Executive information systems use in organizational context: an explanatory user behavior testing

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EXECUTIVE INFORMATION SYSTEMS USE IN ORGANIZATIONAL CONTEXT:
AN EXPLANATORY USER BEHAVIOR TESTING

A Thesis submitted in partial fulfillment of the requirements for the award of the degree of

DOCTOR OF PHILOSOPHY

from

UNIVERSITY OF WOLLONGONG

by

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ABSTRACT

Executive Information Systems (EIS) are designed to enhance executives and senior managers' work performance in their organizations. Despite the importance and the reported growth in popularity of EIS, there are reports of underutilization of these systems which, in part, contributes to the failures of these systems. The majority of prior EIS research has focused on documenting the features, benefits, development methodologies, and implementations of these systems. Unfortunately, very few studies addressed the problem of underutilization of EIS in relation to the user's behavior.

The primary aim of this research study is to investigate the factors that explain users' behavior towards using EIS in organizational settings. The study also aims to identify the relative importance of those factors that determine the use of EIS, with the objective of using the results to suggest ways of improving the usage of EIS in organizations. The research model is based on Triandis' Theoretical Framework, a model from social psychology and organizational behavior. The research model is used to hypothesize that EIS usage (Behavior) is determined by: EIS experience, ability to use EIS (Habits); subjective norms, subjective roles, subjective values, social situations (Social Factors); perceived usefulness of EIS (Consequences); user satisfaction with EIS information, the EIS system, EIS support, EIS plan (Affect); and EIS development processes, management processes, organizational environment (Facilitating Conditions).
Field data obtained by a survey questionnaire from CEOs, CFOs and one other executive from 200 organizations using EIS in Australia were used to test the research model and to confirm the appropriateness of the Triandis’ behavioral model for EIS usage through correlation and regression analyses.

The results of the study indicate overall that social, cultural, political and organizational factors are important variables that explain the behavior of executives in using EIS. The order of importance of these factors (from most to least important) in explaining executives’ behavior in using EIS is: organizational, social, cultural and political.

The results have theoretical, methodological and practical/managerial implications. Theoretically, the study confirmed that Triandis’ behavioral model is an appropriate reference theory for studying EIS usage. Methodologically, the approach for studying EIS as a behavior using Triandis’ Framework has enhanced understandings from previous studies based on different approaches. Practically/managerially, the findings of the study have implications for EIS design, development, implementation and management in organizations.
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CHAPTER 1 INTRODUCTION

1.1 Background to the Research Study

Today, the use of computer-based information systems to improve decision-making and performance prevails in almost every sector of every organization. While executives preside over and authorize expenditures on information technology (IT) and its use in their organizations, they have not necessarily directly benefited from the use of the technology in making strategic decisions and in performing other executive level managerial duties.

Executives have seen IT introduced into the offices of their clerical staff and middle managers to a great effect, but their own experiences of the technology have often been limited to authorizing expenditures on IT, learning why yet another corporate system has failed or needs replacing, being disappointed by the quality of information received from management information systems, and/or being frustrated when trying to operate information systems which were designed with computer experts in mind rather than the casual user (Pervan and Phua, 1997). As a result, executives have relied on printed reports, subordinates, meetings, networks of people inside and outside their organizations, telephone calls, newspapers, government reports, and the like to perform their managerial duties (Watson and Carte, 2000).

To assist executives to obtain some of the necessary information needed in their strategic decision-making and other managerial duties from computer-based
information systems, a few leading-edge firms in the US in the late 1970s developed a computer-based system which we now call executive information systems (EIS) (Houdeshel and Watson, 1987). These innovative systems are specifically tailored to meet executives’ information needs for decision-making and other executive level managerial duties (Holsapple and Whinston, 1987; Harvey and Meiklejohn, 1990; Watson, Rainer and Koh, 1992).

While there are reports of success stories in using EIS, there are comparatively higher number of reports on the failures of these systems (Millet and Mawhinney, 1992; Watson and Frolick, 1993). The reported failures of these systems in organizations, particular at the corporate strategic management levels, have been extensively documented in the literature (Glover, Watson and Rainer, 1992; Rainer and Watson, 1995; Young and Watson, 1995; Hanzic, 1997; McBride, 1997; Nandhakumar and Jones, 1997; Vandenbosch and Huff, 1997; Liang and Miranda, 2001). Rainer and Watson (1995) for instance found the failure rate in the US market as high as 60%, and a recent study estimated the failure rate as high as 70% in the US market (Poon and Wagner, 2001).

These reported failures of EIS revealed the “risky and fragile” nature of the design, development and implementation of these systems (Glover, Watson and Rainer, 1992; Watson, Houdeshel and Rainer, 1997). The reported failures also gave way to cynicism and disappointment to replace the euphoria that accompanied the birth of these systems, and presented a grim outlook for the
introduction and use of the systems in the workplace. As a result, some organizations that are yet to implement EIS are reluctant to do so (Waston and Frolick, 1993; Byun and Suh, 1994).

