three subsystems are embedded in an environment consisting of the organization and relevant factors external to the organization. The structural subsystem , which describes the physical IS, is seen as mediating between its internal environment—the procedures and behaviors which it encompasses—and its external environments. The behavioral subsystem comprises the human actors who participate in the planning, development, and use of information systems—namely, organizational execu-tives, implementors, and users. The procedural subsystem of variables describes IS processes: planning, strategy formulation, development, and operations. The environment contains all those elements which impact the development and use of IS but which are not an integral part of the system. We shall refer to all the
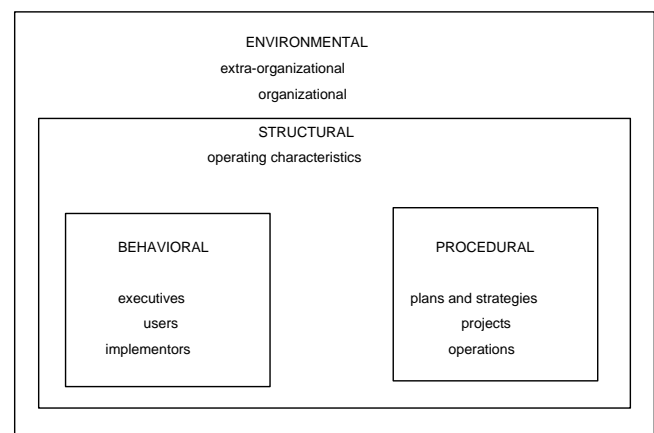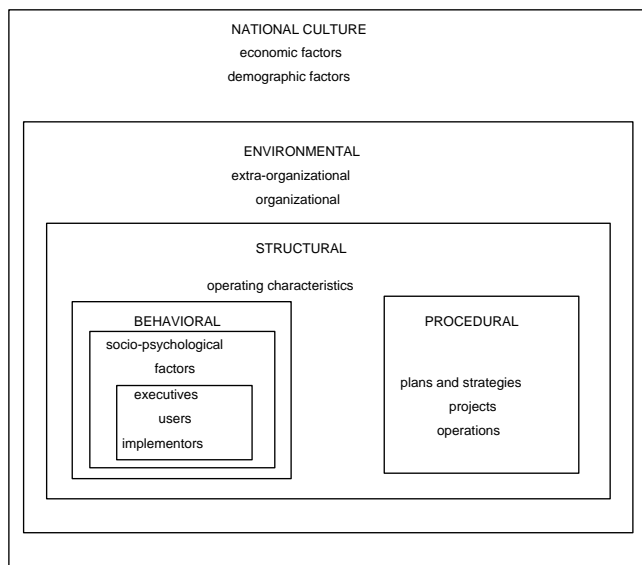

Figure 1: Framework for IS Research

NATIONAL CULTURE
economic factors
demographic factors

ENVIRONMENTAL
extra-organizational
organizational

STRUCTURAL

operating characteristics

BEHAVIORAL
socio-psychological
factors
executives
users
implementors

PROCEDURAL

plans and strategies
projects
operations

Figure 2: Framework for Global IS Research

variables in this model as *local* variables as distinct from the *cultural* variables which differentiate diverse national cultures.

Because of the local nature of the framework exhibited in Figure 1, the national cultural variables are implicitly assumed and do not appear explicitly. It is now possible to expand the framework so as to include those variables which define national culture and which are especially relevant to global IS; this expansion is exhibited as Figure 2. The economic and demographic aspects of the global cultural variables constitute a super-system to the original framework; in other words, one may think of the original framework as embedded in different national cultures. So long as the discussion was restricted to a single culture, it was not necessary to make this overriding construct explicit; with the consideration of different national cultures it now becomes essential. This does not restrict the model to specific states, as a culture may well encompass many national states or a single state may be home to two or more cultures. As examples one may think of the effects of the Chinese or Arab national cultures—languages, scripts, social customs, interpersonal relationships, etc.— on IS in those cultures. These effects clearly transcend any single political entity. These specific examples were chosen because there is an increasing number of studies of IS in Chinese speaking and Arabic countries. This is reflected in the fact that of 17 articles analyzed here in detail, two referred to two different Arab countries (Saudi Arabia and Bahrein) and six to three Chinese-speaking political entities (Hong Kong, Singapore, and Taiwan). Implicitly, most IS research to date has been within the frame-

work of the cultural milieu of English-speaking countries.

