

**THE TRANSITION TO OPEN MARKETS
AND MODERN MANAGEMENT: THE SUCCESS
OF EIS IN MEXICAN ORGANIZATIONS**

by

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The Transition to Open Markets and Modern Management: The Success of EIS in Mexican Organizations

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Abstract: Executive Information Systems are being used in organizations around the world to assist with the increased managerial information needs related to the opening of markets and the globalization of enterprise. This study adapts a model of IS success to the context of EIS in order to examine the potential success of EIS use by Mexican managers to help them cope with their highly competitive environment. Using survey data gathered from 89 Mexican senior and middle managers supplemented by interview data from a subset of the survey respondents, the study examines some antecedents of EIS use, types of EIS use, individual impacts of EIS use, and organizational impacts of EIS use. The study suggests that Mexican managers use EIS to monitor internal and external information which enables them to make decisions faster, to have a better understanding of their environment, and to engage in more thorough decision analysis. These individual benefits of EIS use then lead to certain organizational benefits, including a shared vision of organizational goals and performance, improved communication in the organization, improved competitive response, and improved organizational decision making effectiveness. The results suggest that Mexican managers are able to successfully adapt an information system that originated in the US and is likely embedded with culturally specific assumptions about desirable managerial behavior to their managerial needs in a period of extreme change and uncertainty.

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“We knew that if we didn’t make these modernizations, we could certainly die. It would probably take many years, but it would be an agony nevertheless.”

The President of a Large Mexican Organization

1. INTRODUCTION

The 1990s has witnessed the rapid and unexpected opening of markets around the world. A prime example is that of the Mexican market which had enjoyed lucrative stability and security courtesy of tight government control over competition and trade. For the past several years, Mexican organizations, both because of the increasing competition and political vicissitudes related to the opening of the market, have been faced with fast and unpredictable change. Any sudden and massive change in an organization’s environment demands requisite shifts in an organization; the adaption can structural, technological, and/or cultural [Leavitt, 1964]. Information Technology (IT) is one form of technological response. Information technology can be viewed as both an enabler of globalization in the sense that advanced IT allows the worldwide coordination and communication necessary for operating in a global environment, and as an outcome of globalization in the sense that the opening of previously closed markets creates a need for IT to help make organizations more competitive in the newly open markets.

IT researchers have begun to seriously consider the implications of globalization on the role of IT, the structure of IT, and the architecture of IT in organizations [Ives, Jarvenpaa, and Mason, 1993; Jarvenpaa and Ives, 1994]. Much of the research takes the perspective of the US organization operating in foreign lands facing challenges stemming from the legal environment, language, culture, politics, and poor technology and transportation infrastructures [Deans and Kane, 1992]. Less research exists that takes the perspective of organizations in a developing nation attempting to operate in their own environment and the adaptation required of them to effectively operate, particularly when their markets are newly open and hence subject to competition from firms based in industrialized nations. This is precisely the problem facing many Mexican organizations. IS becomes increasingly important in competitive environments because organizational decision makers have a greater need for timely, accurate information on which to base organizational decisions [Huber, 1990].

One system that is experiencing widespread adoption in Mexico is Executive Information Systems (EIS), necessitated by the need to maintain better control over performance. This study looks specifically at the individual and organizational impacts of EIS in Mexican organizations. While there is growing interest in cross-cultural examinations of IS use and impact [Ho, Raman, and Watson, 1989; Kumar and Bjorn-Andersen, 1990; Straub, 1994; Leidner et al, 1996], this study chooses to examine EIS success in the context of Mexican businesses. Mexico is facing challenges relating to economic development common to other developing nations in South and Latin America as well as in Southeast Asia and Eastern Europe. In addition, Mexico is an important trading partner of the United States, and increasing numbers of US organizations are engaging in business with Mexican organizations (Barton, 1996)¹. Studies shedding light on current managerial practices in Mexican organizations may be of interest to US practitioners and academics with international interests.

Based on an adaptation of the DeLone and McLean [1992] model of IS success to the context of EIS, the study examines some antecedents of EIS use, types of EIS use, individual impacts of EIS use, and organizational impacts of EIS use. The research question is: are EIS, systems which some claim may be ill-suited to polychronic, high-context cultures such as Mexico [Raman and Watson, 1994; Rainer and Watson, 1995], successful in Mexico? What are the impacts of EIS use on Mexican managers and organizations?

2. THE MODEL AND HYPOTHESES

The model of EIS success used for the current study, depicted in Figure 1, draws upon the DeLone and McLean (1992) model of IS success and adapts the model to an EIS context. The DeLone and McLean model of IS success suggests that system quality and information quality lead to use and user satisfaction, which lead to individual impacts which then lead to organizational impacts. We are not going to examine system quality because the evidence suggests that systems that are of low quality are discontinued shortly after their inception leading to a somewhat high failure rate among EIS (Millet and Mawhinney, 1992).

Insert Figure 1

¹ Exports from US firms to Mexico increased from \$28 million in 1990 to \$584 million in 1995 (Barton, 1996). See Table 1 in the Appendix for further figures on US-Mexico Trade during the 1990s.

The model of EIS success does include three variables not included in the DeLone and McLean model, namely perceived competition, perceived time pressure, and collective use of the system. DeLone and McLean suggest that the exact choice of variables depends on the objective of the study, the organizational context, and the aspects of the IS addressed by the study, among other things. Two of the added variables--competition and time pressure--have been found in past research to be important reasons behind EIS development [Watson, Rainer, and Koh, 1991]. Because these variables influence the development of EIS, they are expected to influence EIS use. In addition, we have added a variable labeled collective use. The use variable in the DeLone and McLean model does not explicitly imply either individual or collective use. It seems unlikely that a single individual's use will result in significant organizational impact. Our adaptation of the model suggests therefore that individual use will have individual effects while the collective use of the EIS may have organizational effects. The variables comprising the model of EIS success are further described below.

2.1 Competition

A competitive environment is one in which change occurs rapidly and is frequently unpredictable (Johnston and Carrico, 1988). A competitive environment may influence the deployment and use of IT for managers charged with decision making in this competitive environment (Johnston and Carrico, 1988). Watson, Rainer, and Koh (1991) suggest that an industry's competitiveness is an important aspect of the environment to consider when examining EIS; competitiveness was a key factor leading to EIS development in their study. Emery (1991) also found that the need for senior management to be responsive to environmental changes was a primary factor used to justify EIS projects. If EIS are built to respond to competition in the organization's environment, it is reasonable to presume EIS use will likewise be related to competition. It is thus hypothesized that,

Hypothesis 1: EIS use will be positively related to the competitiveness of the organization's environment.

2.2 Perceived Time Pressure

Perceived time pressure in decision making is the perceived need to make decisions quickly. Rockart and DeLong (1988) found that one of the most prevalent reasons contributing to EIS development included personal time pressure leading to the use of information technology to increase efficiency and to exercise control. Managers react to time pressure by using less information and fewer communication channels than they would under nonthreatening conditions (Gladstein and Reilly; 1985; Molloy and Schwenk, 1995; Gosler, Green, and Hughes, 1986). Executives feeling such pressure would desire a few fast and reliable sources of information. In such a case, an EIS may be a preferred source of information in that it has the capability to bring together information from multiple sources, thereby enabling a manager to readily obtain the necessary real-time information under time pressure from the EIS. Thus, it is hypothesized that,

Hypothesis 2: EIS use will be positively related to the time pressure facing the manager.

2.3 Quality of EIS Information

The presence of and access to timely, relevant, and accurate information, defined as information quality, is crucial to the effective performance of managers. Studies suggest a direct relationship between perceived quality of information and its use in decision making and a direct relationship between good information and good decision making (Szewczak, 1988). In addition, higher quality information is used more frequently as is information that is easier to access (O'Reilly, 1982). Watson et al (1991) found that the need for rapid status updates was the most important internal pressure leading to the development of EIS. Bergeron et al. (1991) identified that for successful EIS, executives identified quality of information provided by the system as one of the most important characteristics. The quality of EIS may be particularly relevant to Mexican managers, who are often unable to get reliable information about performance indicators from human sources because of a cultural tendency to avoid giving unfavorable information (Stephens and Greer, 1995). It is thus hypothesized that,

Hypothesis 3: EIS use will be positively related to the quality of information provided by the EIS.

2.4 EIS Use and EIS User Satisfaction

Consistent with the DeLone and McLean model, we posit that EIS use and EIS user satisfaction will be positively related in a circular relationship so that the greater the use of the EIS, the more satisfied the user and the more satisfied the user, the greater the use. However, in terms of the impact of EIS on individual users and the organization, we will argue that it is the use of EIS, rather than the satisfaction of the user with the EIS, that contributes to individual and organizational impacts. It is thus hypothesized that,

Hypothesis 4: EIS use and EIS user satisfaction will be positively related.