1.1.1 Factors that contribute to EIS failures

There are several factors that contribute to EIS failures: some technical, others managerial and organizational (Watson, Houdeshel and Rainer, 1997). Some of the EIS failures were inexplicably linked to organizational, management, social, cultural, behavioral, psychological and technological factors (Kling, 1991; Davies, 1992; McBride, 1997; Nandhakumar and Jones, 1997; Poon and Wagner, 2001).

Another factor contributing to EIS failures is the non-usage or low usage of the systems. System usage has generally been identified in the IS literature as one of the sources of failures of systems, and system usage is often used as a surrogate of IS success. System usage has also been identified as being user behavior related (Trice and Treacy, 1988).

1.1.2 Research studies on EIS and the Motivation for this Study

Although EIS have attracted a growing number of research studies, a review of the EIS literature indicates that few studies have been done on the usage of these systems. The majority of prior EIS research studies have focused on documenting the features, benefits, design, development, methodologies, and implementation
of these systems (e.g., Rainer and Watson, 1995; Nandhakumar and Jones 1997; McBride, 1997; Watson, Houdeshel and Rainer, 1997; Bajwa et al. 1998; Vandenbosch, 1999; Watson & Carte, 2000; Scholz, 2000; El-Kordy, 2000). The research studies on these aspects of EIS are more thorough and extensive than studies on the usage of these systems. Of the limited research studies on the usage of these systems, unfortunately, very few used appropriate reference theories that addressed system usage as a behavior (Trice and Treacy, 1988). These very few studies on EIS usage are also mixed, with only a very small number addressing the problem of underutilization of these systems. In other words, the research approaches to resolve EIS failures are more technical and technological than social, cultural, political and organizational in nature.

Although recent studies (Bergeron et al., 1995; Carte, 1999; Watson and Carte, 2000) indicate there is a growing popularity of EIS, and new concepts such as enterprise resource planning (ERP), data warehousing, data mining, OLAP, ROLAP, MOLAP, Internet, Intranet, Extranet and the Web are giving rise to a renewed need to provide executives with a meaningful view of corporate information, the problem of underutilization or non-usage of EIS still remains.

The motivation for this study therefore is to provide insights into the failure of EIS in organizations due to underutilization or non-usage of these systems.
The remainder of this chapter introduces: the research problem and the research questions; the conceptual framework upon which this research was built; the significance of this study; the delimitations of scope and key assumptions of this study; and the organization of this thesis.

1.2 Research Problem and Questions

Information systems, including EIS, are social systems. Previous studies (e.g., Sauer, 1993; Poulymenakou & Holmes, 1996; Nandhakumar, 1996) have suggested that the success or failure of an IS cannot be explained purely in technical terms, and that the roots of a successful IS lie in the social and organizational context. Studies of the Stock Exchange Taurus system (Currie, 1995), the London Ambulance system (Beynon-Davies, 1995), the Confirm system (Oz, 1994) and other studies (Sauer, 1993; Mitev, 1996; McBride, 1997) have also indicated that the complex interaction of the social, cultural, political and organizational elements with technical elements resulted in the failure of a number of information systems. The success or failure of information systems is therefore inextricably linked with the dynamics of the organization within which they exist. McBride (1997), who studied the rise and fall of an EIS in a UK manufacturing company over nine years, concluded that: "no study that concerns itself with how to develop a successful IS and how to avoid failures can reach many reasonable conclusions unless it addresses issues of context and culture" (p. 277). Also, social, cultural and organizational factors have been linked with system usage (Bergeron, et al., 1995; Carlson and Davis, 1998; Venkatesh and
The research problem that this study sought to provide solutions to is: the failure of executive information systems (EIS) in organizations due to underutilization or non-usage of these systems.

Given the preceding considerations, the primary aim of the study is to identify, examine and provide an understanding of the social, cultural, political and organizational factors that explain the behavior of executives towards using EIS. The two main research questions that this study addressed in relation to the research problem are:

1. What are the important social, cultural, political and organizational factors that explain the behavior of executives towards using executive information systems in organizational settings?

2. What is the relative importance of these factors in determining executive information systems use by executives in organizational settings?