In addition to those variables describing the cultures in which information system environments are embedded, there is the level of culture-specific psycho-sociological variables affecting the behavior of individuals in the context of information systems. This appears in Figure 2 in the behavioral subsystem as a factor affecting the behavior of executives, implementors, and users. The consideration of cultural differences at the individual level and their effects on IS construction and use is an extremely important issue in the research of international IS.

Analysis

Our next step is to analyze the specific findings of the various studies and to synthesize them insofar as possible. The articles adopted for analysis in this study are summarized in Table 2. The table exhibits the country or countries involved, the number of subject organizations where applicable and found, the methodology employed, and the principle variables studied.

As is obvious from the table, the work reported relied almost exclusively on questionnaires. Acknowledging the difficulty of performing multinational research by other means such as field studies, case studies, or action research, this is not surprising. (But note the intriguing possibility of replicating laboratory experiments in various cultural settings as demonstrated by Ho et al.1989). Given the early state of research in this field, and the lack of theory, questionnaires can only be formulated on a largely intuitive basis, except when replicating single country studies. As a result, most of the studies have very little in common and it is difficult to synthesize the findings. This is readily supported by perusing Table 2, in which the principle variables of the various studies are listed more or less *verbatim* and in which there is very little commonality. We found only two series of studies which consistently applied a common set of variables—one by Dagwell & Weber (1983) who followed Taylor (1979) and Hedberg and Mumford (1975), the other by Couger et al. (1985, 1990). It is perhaps symptomatic that both these series studied programmers and system analysts but have almost nothing in common between them. On the other hand, they are excellent examples of studies involving variables which are assumed as constants within national contexts, but become relevant differences in international contexts.

A synthesis of the findings listed in Table 2 appears

Location(s)*	Reference	Methodology	principal variables
Saudi Arabia (208)	Abdul Ghani & Al-Sakran 1988	interviews	*size: of organization and of computer in use* *applications: types and number of applications* *existence of formal EDP function* *EDP employees: experience and educational level*
Singapore, U.S.A.	Couger & Motiwalla 1985	questionnaire	*systems analysts perception of motivating factors; programmers' perceptions of motivating factors*
Austria (18), Singapore (32), Israel (24),	Couger et al. 1990	questionnaire	*programmer motivation: the work itself, growth need strength, social need strength, participation in goal definition, task attributes*
Australia (8), Sweden , U.K., U.S.A.	Dagwell & Weber 1983	questionnaire	*system designer: organizational models of users, individual models of users, demographic factors, perceived contributions to organizational well-being, perceived contribution to job satisfaction, perceptions of user shortcomings*
U.S.A. (21), Israel (14)	Ein-Dor & Segev 1992	questionnaire	*internal environment: % of EDP employees, EDP as % of budget, % of end users, equipment/user ratio* *IS structure: quantity of end user equipment, number and types of packages, location of data, budget sources, software sources* *behavior: intensity of & motivation for end user computing*
U.S.A. (1160), Republic of China (250)	Harrison and Farn 1990	questionnaire	*culture, economic level, importance of IS issues, organizational size, salaries, level of computerization*
Singapore, U.S.A.	Ho, Raman, & Watson 1989	laboratory experiment	*physical; socio-cultural; technological properties of the environment; decision situation; consensus; equality of influence*
Taiwan (15)	Igbaria 1992	questionnaire	*use: length and frequency* *users: experience, training, attitudes* *number of applications and business tasks supported* *management support*
India (n.a.)	Joshi & Sauter 1991	literature survey	*national culture; foreign trade; IT use; effects on employment; attitudes to computerization*
Bahrein (9)	Khan 1991	interview questionnaire	*IS structure: organization, steering committee existence, IS manager's rank, Nolan stage of development, documentation, make or buy software, IS policy existence, IC existence, personnel turnover*
Canada (13) Denmark (8)	Kumar & Bjørn-Andersen 1990	questionnaire	*product related behavioral relevance score and preferred direction of changes: technical values, economic values, socio-political values* *project related behavioral relevance scores and preferred direction of change: technical values, economic values, socio-political values*
Chile (1), Panama (1)	Robey & Rodriguez-Diaz 1989	case study	*culture: national, organizational* *international communications channels* *environmental relations* *perceptions of IS: national comparison* *involvement: executives, users*
Australia (30)	Sager 1988	interviews	*IT; competitive information systems; business planning & strategy*
25 countries + 3 international organizations	Saraswat & Gorgone 1991	literature survey	*IS issues; percent of GNP connected with IT; number of articles published*
Japan (83)	Sato & Horiuchi 1988	questionnaire	*environmental variables* *organizational and user characteristics* *IS unit characteristics* *IS/user coordination function: existence and location*
Singapore (673)	Sircar & Rao 1986	questionnaire	*existence of independent IS function* *IS structure: formal business plan, IS plan, steering committee, procedures, user involvement in development, end user support* *satisfaction*
Taiwan, Singapore, Hong Kong (n.a.)	Tricker 1988	conceptual	*national culture* *cultural aspects of information*