2.5 Individual Impacts of EIS Use

As individual level decision making impacts of EIS use, this study will use the following variables described and tested in Leidner and Elam (1995): decision making speed, extent of analysis in decision making, and individual mental model enhancement. In their sample of US executives, Leidner and Elam found that the frequency and length of EIS use was positively related to decision making speed, mental model enhancement, and the extent of analysis in decision making. Because we are interested in the organizational impact of EIS which according to DeLone and McLean (1992) may be related to the extent to which individual impacts occur, we will retest these hypotheses on the current sample. Consistent with the findings of the US sample, we hypothesize that,

Hypothesis 5: Decision making speed will be positively related to EIS use.

Hypothesis 6: Mental model enhancement will be positively related to EIS use.

Hypothesis 7: The extent of analysis in decision making will be positively related to EIS use.

2.6 Organizational Impact

As organizational level impacts of EIS use, this study will derive variables alluded to in prior research. For the most part, the organizational level of EIS impacts have not been addressed directly in prior research. Some of the early EIS were used only by a few members of the top management team, making claims about organization wide implications tenuous. However, with the dispersion of EIS to other levels of the organization, it is feasible to anticipate some benefits of EIS on the organization as a whole.

2.6.1 Organizational Vision

EIS use among top managers may result in a shared perspective of what is important for managers at all levels to focus their attention on. In short, if top managers are examining specific performance measures on a regular basis, subordinates are forced to assign priorities in such a manner as to maximize performance on the factors regularly examined by top management. One result of such a visible symbol of top management priority may be to inculcate a shared vision of the organization's performance as well as a shared vision of organizational objectives (Rockart and DeLong, 1988). Much as the development of shared analogies in organizations help frame strategic decisions (Sapienza, 1983), a shared vision may help frame organizational decisions by giving a consistent interpretation to current and desired performance. The greater the level of EIS use by managers at all levels and the greater the impact that EIS has on the individuals using it, the greater the extent the vision is shared. We thus hypothesize that,

Hypothesis 8: Shared organizational vision will be positively related to the individual impacts of EIS use and the collective use of EIS.

2.6.2 Organizational Communication

There are two reasons to expect that EIS use might improve organizational communication. One reason is that many, if not most, current EIS are equipped with electronic mail capabilities. Initial email research has suggested that email increases overall communication by increasing the frequency of communication among existing communication partners and by encouraging the development of new contacts (Trevino and Webster, 1992; Sproull and Kiesler, 1986). A second reason EIS might lead to improved organizational communication is that organizational members have consistent information. Communication may be more efficient in that it can be devoted to discussions about the implication of the information rather than resolving discrepancies in the information content. EIS use may improve both the decision maker's understanding of problems and the decision maker's ability to communicate effectively with others (Molloy and Schwenk, 1995). The greater the level of EIS use by managers at all levels and the greater the impact that EIS has on the individuals using it, the greater the improvement to organizational communication. We thus hypothesize that,

Hypothesis 9: Improved organizational communication will be positively related to the individual impacts of EIS use and the collective use of EIS.

2.6.3 Organizational Competitive Response

A primary objective of many EIS is the provision of external information to improve the ability of managers to scan the environment and keep abreast of competition. While initial studies of EIS revealed markedly little incorporation of external information, more recent research indicates that external information in the form of access to stock market information, to external databases, and to customer information is becoming common in EIS. For example, IBMs executive decisions software package has integrated Desktop Data's NewsEdge product into their EIS which monitors live news from nearly a dozen different sources and provides them to the user based on a match with the user's interest profile (Frolick and Ramarapy, 1993). One example of an EIS providing external information enabling the organization to respond effectively to competition is Hertz, which pulls information about prices in each market and then adjusts their own prices as appropriate to undercut the competition. External information can assist organizations in responding to their external environment. As reported in Rainer and Watson (1995), an energy company has weather maps in their EIS so that if a major storm enters the Gulf, they can track the storm and see if they have to evacuate their offshore drilling rigs. The greater the level of EIS use by managers at all levels and the greater the impact that EIS has on the individuals using it, the greater the competitive response of the organization. We thus hypothesize that,

Hypothesis 10: Improved competitive response will be positively related to the individual impacts of EIS use and the collective use of EIS.

2.6.4 Organizational Decision Making Effectiveness

In some of the early work on MIS, King and Rodriguez (1978) suggested that the primary assessment of the value of an MIS if it is intended to support managerial decision making is improved decision making. Although improved decision making is not the single purported end of EIS, it can be considered an important goal for many EIS. Huber (1990) suggested that higher quality and more timely information provided by advanced IT would lead to higher quality decisions. Molloy and Schwenk (1995) found that the use of IT was considered critical for both the identification activity and the final decision outcome for over half of the decisions examined. Studies have found that data availability and the amount of information accessed can influence the effectiveness of decisions (Gosler, Green and Hughes, 1986). Because EIS are built with the

intent of providing relevant information in an easily accessible format, they should contribute to improvements in the effectiveness of decision making. The greater the level of EIS use by managers at all levels and the greater the impact that EIS has on the individuals using it, the greater the decision making effectiveness of the organization. We thus hypothesize that,

Hypothesis 11: Decision making effectiveness will be positively related to the individual impacts of EIS use and the collective use of EIS.

3. METHODOLOGY

A combination of survey data and interview data was used to examine the research questions and test the hypotheses. A survey instrument was used to gather data to test the relationships expressed in the hypotheses. The survey was originally written in English by the author and then translated into Spanish. Many of the items on the survey had been previously used in a study of EIS users in the United States (Leidner and Elam, 1995). The Mexican translator had been born to Mexican parents in a US border town and had been reared and educated in the US although Spanish was the language of his household. Two other bilingual individuals reviewed the translation. Following translation, the survey was pretested on three Mexican executives to ensure that the questions were clear. These individuals were all executives in a financial institution. The individuals provided feedback on any wording they found ambiguous and their suggestions were incorporated into the final survey. Few changes were necessary, reflecting the fact that the majority of the questions had been pretested in the United States and that the questions had been translated accurately.

As a supplement to the empirical data, unstructured interviews were conducted with top managers in five of the companies. The interviews typically lasted between one and two hours and were conducted in English. The interviewees were asked to talk about how they used the EIS and what benefits they attributed, individually or organizationally, to the EIS. The interviews were recorded with the permission of the interviewees, and were later transcribed. The recommendations of Eisendhardt [1989] for the analysis of qualitative information were followed wherein the researcher seeks for greater clarity over time by successive reading of the cases, each time extrapolating greater detail. The author read through the transcripts and made of list of key themes that appeared in each interview. The themes were consolidated into major categories. The

transcripts were carefully read a second time during which examples of the categories were noted. The transcripts were then read a third time to identify any contradictions with the categories and examples noted during the first two readings and to identify specific examples falling in the purviews of each category. Finally, the observations derived from the analysis of the transcripts were written and are appear in section 4.3. In this study, the qualitative data was used as a means to verify and explain the empirical data rather than as a means to build or revise the theory.

3.1 Selection of Respondents

The researcher obtained a list of all medium and large Mexican organizations. The list was organized alphabetically within major cities in Mexico. The sample for the study was drawn from the Monterrey region. It was desirable to draw the sample from the Monterrey area because the author would be able to personally visit all of the organizations in Monterrey² and it was felt that the response rate would be very low if the author did not personally visit the organizations. The Mexican culture values face-to-face communication (Condon, 1985; Kras, 1995; Moran and Abbott, 1994) and the author anticipated lack of commitment to the study on the part of participants if she did not make the effort to personally meet individuals in the organizations identified to have EIS. The IS director of every tenth organization on the list was called until a sufficient number of organizations with EIS had been identified. The IS directors were asked whether the organization had an EIS and, if so, they were asked to describe the system. If the IS director replied in the positive, an arrangement was then made for an on-site, face-to-face interview. It was felt that the face-to-face interview was important to enable greater clarity (because of the language difference) as well as to establish commitment to the project. Interviewing the IS director was also a means of ensuring that each of the companies participating in the study did in fact have an EIS.