1.3 Conceptual Framework for the Study

A number of researchers have studied different aspects of the phenomenon of individual reactions to computing technology from a variety of theoretical perspectives, including: the Technology Acceptance Model (TAM) which is an adaptation of the Theory of Reasoned Action (TRA) (e.g., Davis, 1989; Davis, et al., 1989; Adams et al., 1992; Venkatesh & Davis, 1996; Kim, 1996; Venkatesh,
1999; Venkatesh and Morris, 2000; Elkordy, 2000; Elkordy and Khalil, 2002); Diffusion of Innovations (e.g., Moore & Benbasat, 1991; Compeau and Meister, 1997); the Theory of Planned Behavior (TPB) (e.g., Mathieson, 1991; Taylor and Todd, 1995); Social Cognitive Theory (SCT) (e.g., Compeau & Higgins, 1995a, 1995b; Hill et al, 1986, 1987) and Activity Theory (e.g., Engeström & Escalante, 1996; Nardi, 1996; Kuutti, 1996, 1999; Engeström, 1999; Blackler et al., 1999; Ditsa, 2003). This body of research has produced useful insights into the cognitive, affective and behavioral reactions of individuals to technology, and into the factors that influence these reactions.

According to Compeau et al. (1999), in each of the theories noted above, behavior (e.g., the use of computers) is viewed as the result of a set of beliefs about technology and a set of affective responses to behavior. These beliefs are represented by the perceived characteristics of innovating in Innovation Diffusion research, by perceived usefulness and perceived ease of use in TAM, by behavioral beliefs and outcome evaluations in TPB, and by outcome expectations in SCT. Seddon (1997) refers to these as the net benefits (realized or expected) accruing from the use of a system. Affective responses are typically measured by attitudes towards use - an individual's evaluation of behavior as either positive or negative. The commonalities in these models reflect a belief in the cognitive basis of behavior.
Compeau et al. (1999) however suggest that, while TAM and the Diffusion of Innovations perspectives focus almost exclusively on beliefs about the technologies and the outcomes of using them, SCT and the TPB include other beliefs that might influence behavior, which are independent of perceived outcomes. The TPB model incorporates the notion of Perceived Behavioral Control (PBC) as an independent influence on behavior, recognizing that there are circumstances in which a behavior might be expected to result in positive consequences (or net benefits), yet not be undertaken due to a perceived lack of ability to control the execution of the behavior. PBC encompasses perceptions of resource and technology facilitating conditions, similar to those measured by Thompson, et al. (1991, 1994), as well as perceptions of ability, or self-efficacy (Taylor and Todd, 1995).

However, none of the above theoretical frameworks addresses explicitly the social, cultural, political and organizational factors that may influence/explain the user's behavior to use information systems.

Triandis' Framework, a theoretical model from social psychology and organizational behavior, explicitly addressed the net beliefs as well as the social, cultural and organizational factors that influence/explain behavior. Bergeron et al. (1995) who used Triandis' Framework as a theoretical foundation for their study on EIS usage have suggested that "future investigations should aim for a cumulative tradition by continuing to employ Triandis' Framework as a
theoretical foundation to further understand the phenomenon of EIS use” (p. 142).

Triandis’ Framework has some similarity with Fishbein and Ajzen’s Theory of Reasoned Action (TRA) from which the Technology Acceptance Model (TAM) was derived and commonly used as a theoretical foundation for IS usage studies.

This study uses Triandis’ Framework as a theoretical foundation. A detail description of the framework is presented in Chapter 3.

1.4 Methodology

The nature of this study is both exploratory and explanatory and the unit of analysis is the individual. A cross-sectional approach, in which the unit of analysis is observed at only one point in time, is adopted in this study. The study employs a field study approach because of the nature of the variables involved.

1.4.1 Data Collection Method

The data collection method was by mail survey using ordinary mail. The questionnaire for the survey was pre-tested and a pilot survey conducted. The main data for the study was obtained by administering the final questionnaire on executives and senior managers from 200 organizations using EIS in Australia.
1.4.2 Data Analysis

Preliminary evaluations of the research model and the hypotheses associated with the model were performed by calculating Pearson’s product-moment correlation coefficients (Pearson’s r). A further analysis was conducted by using stepwise regression analysis to determine the relative importance of the predictor (independent) variables in explaining EIS use. Analyses were also performed to ensure there were no violations of the assumptions of normality, linearity and homoscedasticity. SPSS Release 11.0 for Windows was used in the analysis.