* number of organizations in parentheses

Table 2: Articles Surveyed and Principal Variables

in Table 3. The first three findings in Table 3 relate to effects of cultural differences on local IS variables. The first generalization states that cultural factors have a greater impact on technical aspects of IS than on behavioral aspects. In other words, the structural and procedural subsystems of Figure 2 are affected more than the behavioral subsystem. This finding is quite the opposite of what one would intuitively expect and is particularly true of motivations. Thus, in a study of analysts and programmers in Singapore and the U.S.A., Couger and Motiwalla (1985) found similarity of motivation on nine of twelve factors for analysts and five of thirteen factors for programmers; they anticipated that six of the eight programmer differences were likely to be eliminated by

changes then under way. And, indeed, a later study by Couger et al. (1990) found motivation factors for programmers and analysts ranked similarly in Austria, Israel, Singapore, and the U.S.A. Ein-Dor and Segev (1992) found that motivations for engaging in end-user computing were of the same magnitude and identically ranked in Israel and the U.S.A. This last study did find considerable differences in the technical aspects of end-user computing such as types of equipment used, software packages used, and involvement of the DP function in writing programs for end-users. These differences were attributed in large part to economic and language differences.

Finding number 2 in Table 3 again stresses similarities between analysts and programmers in various cul-

Finding	Sources	Cultures studied
1. Cultural factors have a greater impact on the more technical characteristics of IS project development, IS structure, level of use and a lesser impact on behavioral aspects perceived importance, satisfaction. The major factors which impact IS development, structure, and use are: the level of economic development, local legislation, and national language.	Couger et al. 1990; Ein-Dor & Segev 1992; Harrison & Farn 1990, Igbaria 1992, Joshi & Sauter 1991, Kumar & Bjorn-Andersen 1990, Robey & Rodriguez-Diaz 1989, Samswat & Gorgone 1991, Tricker 1988	Austria, Chile, Hong Kong, India, Israel Panama, Singapore, Taiwan, U.S.A.
2. Systems analysts and programmers exhibit many similarities across cultures but there are also differences. Demographic factors do not seem to play a major part in the differences.	Couger & Motiwalla 1985, Dagwell & Weber 1983, Couger et al. 1990	Australia, Austria, Canada, Israel, Singapore, Sweden, U.K., U.S.A.
3. Use of GDSS has different effects on satisfaction, consensus, conflict expression, and equality of participation in different cultures.	Ho et al. 1989	Singapore, U.S.A.
4. Compatibility between IS structure and organizational culture, strategy, environment and structure contribute to IS success.	Abdul Ghani & Al-Sakran 1988, Joshi & Sauter 1991, Khan 1991, Robey & Rodriguez-Diaz 1989, Sager 1988, Sato & Horiuchi 1988, Sircar & Rao 1986	Australia, Austria, Chile, India, Israel, Japan, Panama, Saudi-Arabia, Singapore, U.S.A.
5. Organizational maturity and IS success are correlated. More mature organizations have a higher degree of success.	Joshi & Sauter 1991, Khan 1991	Bahrein, India
6. Formalization contributes to success of IS implementation projects; this consists of goal setting, high level steering committees, prioritization, standardization, and documentation.	Couger et al. 1990, Khan 1991, Robey & Rodriguez-Diaz 1989, Sircar & Rao 1986, Tricker 1988	Austria, Bahrein, Chile, Hong Kong, Israel, Panama, Singapore, Taiwan
7. Larger and more mature organizations in established industries succeed with a formal, autonomous IS function. Small, young organizations in dynamic environments succeed more with diversified IS.	Abdul Ghani & Al-Sakran 1988, Sato & Horiuchi 1988, Sircar & Rao 1986	Japan, Saudi-Arabia, Singapore
8. Involvement and participation of top management and users in development and use promotes IS success.	Igbaria 1992, Joshi & Sauter 1991, Khan 1991, Robey & Rodriguez-Diaz 1989, Sircar & Rao 1986	Bahrein, Chile, India, Panama, Singapore, Taiwan
9. Competence, motivation, and low turnover of IS implementors contribute to IS success.	Abdul Ghani & Al-Sakran 1988, Couger et al. 1990, Khan 1991	Austria, Israel, Saudi-Arabia, Singapore, U.S.A.
10. Conflict reduction increases IS success	Igbaria 1992, Joshi & Sauter 1991, Robey & Rodriguez-Diaz 1989	Chile, India, Panama, Taiwan