During the on-site interview, the IS director was given a set of ten surveys to distribute to a sample of EIS users. If there were more than ten EIS users, the author requested that the contact person randomly distribute the surveys to users in proportion to their management level (i.e., if 30% of the total EIS users were top managers and 70% middle managers, then 30% of the respondents were upper managers and 70% were middle managers). Although executive policy

² The author had accepted a summer teaching position in Monterrey. The schedule permitted the author to visit organizations during the day and teach in the evening. Visiting organizations outside of the Monterrey vicinity, however, was not feasible.

makers were originally intended to be the users of EIS, these systems are now frequently used at lower management levels (Watson et al., 1991). Leidner and Elam (1995) found no difference in the outcome of EIS use for senior and middle managers, suggesting that EIS is relevant to both levels of management. No distinction in this study between senior and middle managers will therefore be made; rather, EIS users will be referred to as “managers.” The IS director was also asked during the on-site interviews about the possibility of arranging interviews with upper level management users of the EIS. Such interviews were scheduled with upper managers in five of the organizations. For reasons relating to time, scheduling, and language, it was not possible to conduct interviews with users in all of the organizations.

3.2 Measurements

Where possible, items were derived from previously verified sources; in some cases, the items used to measure the variables of interest were created specifically for this study.

3.2.1 Perceived Competition

Items measuring perceived competition were borrowed from an instrument developed by Doty, Glick, Sutcliffe, Miller, and Huber (1988) and reported in Glick, Huber, Miller, Doty and Sutcliffe [1990]. The three items ask about the extent to which other organizations in the industry attempt to capture the organization’s customers/clients, face a prosperous environment, and have easy access to resources for growth and expansion. The survey also asks the extent to which the manager’s own organization operates in a competitive environment, has easy access to resources for growth and expansion (negative scale), and seeks to increase market share. The respondents answered each question on a five point Likert scale ranging from “to no extent” (1) to “to a great extent (5). This same five-point scale was used for most of the items. Exceptions will be noted.

3.2.2 Perceived Time Pressure

Because no previous items measuring perceived time pressure were available, the items were developed by the author. The survey asks the extent to which it is critical to the organization’s performance to: immediately identify problems, find a workable solution to a problem very quickly, and quickly make decisions. The survey also asks the extent to which it is critical to the individual’s personal performance to: immediately identify problems, find a

workable solution to a problem very quickly, and quickly make decisions.

3.3.3 EIS Information Quality

Rockart and DeLong (1988) equated EIS data quality with timeliness, accessibility, accuracy, and completeness. This is similar to Bergeron and Raymond (1992), who associate quality with information that is flexible, timely, relevant, complete, and validated. The survey asks the extent to which the EIS provides availability of information that was previously unavailable, timely information, a single delivery source of important information, control over the content of the information, consistency of the information with that received by other managers, and accurate information.

3.3.4 EIS Use

Frequency of EIS use was measured on a five-point scale consisting of infrequently, monthly, 1-4 times per week, daily, and several times per day. For the collective EIS use measure, respondents were asked to rate the extent to which their peers, their subordinates, and their superiors used the EIS on the same five-point scale consisting of infrequently, monthly, 1-4 times per week, daily, and several times per day.

One way to measure EIS use is thus the frequency of use as described above. However, as stated by Bergeron, Rivard, and Gara (1995), EIS use per se is not necessarily successful use. Vlahos and Ferratt (1995) concur that the effectiveness of EIS depends heavily upon their use, and specifically how they are used. We will thus also define EIS use in terms of the type of EIS use which will be categorized according to monitoring internal data, monitoring external data, and communicating with others in the organization. A major departure of this study from past EIS research is the attempt to examine more closely how the EIS is used rather than only how frequently it is used. To measure the use of EIS for communication, the survey asks the extent to which the individual uses the EIS to communicate with peers, to communicate with subordinates, and to communicate with superiors. To measure the use of EIS for internal monitoring, the survey asks the extent to which the individual uses EIS to monitor daily operations, to analyze operational data, and to monitor the consequences of previous decisions. To measure the extent to which EIS is used to monitor external information, the survey asks the extent to which the individual uses EIS to analyze external data, to monitor information about competitors, and to monitor national and international news.

3.3.5 EIS User Satisfaction

Items measuring EIS user satisfaction are adopted from Sanders and Courtney (1985) who examined user satisfaction with DSS. DSS in their instrument was changed to "EIS". The survey asks the extent to which the individual has become dependent on EIS in fulfilling work responsibilities, the extent to which the use of EIS has made the individual more valuable to the organization, the extent to which the individual personally benefits from the existence of EIS, and the extent to which the individual relies on EIS in performing his/her job. Sanders and Courtney's measure was chosen for its succinctness. Because user satisfaction was not the primary interest of this study, it was desired to have a terse yet previously validated measure for satisfaction. In addition, Sanders and Courtney were examining user satisfaction with a particular subclass of IS, namely decision support systems. Likewise, the current study was not interested in user satisfaction with IS in general, but rather user satisfaction with a subclass of systems, namely executive information systems. The Sanders and Courtney measure, which has also been used in other EIS studies [Vandenbosh and Higgins, 1995], therefore adapted nicely to the purposes of this study.

3.3.6 Individual Impacts

The items measuring mental model enhancement, decision making speed, and the extent of analysis in decision making were taken from Leidner and Elam (1995). To measure mental model enhancement, the survey asks the extent to which the EIS has had the following benefits: given the individual a clearer sense of where things are going, a sharper vision and increased understanding of the business, a better understanding of important trends, and better insights into the problems and opportunities facing the organization. To measure decision making speed, the survey asks the extent to which the EIS helps the individual make decisions quicker, shorten the time frame for making decisions, and spend less time in decision-related meetings. This survey also added two additional questions, one concerning the speed with which the manager is able to conduct decision analysis and one concerning the speed with which the manager is able to implement decisions. To measure the extent of analysis, the survey asks the extent to which the EIS has helped the individual spend significantly more time analyzing data before making a decision, examine more alternatives in decision making, use more sources of information in decision making, and engage in more in-depth analysis.

3.3.7 Organizational Impacts

The organizational impact variables are being created specifically for this study. IS studies have been plagued with difficulty in isolating the effects attributable to the IS (DeLone and McLean, 1992). IS are usually implemented as part of other organizational change. EIS, for example, are many times built as a means of coping with reductions with middle management prompted by competitive pressures. It is therefore difficult to isolate whether organizational impacts following the development of the EIS are attributable to the use of the EIS or are really a result of the streamlining of organizational processes mandated by organizational changes. In addition, one would expect a time lag between when a system is built and when organizational impacts are experienced (Jarvenpaa and Ives, 1990). During the lag between implementation and outcome, there are other organizational processes taking place that might obscure any direct effect of the IS. Thus, because there do not exist at this point valid methods for distinguishing EIS organizational impacts, this study will rely on perceptual measures of organizational impact.

Three items to measure each of the organizational impact constructs were developed. The survey asks the extent to which EIS use has improved communication with subordinates, with superiors, and with peers (the "improved communication" impact); the survey asks the extent to which EIS use has increased the overall effectiveness of the firm, increased the effectiveness of decision making in the firm, and increased the speed with which the organization is able to implement decisions (the "decision making effectiveness" impact); the survey asks the extent to which the firm is better able to make important strategic decisions, to respond to competitive pressures, and to notice changes in the environment (the "competitive response" impact); and the survey asks the extent to which the EIS has led to a giving managers a shared understanding among managers of the firm's competitive environment, a shared understanding of the firm's performance, and a shared understanding of important trends (the "shared vision" impact).

4. ANALYSIS AND RESULTS

In total, the author had telephone interviews with 24 IS directors that stated that their organizations had EIS³. On-site interviews with the IS directors were conducted in each of the organizations. Among the original 24 organizations that agreed to participate, it was determined during the in-site interviews that 7 did not have working EIS but were in the stages of planning or developing an EIS. They were therefore disqualified from further participating in the study. In total, 170 surveys were sent by the IS directors to managers in the 17 remaining organizations. Of these, 89 were returned for a response rate of 62%. The industries represented in the sample include construction, manufacturing, financial services, food products, consumer products, and professional services. Table 1 provides an overall description of the size and industries represented by the sample firms. All of the participating companies were Mexican owned and operated and all of the respondents were natives of Mexico. Roughly half of the respondents were senior managers and half were middle managers. Interviews were conducted in five of the responding organizations. Interviews were conducted with four presidents, one chief financial officer (the president was not available), one director of planning, and four middle management users of EIS. The organizations in which interviews were conducted consisted of one construction company, two manufacturing companies, a food products company, and a consumer products company. The results of the empirical analysis will be presented first, followed by an analysis of the interview data.