1.5 Justification and Significance of the Study

Of all types of information technology, executives information systems are expected to have the greatest impact on executives’ work performance. A survey of senior IS managers in the 1990s identified “facilitating and managing decision and executive support systems” as one of the most critical IS management issues (Niederman et al., 1991). A review of the literature suggests that these IS management issues still remain the most critical today. Although the importance of EIS has been recognized in the IS literature as the key to addressing these issues and providing the expected technological impact on executives’ work performance, few attempts have been made to systematically investigate key factors in the successful utilization of these systems. The empirical results from this study prove useful for both IS researchers and practitioners in identifying the key factors affecting the utilization of EIS.
The significance of this study is threefold: theoretical, methodological and practical/managerial. Theoretically, this study is significant in suggesting and providing a framework for research into EIS usage as behavior. Methodologically, the approach adopted in this study has significance for further research studies into EIS usage. The study also provides important suggestions for further research into usage factors for EIS and other information systems / technologies. Practically/managerially, the results of this study will assist EIS designers, developers, implementers and managements of organizations to improve EIS usage in organizations. In particular, the results of this study points to the following practical/managerial improvements in relation to EIS:

- Improvement in the design, development and implementation of EIS;
- Better education and training of EIS users;
- Improvement in EIS usage leading to the success of these systems;
- Better allocation of resources for EIS;
- Better management of EIS in organizations.

1.6 Organization of the Thesis

This thesis consists of six chapters, titled in this order: Introduction; Literature Review and Research Issues; Theoretical Framework and Research Model; Research Design and Methodology; Data Analysis and Results; Conclusions and Implications.
Chapter 2 presents a review of the relevant EIS literature and critically examines the research focus on EIS usage and presents six classifications of EIS usage by research focus. An historical review of the evolution of EIS and the popularity of EIS are also presented in this chapter. Various definitions of EIS are presented to highlight the complex nature of these systems, and the definition to be used in this study is presented. The benefits and characteristics of EIS, models of EIS, and the future trends in EIS are also examined and presented. The nature of executives’ work and how EIS fit into their work are evaluated in this chapter. Based on the literature review, the research problem and the research questions for the study are presented.

Chapter 3 presents theoretical perspectives used to study IS usage and argues that system usage is a behavior which should be studied using appropriate reference theories. Triandis’ Theoretical Framework which this study uses as a reference theory is described. Based on the theoretical framework and the relevant literature, the research model and the hypotheses to be tested in the study are presented. Details of factors depicted in the research model that are considered to influence/explain behavior in using EIS also are presented. Finally, EIS research studies based on Triandis’ Framework and their advocacy for the use of this framework as a theoretical foundation for IS usage research are presented.

Chapter 4 describes the research design and the methodology adopted to collect data to test the hypotheses and the research model. The nature of the research, the unit of analysis, the dimension, the research methodology, and the data
collection attributes and characteristics employed in this study are described. The conceptualization and operationalization of the constructs and variables based on the theoretical framework and the research model are presented and this is followed by a description of issues relating to reliability and validity which are taken into account in the conceptualization and operationalization. The design of the questionnaire is discussed. Finally, the pilot survey, the main survey, and the administration of the main survey are discussed.

Chapter 5 presents the data analysis and the results of the study. The results of the bivariate analysis and the multiple regression (stepwise) analysis are presented in this chapter.

Chapter 6 presents the discussion of the findings, implications and conclusions related to the research hypotheses. This is followed by discussion of the findings, conclusions and implications related to the research questions and the research problem. The updated version of the original research model and the implications for EIS and IS/technology usage research are presented. This chapter concludes with the contributions of this study, the implications for theory and future research, and the limitations of the study.

1.7 Delimitations of the Scope of the Study

This study is aimed at finding solutions to the problem of EIS failures in organizations due to underutilization or non-usage of these systems. The study seeks solutions to this problem by investigating the important social, cultural,
political and organizational factors that explain the behavior of executives towards using EIS and the relative importance of these factors in determining executives' EIS use in organizational settings. All the hypotheses tested in the study relate to the referenced investigation.

Organizations surveyed are all in Australia. The organizations are from any industry and any sector and they are either private or public organizations. The organizations ranged from small to very large organizations employing a minimum of 1,010 to a maximum of 750,000 people. The number of IT staff in the organizations ranged from 0 to 4000 and turnover ranged from US$0 to over US$1 billion. The participants in the study were executives and senior managers using EIS in the organizations surveyed.

The nature of this study is both exploratory and explanatory and the unit of analysis is the individual. A cross-sectional approach, in which the unit of analysis is observed at only one point in time, is adopted in this study. The study employs a field study approach because of the nature of the variables involved. The data collection method used a mail survey method using ordinary mail.

1.8 Conclusion

This chapter laid down the foundation for this thesis. It introduced: the background to the study; the research problem and the research questions; and the conceptual framework upon which the study was built. It then presented the justification and significance of the study, followed by a brief description of the methodology for the study. Finally, the organization of the thesis, and the delimitations of the scope of the study were presented.
CHAPTER 2 LITERATURE REVIEW AND RESEARCH ISSUES

"'Failures’ of technology have been quite common throughout history - every major innovation starts out with a lot of hype and hope. Within a few years the euphoria is replaced with disappointment and cynicism. If the technology proves itself, however, the cynicism eventually yields to reality and success. The automobile, the radio, television and personal computers have all experienced such an acceptance cycle. Now EIS are having their turn of the bat" (Burkan, 1991, p. vii).