Table 3: Principal Findings of Non-U.S.A. and Cross-Cultural Studies

tures. The differences noted relate to the finding of Dagwell and Weber (1983) that while Australian, Swedish, U.K., and U.S. analysts had similar individual user models, their organizational user models differed. Australian and Swedish system designers held Theory Y oriented organizational user models while U.K. and U.S. designers had Theory X oriented models. However, no relationship was found between demographic variables and the user models. The behavioral similarities among analysts and programmers noted by Couger and Motiwalla (1985) and Couger et al. (1990) also contrasted with considerable demographic differences, again suggesting that, at least with respect to IS professionals, demographic factors are not very important.

Of great significance is Finding number 3 in Table 3. Although it is based on only one study (Ho et al. 1989), it is highly suggestive of the kinds of differences that are likely to be most significant in international IS. The study quoted, which compared effects of GDSS use in Singapore and the U.S.A., found that features of the system beneficial in one culture could be dysfunctional in another. Thus, the anonymity feature of GDSS allowed group members to express negative opinions about other members' contributions; this would be culturally unacceptable in open discussion and led to dissatisfaction not caused in similar circumstances in the U.S.A. System induced structure facilitated expression of agreement or conflict in U.S. groups but did not help Singaporean groups, again because structure forced levels of directness and openness unacceptable in Singaporean culture. Finally, GDSS led to more even member influence in U.S. groups, but not in Singaporean groups. Comparing these results with those concerning IS professionals seems to indicate a real need to map the effects of cultural variables on the various aspects of IS in different cultures in order to permit informed analysis in international contexts.

Discussion

The national cultural variables listed in Table 1, the lists of variables in Table 2, the research findings of Table 3, and the framework presented in Figures 1 and 2 are all closely related. Before proceeding further it is desirable to integrate these outputs of the literature review.

Table 1 exhibits only those variables which become explicit in cross-cultural studies or in explaining conditions in a particular country in comparison to other countries. These variables are additions to the list of local variables typically employed in IS research and represented in Figure 1. Thus, they are the additions made to the general model in Figure 2, namely economic factors, demographic factors, and socio-psychological factors.

Table 2 exhibits an aggregation of the principal

cultural and local variables employed in any of the studies addressed here. The variable names have been copied *verbatim* from the original publications. This may obscure some commonalities but is designed to prevent inaccurate interpretation and loss of information. Thus, Table 2 contains the subset of variables from Figure 2 and Table 1 which were actually studied in the articles reviewed. Table 3 synthesizes the available findings reported in Table 2 concerning the variables. The studies which addressed the cultural variables reported in Table 2, all of which also appear at various levels in Table 1, are exhibited in Table 4.

The studies of international IS may be categorized on two dimensions—research location (single or multiple country) and variables studied (cross-cultural, local, or interaction of cross-cultural and local). This organization of the studies reviewed is exhibited as Table 5. From the table it becomes clear that cross-cultural studies may employ only local variables; in that case they can pinpoint differences, but cannot explain them. It is also clear that a single country study may employ cultural variables in order to explain its findings. The first three findings listed in Table 3 were discussed at the end of the previous section and are all outcomes of cross-cultural studies. The remaining findings refer to local variables and result from both single country and multiple-country studies. The research implications of Table 5 will be discussed in the research directions section.

It is possible to learn the effects of national culture from both these types of studies; however, it is more difficult to do so from single country studies as these do not provide data on interactions between cultural and local variables. It would be necessary to make thorough comparisons of the findings from single country studies together with data on cultural variables and to calibrate the findings by cross-cultural studies involving several countries, including those in which the single culture studies were performed. This has not yet been done, and is probably not yet warranted by the number of single-country studies; hopefully, more such studies will become available and should permit comparisons of the kind suggested.