INSERT TABLE 1

4.1 Empirical Analysis

4.1.1 Construct validity & reliability

Content validity--the representativeness of the measures (Straub, 1989) was assessed by subjecting the survey to pilot testing. The pilot testing suggested that the questions and instructions were clear. Construct validity--the meaningfulness of the measures--was assessed by common factor analysis (Kerlinger 1986). Eigenvalues greater than 1 and scree plots were used in determining the number of factors. For an item to be considered in the composition of a variable, it

³ The author was planning to spend approximately five weeks in Mexico gathering data and wished to arrange one interview per working day. After 24 companies with EIS were identified, the telephone calls to identify companies with EIS were stopped.

had to have a loading of at least .5 on the factor, with no loading exceeding .3 on another factor, had to conform to a priori assignments, and had to add to the variable's reliability.

The mean of the items in each scale was used to combine the items into a variable score. Cronbach's alpha was used to assess the inter-item reliability of the final, multi-item scales. In general the items loaded strongly on the proper construct and the alpha's, except for competition, all exceed .7. Table 2 presents the results of the factor loadings and reliability scores. Table 3 presents the descriptive statistics for each variable.

INSERT TABLE 2

INSERT TABLE 3

A MANOVA was run to test for an overall organizational effect (Table 4). The test was marginally significant ($F=1.88$, $p>.041$) although only one of the variables showed a significant difference across organizations. This variable was perceived competition ($F=6.37$, $p>.014$). Because only a single variable showed a systematic difference across organizations and because the study is interested in the perceptions of individual EIS users, we will treat the individual responses within organizations as individual responses rather than collapsing all of the responses in an organization into a single response.

INSERT TABLE 4

In order to test the hypotheses, MANOVAs were run. Table 5 shows the results of the MANOVA using the antecedents of EIS (perceived time pressure, perceived competition, perceived information quality in the EIS) as the independent variables and the types of EIS use as the dependent variables. This MANOVA is significant ($F=3.199$, $p>.002$).

INSERT TABLE 5

Table 6 shows the results of the MANOVA using the types of EIS use as independent variables and the individual impacts as dependent variables. The MANOVA is significant

($F=5.23; p>.000$).

INSERT TABLE 6

Table 7 presents the results of a MANOVA using the individual impacts and collective EIS use as independent variables and the perceived organizational impact variables as the dependent variables. The MANOVA is significant ($F=11.23, p>.000$).

INSERT TABLE 7

4.1.2 Hypothesis Testing

Hypothesis 1 predicted that EIS use would be positively related to perceived competition. This hypothesis is rejected. None of the types of EIS use is predicted by perceived competition. Contrary to the hypothesis, the use of EIS to examine external information is negatively related to perceived competition ($t=-2.52, p>.014$).

Hypothesis 2 predicted that EIS use would be positively related to perceived time pressure. This is not supported for any of the types of EIS use. The use of EIS to communicate, however, is negatively related to perceived time pressure ($t=-2.78, p>.007$).

Hypothesis 3 predicted that EIS use would be positively related to the quality of information in the EIS. This hypothesis is supported for the use of EIS to monitor internal information ($t=3.031, p>.003$) and the overall frequency of EIS use ($t=3.28, p>.002$).

Hypothesis 4 predicted that EIS Use and EIS Satisfaction would be positively related. Correlation analysis was used to test this hypothesis. This hypothesis is supported for the use of EIS to examine internal ($r=.389, p>.000$) and external ($r=.278, p>.007$) information but not for the overall frequency of EIS use ($r=.15, p>.07$) nor the use of EIS to communicate ($r=.079, p>.242$).

Hypothesis 5 predicted that decision making speed would be positively related to EIS use. This hypothesis was supported. Specifically, the use of EIS to monitor internal information and the use of EIS to monitor external information were positive and significant predictors of individual decision making speed ($t=2.613, p>.011$ and $t=2.604, p>.042$, respectively). Thirty-one percent of the variance in decision making speed was explained by the EIS use variables.

Hypothesis 6 predicted that mental model enhancement would be positively related to EIS

use. This hypothesis was supported. Specifically, the use of EIS to monitor internal information ($t=3.094$, $p>.003$) and the use of EIS to monitor external information ($t=2.610$, $p>.011$) were significant positive predictors of mental model enhancement. Forty percent of the variance in mental model enhancement was explained by the EIS use variables.

Hypothesis 7 predicted that the extent of analysis in decision making would be positively related to EIS use. This hypothesis was supported. Specifically, the use of EIS to monitor internal information ($t=2.89$, $p>.005$) and the use of EIS to monitor external information ($t=2.72$, $p>.026$) were significant positive predictors of the extent of analysis in decision making. Thirty-eight percent of the variance in the extent of analysis in decision making was explained by the EIS use variables.

Hypothesis 8 predicted that shared organizational vision would be positively related to individual impacts and collective EIS use. This hypothesis is supported. However, it is only the individual impact that EIS use has on the extent of analysis that significantly and positively contributes to shared vision ($t=2.356$; $p>.02$). Forty-eight percent of the variance in shared vision is explained by the individual impacts and collective use variables.

Hypothesis 9 predicted that improved communication in the organization would be positively related to individual impacts and collective EIS use. This hypothesis is supported. Collective EIS use ($t=3$; $p>.004$) and individual decision making speed ($t=2.5$; $p>.000$) are significant positive predictors of improved organizational communication. Nineteen percent of the variance in organizational communication is explained by the individual impacts and collective use variables.

Hypothesis 10 predicted that improved competitive response in the organization would be positively related to individual impacts and collective EIS use. This hypothesis is supported. Mental model enhancement ($t=3.7$, $p>.002$) is a significant and positive predictor of organizational competitive response. Fifty-two percent of the variance in organizational competitive response is explained by the individual impacts and collective use variables.

Hypothesis 11 predicted that organizational decision making effectiveness would be positively related to individual impacts and collective EIS use. This hypothesis is supported. It is the individual speed related to EIS use that enables effective organizational decision making ($t=4.04$, $p>.000$) according to the data. Sixty-three percent of the variance in organizational

decision making effectiveness is explained by the individual impacts and collective use variables.

Figure 2 summarizes the findings of the hypothesis testing. Arrows indicate significant positive relationships unless there is a negative sign to indicate that the relationship is significant but negative. Although from a theoretical and intuitive viewpoint, the direction of the relationships can be argued, the research method does not allow for causality to be ascertained. The arrows must therefore be interpreted as indicating relationships but not necessarily causality.

INSERT FIGURE 2

4.2 Qualitative Analysis

The empirical data can shed light on the relationships of EIS to individual and organizational outcomes, but fall short of providing insight into the aspects of EIS that enable organizational outcomes, except that individual outcomes are associated with organizational outcomes. The purpose of the interviews was therefore to determine how, in the opinions of the users, EIS contributed to individual and organizational improvements. Two visions of EIS emerged from the interviews: one, EIS as a personal productivity tool; the other, EIS as an organizational change tool. The vision of EIS as an organizational change tool coincided with a perceived need to enable the organization to cope with environmental uncertainty and turbulence whereas the vision of EIS as a personal productivity tool coincided with a fairly clear and stable organizational culture.

Whereas there is evidence that many systems built in the US are done so purely with the personal productivity of senior managers in mind [Rockart and DeLong, 1988], only one of the systems in the five Mexican organizations where interviews were conducted evinced a view of EIS as a means of improving productivity and nothing more. Managers in this organization felt intuitively that the EIS should help them respond to competition in their industry. However, the original EIS fell into desuetude shortly after its inception. Reasons given for the failure included the difficulty of integrating information from the worldwide operations, and, more importantly, a lack of interest among top managers. The organization still had some upper and middle level marketing managers using the EIS but had halted any plans to improve the system. This organization, where the vision of EIS seemed to be purely personal, was operating in a stable

environment in comparison to the majority of large Mexican organizations. This organization had experienced international success well before NAFTA and had arguably already mastered the art of global competition. Thus, this organization was not as focused on rapid and radical improvements in order to survive the emergence of foreign-based competition as were the other organizations.

By contrast, EIS in the remaining organizations were built in response to a perceived need to enable the organization to cope with environmental uncertainty. Executives in these organizations focused their discussion almost exclusively on the organizational impacts of the EIS. EIS were seen as a way of inculcating a new organizational vision and as a way of shaping organizational culture. The organizations viewing EIS as a means of aiding in the transition to an open market had systems with very-widespread use across divisions and downward in the organization and showed a balance of information in several areas of management, including finance and sales, human resource management, and external information. This balance of information facilitated various organizational outcomes including (1) refocusing organizational vision (2) coordinating activities (3) managing organizational downsizing and (4) adapting to the new environment.