2.1 Introduction

This chapter reviews the relevant literature for this study and presents the research issues resulting from the literature review. The chapter is organized as follows.

The quest for an information system (IS) to meet executives’ information needs in their managerial duties which gave rise to the development of executive information systems (EIS) is first presented. This is followed by consideration of the evolution and popularity of EIS. Various definitions of EIS and the definition to be used in this study are presented next, followed by the benefits and characteristics of EIS, models of EIS, and future trends in EIS. Next, executives’ work and how EIS fit into their work is evaluated. Finally, a critical evaluation of previous research studies on EIS usage is presented in order to demonstrate why this study is important. A conclusion to the chapter summarizes the material presented and the motivation for this study.
2.2 The Quest for an Information System to meet Executives' needs

Top executives in organizations are charged with the responsibility of making strategic decisions for their organizations. The strategic decision-making processes require a myriad of information from within and outside the organizations. In recent times, the complexity of the business environment has increased due to market globalization coupled with the growth in the number of products and services produced in multiplying markets (Matthews 1992). To complicate matters, competition and pressures from financial markets have intensified, while more and more government legislation, policies and regulations are affecting industries (Matthews, 1992; Frolick et al. 1997). All these factors must be carefully taken into consideration by any visionary executive in making any strategic decisions for their organization. And due to today's rapidly changing business environment and fierce competition in the marketplace, there is also the dire need and the growing challenge for executives to make strategic decisions promptly, in order to remain competitive and stay ahead in business.

While executives preside over and authorize expenditures on information technology (IT) and its use in their organizations, they have not necessarily directly benefited from the use of that technology in making strategic decisions and in performing other executive level managerial duties. They have relied on printed reports, subordinates, meetings, networks of people inside and outside their organizations, telephone calls, newspapers, government reports, and the like
p. 17 is missing from original document
However, as indicated in the opening quotation, the euphoria that accompanied the birth of these systems has been replaced often by cynicism and disappointment. While there were some reports of success in using these systems, there was substantial number of reports of EIS failures (Millet and Mawhinney, 1992; Waston and Frolick, 1993). These failures revealed the “risky and fragile” nature of the design, development and implementation of these systems (Rockart and DeLong, 1988; Glover, Watson and Rainer, 1992; Watson, Houdeshel and Rainer, 1997).

Reports of EIS failures in organizations, particular at the corporate strategic management levels, have been extensively documented in the literature (Glover, Watson and Rainer, 1992; Rainer and Watson, 1995; Young and Watson, 1995; Hanzic, 1997; McBride, 1997; Nandhakumar and Jones, 1997; Vandenbosch and Huff, 1997; Liang & Miranda, 2001). Rainer and Watson (1995) for instance found the failure rate in the US market as high as 60%. A recent study estimated the failure rate as high as 70% in the US market (Poon and Wagner, 2001). EIS failures were inexplicably linked to organizational, management, culture, social, behavioral, psychological and technological factors (Poon and Wagner, 2001; McBride, 1997; Nandhakumar and Jones, 1997; Davies, 1992; Kling, 1991).

As a result of the reported EIS failures some organizations that are yet to implement these systems are reluctant to do so (Waston and Frolick, 1993; Byun and Suh, 1994). Earlier studies have revealed that relatively few EIS were fully
operational. In Australia, for example, by 1997 there were relatively few EIS that were fully operational (Pervan and Phua, 1997). These reported EIS failures presented a grim outlook for the introduction and use of these systems in the workplace.

The next section presents an historical overview of the evolution of EIS and the difficulties associated with developing an appropriate name for these systems.

### 2.3 The Evolution and Popularity of EIS

("What these systems are called does not really matter. What does matter is what they can do" (Paller and Laska, 1990, p. 2).

The term executive information systems (EIS) was first coined at the Massachusetts Institute of Technology (MIT) in the late 1970s when a few leading-edge firms developed computer-based information systems to assist their executives in their managerial duties (Houdeshel and Watson, 1987). These systems generally went unnoticed until Rockart and Treacy published their 1982 article, "The CEO Goes On-Line", which described executives such as Ben Heineman at Northwest Industries in the US, who was a daily user of EIS. This article made many executives aware of the possible benefits of EIS. The book, *Executive Support Systems*, by Rockart and DeLong (1988), further fueled executives' interest in EIS and led to many large and even smaller organizations developing the systems in the late 1980s (Watson, Rainer and Houdeshel, 1992).
It was not surprising that other organizations were skeptical and reluctant to follow suit. This was because both management information systems (MIS) in the 1960s and decision support systems (DSS) in the 1970s had failed to deliver what they promised and above all, EIS were (and still are) very expensive to build and maintain. MIS became an expanded set of scheduled, summary reports, while DSS were used by staff and lower level managers to analyze specific decision-making tasks. Neither of these types of systems made executives hands-on computer users or became an integral part of how executives perform their duties (Watson, Rainer and Houdeshel, 1992).