The previous considerations are reflected in the synthesis of findings in Table 3. As noted already, only the first three findings relate directly to aspects of the cultural environment. The remaining seven findings seem, by and large, to replicate US findings. Here, however, the major question which must be asked concerns the relative strengths of the relationships. Take, for example, finding number 8—that involvement and participation of top management and users in development

Table 1 variable name	Table 2 variable name	References
cultural factor	• Culture • National culture	Harrison & Farn 1990 Joshi & Sauter 1991 Robey & Rodriguez-diaz 1989 Tricker 1988
Average income	• Salary levels	Harrison & Farn 1990
Gross National Product	• Economic level	Harrison & Farn 1990
Scope of international trade	• Foreign trade	Joshi & Sauter 1991
Level of employment	• Effects on employment	Joshi & Sauter 1991
Level of industrialization	• Level of computerization • Technological properties of the environment • Percent of GNP connected with IT • International communications channels	Harrison & Farn 1990 Ho, Raman & Watson 1989 Saraswat & Gorgone 1991 Robey & Rodriguez-Diaz 1989
Demographic	• Demographic factors	Dagwell & Weber 1983
Georgraphy	• Physical	Ho, Raman & Watson 1989
Psycho-sociological	• Socio-cultural	Ho, Raman & Watson 1989
Values	• Technical values • Economic values • Socio-political values	Kumar & Bjørn-Andersen 1990 Kumar & Bjørn-Andersen 1990 Kumar & Bjørn-Andersen 1990

Table 4: National Culture Variables Studied

	Local variables	Cultural & local variables	Variable interaction
Single country studies	Abdul Ghani & Al-Sakran 1988 Igbaria 1992 Khan 1991 Sager 1988 Sato & Horiuchi 1988 Sircar & Rao 1986	Joshi & Sauter 1991 Saraswat & Gorgone 1991	
Multiple country studies	Couger & Motiwalla 1985 Couger et al. 1990 Ein-Dor & Segev 1992 Tricker 1988	Harrison & Farn 1990 Dagwell & Weber 1983	Ho, Raman, & Watson 1989 Kumar & Bjørn-Andersen 1990 Robey & Rodriguez-Diaz 1989

Table 5: Categorization of International IS Studies

and use promotes IS success. Is the involvement equally important in all cultures? What factors condition the involvement? Is the nature of beneficial involvement the same in all cultures? These and similar questions indicate that cross cultural studies will not only provide insight into the differences between cultures but will also force crisp operationalization of the concepts involved and should improve the understanding of the concepts and the quality of research within single cultures. Just how important such questions are is stressed by the only laboratory experiment in this study—Ho et al. (1989)—which demonstrates how cultural differences can cause similar effects but of unequal magnitude and with different implications for system success.

Perhaps the most important immediate finding to emerge is number 1 in Table 3, discussed in detail at the end of the Analysis section. It suggests that cultural differences have greater impact on the technical and procedural aspects of IS while the behavioral aspects exhibit greater similarity. Thus, one may assume that people everywhere are affected by the same factors, i.e. the local variables seem to be universally relevant. The problems in applying research findings to global IS development arise from the fact that although the same variables may be relevant, the relative magnitudes of the effects and hence the nature of the solutions which work in different cultures may be different. This indicates that research into the relative importance of variables will yield fruitful results and will identify those areas to which implementors of international IS should pay the most attention.

There is a growing literature on national IS policies and their effects. The factors identified as "Changeables" in Table 1 are those which national and organizational policies to promote IS may fruitfully address. Those listed as economic and demographic are in the province of national policy; those termed socio-psychological are within the province of single organizations. An example of a national IS policy which has apparently met with considerable success is that of Singapore (Gable and Raman 1992). In our study we did not address IS policy issues, but it would be extremely helpful to integrate the IS policy literature with findings on cultural effects on IS in order to provide insight for policy formulation.

Future Research Directions

McHenry et al. (1990) have suggested four major problems in cross-cultural information technology research, namely:

- Finding reliable *literature*,
- Getting *access* to, finding, and working with the people involved,
- *Communications*, language, and cultural mis-match problems, and,
- Internal and external *biases*." (italics in the original)

We have already discussed the literature problem encountered in this study but, because this was a literature review, we did not encounter the other problems. It should be stressed, however, that we only searched the English language literature, and there is surely a gold mine of cross-cultural source material in other languages. This is clearly an area in which bilingual and

multilingual researchers could provide an extremely useful service. In the same vein, it might be useful if major IS journals, especially those devoted to, or heavily involved in, international information systems, allocated space to translations of especially significant articles from other cultures. Even one translation per issue would enormously increase the breadth of coverage.