4.2.1 Refocusing Organizational Vision

The detailed performance information, primarily financial and sales related, helped focus the attention of employees on the factors considered most critical by the top managers. This information thus enabled the top managers to maintain control over their organizations and manage the change by securing a shared vision of the factors most critical to the organization's survival. One of the systems was organized around ten critical success factors that could be viewed in terms of a selected product by a selected region across a selected time frame. The data was gathered real time from the chosen region, be it in South or Latin American, or Spain where the organization had divisions, and displayed graphically in less than ten seconds. It was felt in this organization that managers would focus on the success factors that were being monitored closely by top managers. In another organization, the CEO had a monthly "direction" meeting in which all the people who reported directly to him attended. He explained during this meeting his assessment of organizational performance during the past month and presented the main indicators he was examining as well as his interpretation. He used the EIS during the meeting to display his thoughts and encourage his subordinates to make necessary improvements in the coming month. Several other managers mentioned that by virtue of the fact that they were looking consistently at certain

pieces of information, others in the organization began to focus considerable attention on these performance indicators as well. This refocusing of attention was viewed as a part of their turnaround strategy. One president compared the organization's environment before NAFTA to "a kid riding a bike with training wheels--it was hard to fall down." EIS were a means of providing the informational support necessary to enable the organization to shift from a view of performance based on volumes sold to one based on profits earned.

4.2.2 Coordinating Activities

A second reason why the systems appeared to enable organizational improvement was that they facilitated coordination across individuals and units. For example, one president stated that "if we need to present information to stockholders, we can sometimes have a view ahead of what is going to happen in the next month like maybe the flat division's plant is thinking about having maintenance so maybe in the next month it is going to be lower in sales so he deals with that and informs our CFO. So if we are trying to ask for some loans or some other thing then we need to take into account that situation." Thus, the information contained in the system assisted in coordination not only within divisions and departments, but across divisions and departments. Furthermore, the EIS helped reduce the need for coordination. Another executive stated that "if you leave a problem out of hand, then you have a lot of coordination and a lot of conflict among the functions. If you tackle the problem when it is just marginal, then hopefully it is also easier to solve. So, in a way, the EIS also helps you avoid the conflict." The attitude in these organizations was that the more users across divisions worldwide, the better the coordination. Said a financial manager in one of the organizations: "It is very difficult to have some uniformity in reports with a lot of divisions if we don't have a system that is for everyone." The goal from the inception of the EIS was to provide information to as many managers worldwide as possible. In addition, electronic mail was viewed in the organizations as a means of improving coordination. One organization had hoped to shift from an autocratic management style to a more consultative style and were using the shared vision provided by the EIS as well as the electronic communication provided therewith to encourage this change.

4.2.3 Managing Organizational Downsizing

A third way in which the EIS facilitated organizational improvement was by providing

information enabling upper managers to efficaciously handle human resource management in a time of severe downsizing. Large reductions in the number of employees was common during the years immediately following NAFTA. Indeed, in one organization, the number of employees dropped in half in the two years after NAFTA. The human resource information was used, for example, in decisions concerning the elimination of positions or the relocation of individuals within the organization to another position. The director of planning interviewed in one of the manufacturing firms was chiefly responsible for the personnel decisions entailed in the company's major downsizing effort. He stated that before he had the EIS, he was unable to obtain information about employees without word rapidly spreading concerning whom he was considering for the layoff. This exacerbated an already tenuous problem with employee morale. The EIS greatly facilitated his role by enabling him to search for employee information without having to ask for it. In one of the organizations, employee satisfaction surveys were conducted each year. The survey had been developed by industrial psychologists for this organization. The responses were included in a human relations module in the EIS. Each manager could see his subordinates' responses as well as the satisfaction of the subordinates of other managers. This enabled upper level managers to monitor employee morale during the change efforts. Another organization had an holistic view of the EIS as engendering a certain management style which endowed the organization with a competitive advantage. Human resources were viewed in this organization as the basis upon which the organization competed. The EIS was viewed as a means of inculcating the desired management style.

4.2.4 Adapting to the New Environment

A fourth and final way in which EIS facilitated efficacious organizational improvement was by providing external information about the industry, business cycles, and the purchasing profiles of customers which enabled the organizations to adapt more quickly to a changing environment. In one of the organizations, the CEO was attempting to make the company a publicly traded company in the US. For this reason, he wanted to "know every single movement that is happening in the company and the industry each month" so as to enable him to have explanations for potential lenders. One of his subordinates stated that the CEO's "main target for using the EIS is to be well prepared to answer the questions of the lenders." This entailed following movements of the market in Mexico and the United States. The EIS was also used to assist with important decisions such as

deciding on whether to close a plant, whether to implement price increases or decreases, and what type of product mix to produce each month. Another organization was pursuing a strategy of growth by acquisition. Each time an acquisition was made, the systems in the acquired organization were immediately replaced with the systems of headquarters and the acquired company's information was incorporated into the EIS for monitoring. This allowed the newly acquired organization to be quickly initiated to the vision and style of headquarters (though not always without some resistance over the massive and sudden changes introduced by headquarters). This company is currently pushing to include more information about customers and even linking certain modules of the EIS to customers so that major customers themselves will be able to check the status of their orders. Thus, EIS may provide not only external information to the organization but organizational information to external constituencies.

4.2.5 Summary of Qualitative Analysis

Revisiting the model derived from the empirical data, we can suggest that the interviews are complimentary to the empirical findings with the exception that the executives interviewed in all organizations except for one did not discuss individual outcomes but rather focused on the link between the information provided by the EIS and the organizational outcomes enabled thereby. The outcomes expressed in the interviews appear to fall within the purview of the organizational impact variables examined empirically. Coordination may be intimately tied to "organizational communication" so that perceived improvements in coordination explain the significant relationship of EIS and organizational communication. Human resource decisions appeared to be among the most urgent decisions being made and may have been on executives' minds when they responded to questions on the survey concerning decision making effectiveness. The ability to adapt quickly to a changing environment is likely related to the variable "competitive response" and the focusing of employee attention on critical success factors is likely related to the "shared vision" variable. Thus, the interviews provide additional support for the general model, particularly to the perceived organizational impacts of EIS, in addition to providing a depth of insight not available from the survey analysis.

6. DISCUSSION, LIMITATIONS, AND CONCLUSIONS

The present study adapted the DeLone and McLean model of IS success to the context of EIS success. The results proffer insights into some antecedents as well as some consequences of EIS use. The overall frequency of EIS use was best explained by the quality of information in the EIS. Prior research has shown that competition in the organization's environment as well as time pressure facing managers are important reasons behind the development of EIS (Watson et al, 1991; Rockart and DeLong, 1988); however, neither competition nor perceived time pressure were significant predictors of EIS use. Hence, EIS tend to be used for different reasons than they are built. Using EIS to communicate with others in the organization was negatively related to perceived time pressure. It may be that the lack of immediate feedback hinders the use of electronic communication when there is a sense of urgency. It may also be that Mexican managers, who have been noted to communicate face-to-face more than their North-American counterparts (Stephens and Greer, 1995), use email to supplement rather than replace face-to-face communication so that when time pressure exists, it is the supplementary communication form that is abandoned. This study also favors the finding of Molloy and Schwenk (1995), that managers decrease reliance on IS when faced with time pressure. Perceived time pressure was, in fact, negatively related to each type of use, except for external monitoring, although the relationships were not all significant. Perceived competition was negatively related to the use of EIS to examine external information. It is possible that given such a turbulent environment as is facing Mexico, information about the external environment is not trusted and hence, not examined, because it is felt that it will change so quickly. Very little of the variance in the EIS use variables was explained by the antecedents of EIS use, pointing to the need to reconsider the antecedent variables.

This study, as have past EIS studies (Leidner and Elam, 1995; Rainer and Watson, 1995), indicates that managers perceive personal benefits from using EIS. This study also suggests that certain types of EIS use have a greater influence on outcomes than others. Of the three types of use examined in this study--the use to communicate, the use to monitor internal information, and the use to monitor external information--it is the internal and external monitoring that demonstrate significant positive influences on the individual impact variables. Using EIS to communicate was not positively related to any of the individual impacts. This does not suggest that the communication function is not valuable, but rather that in comparison with the internal and external

information provided by EIS, it is not as significant, particularly as pertains to the decision making variables examined as individual impact variables. Each of the three individual impacts of EIS use-- decision making speed, mental model enhancement, and the extent of analysis in decision making-- was significantly related to the use of EIS to examine internal information and the use of EIS to examine external information. One EIS study found that improved mental model was not considered an important benefit of EIS use (Rainer and Watson, 1995); this study, however, confirms the findings in Leidner and Elam (1995) and Vandenbosch and Higgins (1996) --that EIS helps refine a manager's understanding of the business. The overall frequency of EIS use is not an important predictor of EIS benefits when the types of EIS use are taken into account.