Recent studies (Bergeron et al., 1995; Hoven, 1996; Carte, 1999; Watson and Carte, 2000; Xu and Kaye, 2002) indicate there is a growing popularity of EIS. According to Bergeron et al. (1995), as of 1988 approximately 25% of large US companies had senior executives who directly accessed EIS through workstations. In 1995 the expenditure on EIS software in the US market was US$350 million annually (Watson et al., 1995). Annual average expenditure on a single EIS in the US in 1995 was US$365,000 on development and US$208,000 on maintenance (Nord and Nord, 1995). In 1995 the US market for EIS was predicted to grow at 40% annually (Watson et al., 1995).

EIS have also spread into the public and small business sectors and in 1990 the total software revenue of the three leading EIS providers (Comshare, Execucom and Pilot) was estimated at US$157 million. According to Hoven (1996), the
International Data Corporation estimated that expenditure on EIS rose from US$339 million in 1994 to as much as US$1 billion in 1997. In Europe, the British, the French and the German markets for EIS grew by 72 percent in 1989 alone. Recent investments in EIS across all sectors and industries in the US were predicted to grow to nearly US$5 billion in 2003 (Liang and Miranda, 2001) and in a recent study, a total of 37.5 percent of large Spanish companies were found using EIS with 89.6 percent of these companies recently completing the implementation of EIS (Salmeron, 2002).

New technologies such as data warehousing, data mining, enterprise resource planning (ERP), on-line analytical processing (OLAP), relational operations for online analytical processing (ROLAP), multidimensional operations for online analytical processing (MOLAP), Internet, Intranet, Extranet and the Web technologies have recently increased the popularity of EIS (Carte, 1999; Bashein and Markus, 2000, Singh et al., 2002). These technologies have given the impetus for the widening use of EIS by managers whose decisions must be timely in an increasingly competitive and uncertain business environment (Bergeron et al., 1995; Bashein and Markus, 2000, Singh et al., 2002). Data warehousing, for example, is generally regarded as the prerequisite for effective decision support or data mining systems, and ROLAP and MOLAP have given rise to such concepts as “slicing” and “dicing” of data which have added more flexibility and ease of use to EIS (Bashein and Markus, 2000). Kirkgoeze et al.
(1997) have proposed a three-layer EIS model incorporating some of these newer technologies as shown in Figure 2.2 on page 33.

Recent studies (Wheeler et al., 1993; Frolick & Robichaux, 1995; Bergeron et al., 1995; Bashein & Markus, 2000) have also shown that the use of EIS is spreading to other levels in organizations. Consequently, they are referred to in some organizations as "enterprise-wide information systems" or "everyone's information systems" which still befits the acronym EIS. In some organizations they are known by vendor product names such as Enterprise Business Intelligence Systems, Balanced Scorecard or simply Scorecard. The search for a single name for these systems is not the issue: "What these systems are called does not really matter. What does matter is what they can do" (Paller and Laska, 1990, p. 2).

The next section presents various definitions of EIS highlighting the benefits, the characteristics and the complex nature of these systems.

2.4 Definitions of EIS

Definitions for EIS depend on the perspective through which one sees these systems. This section presents a sample of these definitions before introducing the definition to be used in this study.
The various definitions for EIS are substantially similar. Essentially, these definitions vary according to the weight given to the three elements in the name itself and the characteristics and benefits of the systems. A sample of these definitions is presented in Table 2.1.

### Table 2.1: Sample Definitions of EIS

<table>
<thead>
<tr>
<th>Definition</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Intensely data oriented systems designed to provide information for executive use to improve managerial planning, monitoring and analysis”.</td>
<td>Rockart and Treacy (1982, p. 84)</td>
</tr>
<tr>
<td>“An information system supported with a mainframe computer, or a personal computer, used for various business functions on a current basis by the CEO or a member of the senior management team”.</td>
<td>Bergeron, Raymond &amp; Lagorge (1991, p. 7)</td>
</tr>
<tr>
<td>“A computer system that deals with all of the information that helps an executive make strategic and competitive decisions, keeps track of the overall business and its functional units, and cuts down on the time spent on routine tasks performed by an executive”.</td>
<td>Thierauf (1991, p. 10)</td>
</tr>
<tr>
<td>“A computerized system that provides executives with easy access to internal and external information that is relevant to their critical success factors”.</td>
<td>Watson, Rainer &amp; Koh (1992, pp. 82-83)</td>
</tr>
<tr>
<td>“A structured, automated tracking system that operates continuously to keep management abreast of what is happening in all important areas both inside and outside the corporation [and] is designed to support the complex and multi-dimensional nature of top-level decision making”.</td>
<td>Turban (1993, p. 404)</td>
</tr>
</tbody>
</table>
Table 2.1 (continued)