In addition to the problems quoted above from McHenry et al., we have addressed two more in this paper—variable definition and model building. With respect to defining variables, we have presented an initial list in Table 1 to supplement existing local IS variables; we do not delude ourselves that this list is complete or that only relevant variables are included. Table 1 is based on the current state of the literature, much of it anecdotal and/or borrowed and/or untested. From Table 5 it is clear that most studies of international IS to date have focused on local variables, albeit in indigenous or multi-cultural contexts. The most valuable studies, however, are those exploring the interactions of cultural and local variables in multi-cultural studies; only three of these were found in our study, each of a different nature.

The Robey and Rodriguez-Diaz (1989) article reports a multinational case study; it seems to us that work of the kind exemplified by this article should currently be the first priority for research in the field. Case studies of this type could be instrumental in defining a comprehensive and accurate list of variables. Once a standard list of variables has been developed it would be possible to build a model of information systems which includes these variables. While we believe that our model presented in Figure 2 is correct as far as it goes, there is no guarantee that it is complete. In particular, no variables have been identified which affect the structural and procedural aspects of international IS. It seems highly unlikely that these subsystems of IS are not affected differently by disparate cultural environments. Is the physical structure of IS not dependent at all on national factors such as population density and state of development of communications infrastructure? Similarly, do accepted western norms for system development procedures apply equally in other cultures or do different processes and arrangements work better in different environments?

The Ho et al. (1989) paper is the only example we found of a multi-cultural laboratory experiment. This study is especially significant in suggesting that while local variables may have similar effects in different cultures, the magnitudes of those effects may be quite different. Furthermore, similar effects may be beneficial or neutral in one culture and dysfunctional in another. Such results can only be obtained by true multi-cultural interaction effect studies such as this. Similar research conclusions can be drawn from the Kumar & Bjørn-Andersen study (1990) which indicates that there can be considerable differences within what might be considered fairly similar cultures—in this case Canada and Denmark. This is supported by the Dagwell & Weber (1983) study which demonstrated similarities between Australian and Swedish system designers who behaved differently from Canadian and U.K. subjects, the last two being similar between them. More studies of this nature would clearly add greatly to the current level of knowledge.

The upper-right cell of Table 5 is empty for obvious reasons; it is infeasible to study interactions of cultural and local variables within a single culture.

In a nutshell, the state of research of global information systems is still embryonic and there are virtually unlimited opportunities for creative insights and significant contributions. The most valuable contributions will almost certainly originate in multi-cultural explorations of interactions between cultural and local variables. The ongoing unification of Western Europe and continuing dissolution of Eastern Europe should offer rich opportunities for research of this nature.

Conclusions

This article is an initial attempt to integrate the growing body of literature on international IS and to point to promising directions for future research. The number of studies available is as yet insufficient to permit any clear conclusions to be drawn, but it does indicate some interesting consistencies in the findings which should encourage additional research at all three levels—within cultures, between cultures, and integrative.

It is already possible to establish that the existence of global IS requires extension of the IS research frameworks in order to include aspects of national culture as variables. The main goal of future research should be to establish the nature of the interaction between cultural variables and local IS variables for different national environments.

The operationalization of national culture comprises three groups of variables—economic, demographic, and socio-psychological. The first two may be incorporated into IS research frameworks as a supersystem to the frameworks generally applicable within na-

tional cultures. The socio-psychological variables should be incorporated within the behavioral subsystem. From the research point of view there is obviously a need for considerable additional research on the effects of national culture on IS.

From the practical point of view, much more needs to be known about the effects of culture on IS in order to facilitate technology transfer and the construction of successful global and indigenous systems information systems. It is already clear that cultural differences must be taken into account when building global information systems.

The classification of variables into constants and changeables indicates those areas in which national and organizational policies may be expected to induce change in the cultural environment. The literature on effects of national IS policy on IT development is still in its infancy. Again, more research and better knowledge of the relationships between culture and IS might facilitate the formulation of effective national IS policies and indicate where investments might be most beneficial.

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