The organizational impacts were examined from the perspective of individual managers. Consistent with the DeLone and McLean model, we examined the relationship between individual impacts and organizational impacts. We also considered the impact of collective EIS use on organizational impacts. The findings suggest that improvements in decision making effectiveness were best explained by improvements in the decision speed of individual managers, improvements in organizational communication were associated with collective EIS use and decision making speed, improvements in competitive response were related to the enhanced mental models of managers, and shared vision was explained by the extent of analysis of the information. These results suggest that the individual impacts of EIS use are associated with various perceived organizational benefits. Although the organizational measures are perceptual, they do offer a rough indication that EIS can have organizational outcomes in addition to the more commonly examined individual outcomes.

In terms of the Model of EIS Success, the antecedents of EIS use need to be more clearly explored. It may be that the explanation for use is quite simple--that managers anticipate benefits from using EIS and hence they use EIS. Of equal interest would be undertaking a study of why some managers do not use EIS even though a quality EIS is available. The individual impacts of EIS seem to be well explained by EIS use and the organizational impacts are well explained by the individual impacts and collective use. Thus, the DeLone and McLean model of IS success, when adapted to an EIS context, appears to be useful in understanding the impact of EIS on managers and organizations.

Lastly, the interview data largely support the conclusion that executives do perceive EIS to

enable organizational outcomes. The interviews suggested that EIS, from the perspectives of high level managers, facilitated organizational improvements in four ways: by providing detailed internal data which enabled a refocusing of attention on important factors and the sharing of a new vision, by providing detailed internal operational data which enabled better coordination, by providing human resource information which assisted with downsizing decisions, and by providing external information which enabled a fast response to the changing market conditions. Moreover, what emerges from the interviews is that the relevance of information aggrandizes with the opening of a market. Leidner et al [1996] found that EIS were perceived as more useful by Mexican executives than by US or Swedish executives: it appeared that characteristics of the national business environment, rather than characteristics of national culture or features of the systems themselves, best explained this result. In the interviews described here, clear indications that the information was valuable in the transition to the open market were given by the top managers. These findings reinforce the notion that economic situations have an important effect on the utility of information [Leidner et al., 1996].

6.2 Limitations

There are several limitations to the study that warrant mention. First, the study addressed only users of EIS at the point in time the survey was administered. Users who had discontinued use of the system were not included in the sample. Thus, the results cannot be used to deduce requirements for EIS success but only to suggest that EIS can be successfully used. In addition, one can infer from the results some impacts EIS use may have on individuals and organizations but not necessarily what results EIS use will have. Secondly, the study was conducted in a particular context--that of a developing nation with a recently opened market. One must take caution in generalizing the results to other contexts. Thirdly, it is inappropriate to make causal deductions. Although from a theoretical and intuitive standpoint, the direction of the hypotheses were argued, the research method did not test for directionality. Therefore, the results must be interpreted in terms of association rather than causality. Fourthly, the respondents, though all native Mexicans, were based in the Monterrey region of Mexico. Some may argue that because of its proximity to the United States, Monterrey is non-representative of Mexico as a whole. However, many would argue that it is the southern regions of the US border states that are more Mexican than American in culture. Monterrey does have a culture that is distinct from other major regions of Mexico, but one

should expect that Monterrey is nevertheless more Mexican in culture than it is American. The issue of cultural similarity due to contiguosity cannot be resolved by this study. We can proffer, however, that the organizations were all fairly large and had international relations. These organizations were likely representative of other large international Mexican organizations but not representative of small Mexican organizations. Fifthly, the author did not have personal control over the individual respondents chosen to complete the EIS survey. Hence, it is possible that only satisfied users of the EIS were requested by the IS directors to complete the surveys. However, the statistical data indicates variations in frequency of use and user satisfaction which would suggest that the IS directors did not attempt to skew the responses in either a positive or a negative direction. Lastly, the organizational measures were individual's perceptions of organizational impacts. More powerful measures of organization impact would examine financial measures of organizational performance.

6.3 Conclusions

This study purported to examine the impact of EIS on Mexican managers and Mexican organizations. In particular, are EIS successful in Mexico? Ramon and Watson (1994) state that "for managers in a high context society, EIS is a poor substitute for the meaning that comes from high context communication". This study contravenes the viewpoint that systems such as EIS will not be successful in high-context societies; EIS is not a substitute for other sources of communication or information, but rather a complement. The results suggest that Mexican managers use EIS in such a manner as to experience faster decision making, improved understanding of the business, and increased decision making analysis which then help create a shared organizational vision, improved organizational communication, improved organizational competitive response, and improved organizational decision making effectiveness. EIS can thus be successful in a high context society in the sense that managers using EIS perceive benefits from their use. On a broader level, EIS appear to be helping Mexican managers cope with the increased need for both more internal and external information resulting from their new business environment. This is not to suggest that organizations in developing nations must embrace the management technology and practices of their counterparts in industrialized nations in order to succeed, but rather that management technology from the industrialized organization can be used successfully, though perhaps differently, in organizations in developing nations to help the

organizations in developing nations respond to the challenge of competition from their industrialized rivals.

References:

- Bergeron F., and Raymond, L., "Evaluation of EIS from a Managerial Perspective," Journal of Information Systems, vol. 2, 1992, pp.45-60.
- Bergeron, F., L. Raymond, S. Rivard, and M.F. Gara, "Determinants of EIS Use: Testing a Behavioral Model," Decision Support Systems, vol.14, no.2, 1995, 131-146
- Bergeron, Francois, Chantal Buteau, and Louis Raymond , "Identification of Strategic Information Systems Opportunities: Applying and Comparing Two Methodologies," MIS Quarterly, vol. 15, no.1, March 1991, 89-104.
- Cats-Baril, William L., and Jelassi, Tawfik , "The French Videotex System Minitel: A Successful Implementation of a National Information Technology Infrastructure," MIS Quarterly, vol. 18, no.1, March 1994, pp.1-20.
- Condon, John C., Good Neighbors: Communicating with the Mexicans, (Yarmouth: Intercultural Press), 1985.
- Deans, P. Candace and Michael J. Kane, International Dimensions of Information Systems and Technology, (Boston: Pws-Kent Publishing Company), 1992.
- Delone, William H. and McLean, Ephriam R. , "Information Systems Success: The Quest for the Dependent Variable," Information Systems Research, vol. 3, no.1, March 1992, pp. 60-95.
- Doty, D.H., Glick, W.H., Sutcliffe, K.M., Miller, C.C., and G.P Huber, "CODE Technical Report 06," July 1988, Department of Management, University of Texas, Austin.
- Emery, Charles C., "Implementing an Executive Information System at Samaritan Health Services," DSS-91 Transactions (Ed. Ilze Ziguers), 1991, pp. 28-32.
- Frolick, Mark and Ramarapu, Narendra K., "Hypermedia: The Future of EIS,"Journal of Systems Management, July 1993, pp. 32-36.
- Gladstein, Deborah L. and Nora P. Reilly, "Group Decision Making Under Threat: The Tycoon Game," Academy of Management Journal, Vol. 28, No. 3, 1985, pp. 613-827.
- Glick, William H, George P. Huber, C. Chet Miller, D. Harold Doty, and Kathleen M. Sutcliffe, "Studying Changes in Organizational Design and Effectiveness Retrospective Event Histories and Periodic Assessments", Organization Science, vol. 1, no.3, 1990, pp. 293-312.
- Gosler, Martin D., Gary I. Green, and Terry H. Hughes, "Decision Support Systems: An Empirical Assessment for Decision Making," Decision Sciences, vol. 17, 1986, pp. 79-91.
- Huber, George P., "A Theory of the Effects of Advanced Information Technologies on Organizational Design, Intelligence, and Decision Making," Academy of Management Review, vol. 15, no. 1, 1990, pp. 47-71.
- Ives, B., Jarvenpaa, S.L. and Mason, R.O., "Global Business Drivers: Aligning Information Technology to Global Business Strategy," IBM Systems Journal, vol. 32, no. 1, 1993, pp. 143-161.
- Jarvenpaa, Sirkka L. and Ives, Blake "Information Technology and Corporate Strategy: A View from the Top,"Information Systems Research, vol. 1, no.4, December 1990, pp. 351-377.
- Jarvenpaa, Sirkka L. and Ives, Blake, "The Global Network Organization of the Future: Information Management Opportunities and Challenges," Journal of Management Information Systems, Spring 1994, vol. 10, no. 4, pp. 24-57.
- Johnston, H. Russell, and Shelley R. Carrico, "Developing Capabilities to Use Information Strategically," MIS Quarterly, March 1988 (12:1), 37-50.
- Kerlinger, F.N., Foundations of Behavioral Research. (Fort Worth, TX: Holt, Rinehart, and Winston), 1986.
- King, W.R. and J.I. Rodriguez, "Evaluating Management Information Systems," MIS Quarterly,