<table>
<thead>
<tr>
<th>Definition</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;A computerized system that is developed for senior executives to help satisfy their information needs&quot;</td>
<td>Young and Watson (1995, p. 153)</td>
</tr>
<tr>
<td>&quot;A computer-based information system designed to provide a senior manager access to information relevant to his or her management activities&quot;</td>
<td>Elam and Leidner (1995, p. 89)</td>
</tr>
<tr>
<td>&quot;Computer-based information systems designed to provide senior executives with easy access to integrated information from a variety of internal and external data sources, to support their analytical, communication and planning needs&quot;</td>
<td>Pervan and Phua (1997, p. 64)</td>
</tr>
<tr>
<td>&quot;A set of tools designed to help an organization carefully monitor its current status, its progress toward achieving its goals, and the relationship of its mental model of the world to the best available clues about what's really happening&quot;</td>
<td>Kelly (1998, p. 3)</td>
</tr>
<tr>
<td>&quot;A computer-based information system that provides executives with easy access to internal and external information with drill-down capability related to the critical success factors for running current and future business operations&quot;</td>
<td>Bidgoli (1998, p. 93)</td>
</tr>
</tbody>
</table>

Summarizing the thoughts behind these various definitions gives us an EIS as:

Any information systems that can present critical information timely, clearly and accurately, and reveal the interrelationships and driving factors between key performance indicators to enable faster and more accurate decision-making.
We note that a single definition of these systems is unlikely to emerge since the functionality and application of these systems are evolving and changing. Although the use of EIS has spread across the levels of organizations, and may be engaged by other users in many functional areas, in the context of this study, an EIS will be defined simply as:

A computer-based information system designed to aid executives in the performance of their managerial roles.

While definitions are useful, in a complex area such as EIS, a better understanding is obtained by looking at their benefits, characteristics and how different they are from traditional information systems.

2.5 Benefits and Characteristics of EIS

This subsection presents the benefits and the characteristics of EIS.

2.5.1 Benefits of EIS

From an economic perspective, an EIS helps to reduce the need for paper reports (Gelfond, 1988); to eliminate staff levels and administrative tasks in organizations (Gauthir, 1989) and consequently to decrease the costs associated with them.
From an individual perspective, an EIS supports executive activities by providing online and fast access to data and information from internal and external sources (Rockart and DeLong, 1988; Paller and Laska, 1990). As a result, it can lead to a better understanding of the business (Rockart and DeLong, 1988), remove guesswork in financial forecasting (McCartney, 1989), keep executives up to date with operations (Gauthier, 1989), and increase the quality of decision-making, communication capacity and quality (Bergeron, Raymond and Lagorge, 1991).

From an organizational perspective, an EIS facilitates the attainment of organizational objectives, provides a competitive advantage within an industry (Bergeron, Raymond and Lagorge, 1991) and consequently can lead to higher levels of organizational performance (Paller and Laska, 1990).

Despite these obvious potential benefits, EIS have not been used extensively for a variety of reasons (Watson and Glover 1989; Watson, Rainer and Koh, 1992; Bidgoli, 1997; Frolick, 1994; King, 1994). One of the reasons given is the non-use of the systems by the intended users. Another reason is executives do not feel the necessity to use a computer because they can always rely on staff personnel and subordinates who fulfill their information needs. An additional reason is that executives favor soft information from formal and informal meetings over information from computer systems (McLeod and Jones, 1992). Another reason relates to a lack of real understanding of the nature of an
executive’s work. Of particular interest to this study is the underutilization or non-usage of EIS.

Having considered some of the benefits of EIS and some reasons why the benefits may not have been realized, we now consider the important characteristics of these systems.

2.5.2 Characteristics of EIS

Executive information systems draw on multiple applications and multiple data sources, both internal and external to an organization, in order to provide executives with the necessary information to monitor and analyze the performance of their organizations. EIS are mostly concerned with data and ways of interacting with data. They are designed as structured reporting systems that filter, extract, and compress a broad range of relevant current and historical information which are either internal or external to the organization.

EIS attempt to present data in a form that is relevant for enterprise-wide decision-making. They are used, in part, to monitor and highlight the critical success factors of an organization as defined by the user. In general, EIS are enterprise-wide, data-driven DSS that help executives and senior managers analyze, compare, and highlight trends in important variables so that the user can monitor performance and identify problems and opportunities. EIS increase the ability of
executives and senior managers to monitor many activities and may help reduce the number of management levels in an organization (Power, 2002).