- September 1978, pp. 43-51.
- Kras, Eva S., Management in Two Cultures: Bridging the Gap between US and Mexican Managers, (Yarmouth: Intercultural Press), 1995.
- Leavitt, Harold, "Applied Organizational Change in Industry," in Copper, Leavitt, and Shelley (eds), New Perspective in Organization Research, N.Y.: Wiley, 1964.
- Leidner, Dorothy E., and Joyce J. Elam, "The Impact of Executive Information Systems on Organizational Design, Intelligence, and Decision Making," Organization Science, Vol. 6, no. 6, 1995, pp. 645-665.
- Millet, Ido and Mawhinney, Charles H., "Executive Information Systems," Information and Management, vol. 23, 1992, pp. 83-92.
- Molloy, Steve, and Charles R. Schwenk, "The Effects of Information Technology on Strategic Decision Making," Journal of Management Studies, vol. 32, no. 5, May 1995, pp. 283-311.
- Moran, Robert T. and Jeffrey Abbott, Nafta: Managing the Cultural Differences, (Houston: Gulf Publishing Co), 1994.
- O'Reilly, III, Charles A., "Variations in Decision Makers' Use of Information Sources: The Impact of Quality and Accessibility of Information," Academy of Management Journal, vol. 25, no. 4, December 1982, pp. 756-771.
- Rainer Jr., R.K. and H.J. Watson, "What Does It Take for Successful Executive Information Systems?" Decision Support Systems, vol. 14, no. 2, 1995, pp. 147-156.
- Raman, K.S. and Richard T. Watson, "National Culture, Information Systems, and Organizational Implications" in Global Information Systems and Technology: Focus on the Organization and Its Functional Areas (ed. P. Candace Deans and Kirk R. Karwan) IDEA Group Publishing, Harrisburg, USA, 1994, pp. 493-513.
- Rockart, John and David DeLong, Executive Support Systems: The Emergence of Top Management Computer Use, (Illinois: Dow-Jones-Irwin), 1988.
- Sanders, G. Lawrence and James F. Courtney, "A Field Study of Organizational Factors Influencing DSS Success," MIS Quarterly, March 1985, pp. 77-93.
- Sapienza, A.M. "A Cognitive Perspective on Strategy Formulation". Paper presented at the Academy of Management National Meeting, Dallas, August, 1983.
- Sproull, L. and S. Kiesler, "Reducing Social Context Cues: Electronic Mail in Organizational Communication," Management Science, 32, 1986, pp. 1492-1512.
- Stephens, Gregory K., and Charles R. Greer, "Doing Business in Mexico: Understanding Cultural Differences," Organizational Dynamics, Summer 1995, pp. 39-54.
- Straub, Detmar W., "Validating Instruments in MIS Research," MIS Quarterly, vol. 13, no. 2, June 1989, pp. 147-170.
- Szewezak, Edward J., "Exploratory Results of a Factor Analysis of Strategic Information: Implications for Strategic Systems Planning," Journal of Management Information Systems, vol. 5, no. 2, Fall 1988, pp. 83-98.
- Trevino, Linda and Jane Webster, "Flow in Computer-Mediated Communication," Communication Research, vol. 19, no. 5, October 1992, pp. 539-573.
- Vandenbosch, Betty and Chris Higgins, "Executive Support Systems and Executive Preferences: a Comparison of Information Channel Selection Theories," Information Systems Journal, vol. 5, 1995, pp. 105-118.
- Vandenbosch, Betty and Chris Higgins, "Information Acquisition and Mental Models: An Investigation into the Relationship Between Behaviour and Learning", Information Systems Research, Vol. 7, No. 2, June 1996, pp. 198-214.
- Vlahos, George E. and Thomas W. Ferratt, "Information Technology Use by Managers in Greece to Support Decision Making: Amount, Perceived Value, and Satisfaction," Information and Management, vol. 29, 1995, pp. 305-315.
- Watson, Hugh J., Kelly Rainer, and Chang Koh, "Executive Information Systems: A Framework for Development and A Survey of Current Practices," MIS Quarterly, March 1991, 13-30.

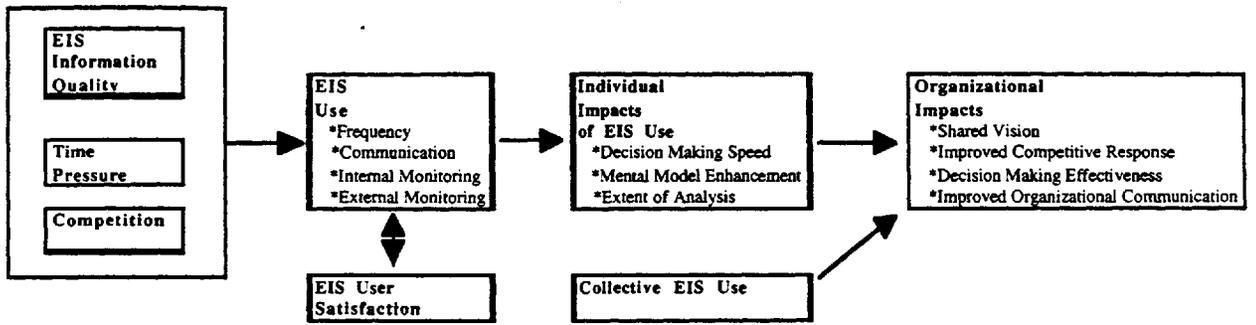


Figure 1: Model of EIS Success

	Ave. No. Employees	Average Revenue	Number in Sample
Manufacturing	9364	\$802,735	7
Financial Services	11434	\$697,479	3
Food Products	13170	\$1,087,949	3
Consumer Products	3103	\$573,077	1
Professional Services	2829	\$185,642	2
Construction	n/a	n/a	1

Table 1: Profile of Participating Organizations by Industry

Construct	Factor Loading	Cronbach's Alpha	Construct	Factor Loading	Cronbach's Alpha
Factor: Perceived Time Pressure		0.89	Factor: Speed of Decision Making		0.85
Critical to effective organization performance to:			Make decisions quicker	0.79	
Immediately identify problems	0.75		Speed of decision analysis has increased	0.8	
Find a workable solution to a problem very quickly	0.81		Able to implement decisions faster	0.88	
Quickly make decisions			Shorter time frame for making decisions	0.86	
Critical to effective personal performance to:	0.8		Spend less time in decision related meetings	0.72	
Immediately identify problems	0.81		Factor: Mental Model Enhancement		0.79
Find a workable solution to a problem very quickly	0.84		Clearer sense of where things are going	0.85	
Factor: Perceived Competition		0.59	Sharper vision and increased comprehension of the business	0.75	
Other organizations in the industry:			Better understanding of important trends	0.77	
attempt to capture our customers/clients	0.55		Factor: Extent of Analysis		
face a prosperous environment	0.82		Using the EIS has allowed me to engage in more in-depth analysis	0.77	
have easy access to resources for growth	0.64		I spend more time analyzing data before making a decision	0.8	
Our organization:			Factor: Organizational Competitive Response		0.94
operates in a competitive environment	0.57		Organization better responds to competitive pressure	0.79	
Factor: EIS Information Quality		0.81	Organization better makes important strategic decisions	0.76	
Accuracy of information	0.72		Factor: Organizational Communication		0.89
Consistent and dependable information	0.68		Improved communication with superiors	0.89	
Correct information	0.88		Improved communication with peers	0.87	
Availability of timely information	0.86		Factor: Organizational Shared Vision		0.73
Factor: EIS Use for Communication		0.86	Shared understanding of the firm's performance	0.86	
Use EIS to communicate with others in the organization	0.88		Shared understanding of important trends	0.77	
Use EIS to communicate with superiors	0.91		Factor: Organizational Decision Making Effectiveness		0.82
Factor: EIS Use for Monitoring Internal Information		0.74	Increased Organizational Effectiveness	0.75	
Use EIS to monitor daily operations	0.81		Improved Quality of Decision Making	0.68	
Use EIS to monitor operational data	0.85		Organization can implement decisions faster	0.82	
Factor: EIS Use for Monitoring External Information		0.75			
Use EIS to analyze external data	0.74				
Use EIS to monitor information about competitors	0.69				
Use EIS to monitor national and international news	0.79				
Factor: EIS User Satisfaction		0.77			
Dependent on EIS	0.72				
More valuable in the organization	0.74				
Personally benefit from EIS	0.63				
Rely on EIS in performing job	0.86				

Table 2: Factor and Reliability Analysis

Variable	Mean	St Dev	Max	Min	N
Perceived Time Pressures	4.58	0.51	5	2.6	89
Competition	3.72	0.59	5	2.25	88
Perceived EIS Information Quality	4.15	0.79	5	1	84
Frequency EIS Use	3.6	1.2	5	1	89
EIS Use--Communication	2.69	1.31	5	1	83
EIS Use--Internal	0.079	1.12	5	1	83
EIS Use--External	2.87	1.15	5	1	82
Satisfaction	3.22	0.78	5	1	82
Decision Making Speed	3.67	0.8	5	1	88
Mental Model Enhancement	3.57	0.82	5	1	88
Extent of Analysis	3.79	0.95	5	1	85
Organizational Shared Vision	3.85	0.94	5	1	86
Org. Decision Making Effectiveness	3.79	0.86	5	1	86
Organizational Communication	3.29	1.05	5	1	86
Org Competitive Response	3.36	1.19	5	1	85

Table 3: Descriptive Statistics

Variable	F	p>
Perceived Time Pressures	2.79	0.099
Competition	6.37	0.014
Perceived EIS Information Quality	1.68	0.199
Frequency EIS Use	3.478	0.067
EIS Use--Communication	0.047	0.827
EIS Use--Internal	0.174	0.678
EIS Use--External	0.697	0.407
Satisfaction	0.3511	0.555
Decision Making Speed	0.0147	0.839
Mental Model Enhancement	0.542	0.464
Extent of Analysis	0.847	0.361
Organizational Shared Vision	0.313	0.578
Org. Decision Making Effectiveness	0.213	0.645
Organizational Communication	0.396	0.531
Org Competitive Response	0.9544	0.332

Table 4: MANOVA for Organization Effect

	MANOVA		Regression			
	F (df)	p>	Adj. R2	Coeff.	t	p >
Frequency of EIS Use	3.199 (12)	0.002	0.090			
Perceived Time Pressure				-0.137	-1.182	0.241
Perceived Competition				-0.035	-0.321	0.749
Perceived EIS Information Quality				0.381	3.280	0.002
EIS Use--Communication			0.067			
Perceived Time Pressure				-0.326	-2.783	0.007
Perceived Competition				0.086	0.784	0.435
Perceived EIS Information Quality				0.035	0.302	0.764
EIS Use: Internal			0.159			
Perceived Time Pressure				0.160	1.440	0.154
Perceived Competition				-0.170	-1.627	0.108
Perceived EIS Information Quality				0.339	3.031	0.003
EIS Use: External			0.065			
Perceived Time Pressure				0.172	1.472	0.145
Perceived Competition				-0.278	-2.520	0.014
Perceived EIS Information Quality				0.027	0.228	0.820

Table 5: MANOVA of EIS Antecedents on EIS Use

	MANOVA		Regression			
	F (df)	p>	Adj. R2	Coeff.	t	p >
	5.23(12)	0.000				
Decision Making Speed			0.318			
EIS Use: Communication				0.029	0.306	0.761
EIS Use: Internal				0.343	2.613	0.011
EIS Use: External				0.238	2.064	0.042
EIS Use: Frequency				0.124	1.035	0.304
Mental Model Enhancement			0.404			
EIS Use: Communication				0.042	0.457	0.649
EIS Use: Internal				0.380	3.094	0.003
EIS Use: External				0.282	2.610	0.011
EIS Use: Frequency				0.113	1.037	0.303
Extent of Analysis			0.386			
EIS Use: Communication				-0.107	-1.152	0.253
EIS Use: Internal				0.360	2.890	0.005
EIS Use: External				0.248	2.720	0.026
EIS Use: Frequency				0.155	1.410	0.163

Table 6: MANOVA of Individual Impacts by EIS Use

	MANOVA		Regression			
	F (df)	p>	Adj. R2	Coeff.	t	p >
	11.23(16)	0.000				
Organizational Shared Vision			0.483			
Individual Speed				0.159	0.795	0.429
Individual Analysis				0.417	2.336	0.022
Individual Mental Model				0.149	0.975	0.333
Collective EIS Use				0.042	0.457	0.649
Organizational Communication			0.197			
Individual Speed				-0.627	2.512	0.014
Individual Analysis				-0.330	-1.483	0.142
Individual Mental Model				-0.141	-0.743	0.460
Collective EIS Use				0.351	3.007	0.004
Organizational Response to Competition			0.525			
Individual Speed				0.191	0.997	0.322
Individual Analysis				0.106	0.624	0.534
Individual Mental Model				0.459	3.135	0.002
Collective EIS Use				0.039	0.438	0.663
Organizational Decision Making Effectiveness			0.630			
Individual Speed				0.685	4.042	0.000
Individual Analysis				-0.001	-0.009	0.993
Individual Mental Model				0.099	0.772	0.442
Collective EIS Use				0.077	0.992	0.360

Table 7: MANOVA of Organizational Impacts by Individual Impacts

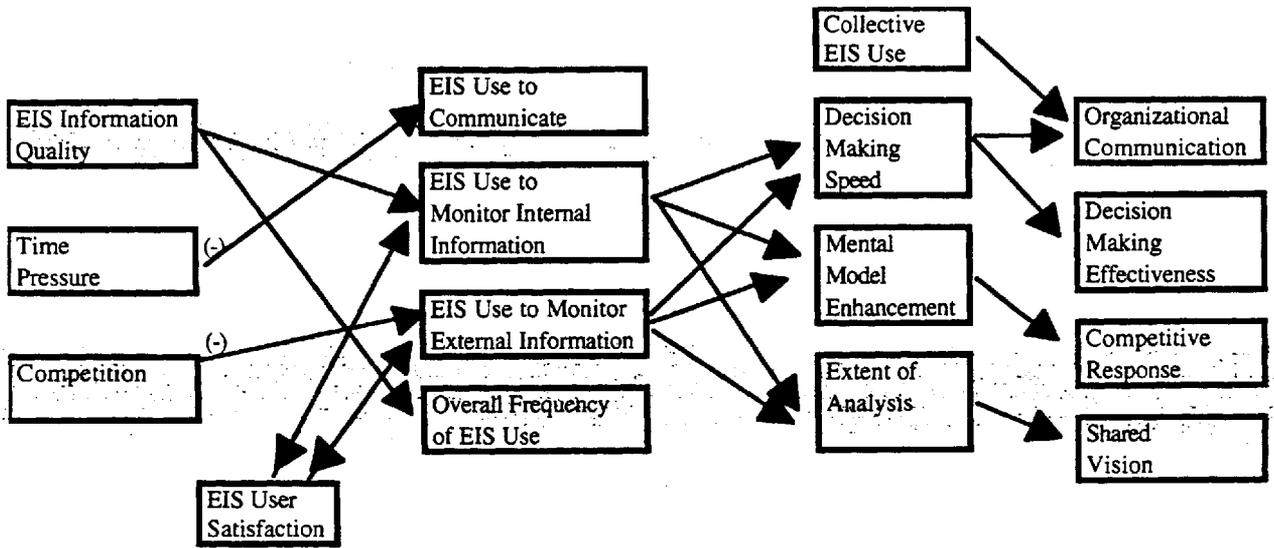


Figure 2: Summary of Hypothesis Testing Results

The Appendix

	The United States			
	1990	1992	1994	1995
Population (1)	250,410,000	254,521,000	260,713,585	263,814,032
GDP (2)	\$5,743,800	\$6,244,400	\$6,931,400	\$7,245,800
Total Exports (2)	\$393,592	\$448,164	\$512,627	\$584,742
Exports To Mexico (2)	\$28,279	\$40,592	\$50,844	\$46,292
Total Imports (2)	\$495,310	\$532,665	\$663,256	\$743,445
Imports from Mexico (3)	\$30,157	\$37,285	\$52,795	\$66,712
	Mexico			
	1990	1992	1994	1995
Population (1)	87,870,154	92,380,721	92,202,199	93,985,848
GDP (1)	\$187,000	\$289,000	\$740,000	\$728,000
Exports Total (3)	\$37,700	\$46,196	\$61,976	\$79,777
Exports To USA (3)	\$30,157	\$37,285	\$52,795	\$66,712
Total Imports (3)	NA	\$52,990	\$80,179	\$72,440
Imports from USA (2)	\$28,279	\$40,592	\$50,844	\$46,292

**All dollar amounts are in millions

(1) Source: CIA World Fact Book
(2) Source: Department of Commerce, "US Foreign Trade Highlight 1995" by David Barton
(3) Source: Inter American Development Bank, Statistics based on Data International, <http://www.iadb.org>

Table 1: US-Mexico Trade Figures