Common characteristics of EIS given in the literature (e.g., Rockart and DeLong, 1988; Millet and Mawhinney, 1990; Watson, Rainer and Koh, 1992, Turban, 1993; Watson, Houdeshel & Rainer, 1997; Bidgoli, 1998; Gordon, 1999) include:

- Specifically tailored to executive's information needs and management style;
- Able to access data on specific issues and problems and aggregate reports;
- Able to provide on-line status access, trend analysis, exception reporting and "drill-down" capabilities;
- Able to access a broad range of internal and external data;
- Particularly easy-to-use (typically mouse or touch-screen driven);
- Used directly by executives without assistance;
- Able to extract, filter, compress, and track critical data;
- Able to contain superb graphics capabilities such that information can be presented graphically in several ways;
- Very user-friendly and requires minimal or no training to use, so it can be used by the executive directly;
- Able to provide instant access to supporting details of any summary displayed on an EIS screen.

Table 2.2 shows some of the popular EIS products in the marketplace today.
Table 2.2: Popular EIS Products (Source: Bidgoli, 1997)

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Company Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acumate Enterprise</td>
<td>Kenan Technologies</td>
</tr>
<tr>
<td>Commander EIS</td>
<td>Comshare, Inc.</td>
</tr>
<tr>
<td>Cross Target</td>
<td>Dimensional Insight, Inc.</td>
</tr>
<tr>
<td>Data Interpretation</td>
<td>Metaphor, Inc.</td>
</tr>
<tr>
<td>EIS Toolkit</td>
<td>MicroStrategy, Inc.</td>
</tr>
<tr>
<td>Express/EIS</td>
<td>IRI Software</td>
</tr>
<tr>
<td>Focus/EIS</td>
<td>Information Builders, Inc.</td>
</tr>
<tr>
<td>Forest &amp; Trees</td>
<td>Trinzic Corps.</td>
</tr>
<tr>
<td>Holos</td>
<td>Holistic Systems, Inc.</td>
</tr>
<tr>
<td>LightShip</td>
<td>Pilot Software, Inc.</td>
</tr>
<tr>
<td>PowerPlay</td>
<td>Cognos Corp.</td>
</tr>
</tbody>
</table>

The characteristics of EIS mentioned above differentiate EIS from traditional information systems such as DSS and MIS. A comparison of EIS, DSS, and MIS by Watson, Houdeshel and Rainer (1997) is shown in Table 2.3.

In spite of the unique characteristics and the numerous benefits of EIS, many of which have been presented in the sub-sections 2.5.1 and 2.5.2 above, careful planning for and use of these systems are required to realize the full benefits of EIS. The underutilization of EIS will not yield the full benefits of the systems.
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>EIS</th>
<th>DSS</th>
<th>MIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal use</td>
<td>Guide actions</td>
<td>Planning, organizing, staffing, and controlling</td>
<td>Control</td>
</tr>
<tr>
<td>Applications</td>
<td>Environmental scanning, performance evaluation, identifying problems and opportunities</td>
<td>Diversified areas where managerial decisions are made</td>
<td>Production control, sales forecasts, financial analysis, human resources management</td>
</tr>
<tr>
<td>Database(s)</td>
<td>Corporate, special</td>
<td>Special</td>
<td>Corporate</td>
</tr>
<tr>
<td>Decision support capabilities</td>
<td>Indirect support, mainly high-level and unstructured decisions and policies</td>
<td>Supports semi-structured and unstructured decision making; mainly ad hoc, but some repetitive decisions</td>
<td>Direct or indirect support; mainly structured, routine problems; using standard operations research, and other models</td>
</tr>
<tr>
<td>Adaptability to Individual Users</td>
<td>Tailored to decision making style of each individual executive; offer several output options</td>
<td>Permits individual judgment, “what-if” capabilities, some choice of dialog style</td>
<td>Usually none, standardized</td>
</tr>
<tr>
<td>Graphics</td>
<td>A must, and they should be superb</td>
<td>Choice of dialog style integrated in many DSS</td>
<td>Desirable</td>
</tr>
<tr>
<td>User Friendliness</td>
<td>A must</td>
<td>A must if no intermediaries are used</td>
<td>Desirable</td>
</tr>
<tr>
<td>Treatment of Information</td>
<td>Filters and compresses information, tracking of critical data and information</td>
<td>Information is provided by the EIS and/or MIS is used as input to the DSS</td>
<td>Info is provided to a diversified group of users who then manipulate it or summarize it as needed</td>
</tr>
<tr>
<td>Supporting detailed information</td>
<td>Instant access to the supporting details of any summary coming up on the EIS screen</td>
<td>Provides answers to questions and solves problems raised by the use of EIS</td>
<td>Inflexibility of reports, cannot get the supporting details quickly</td>
</tr>
<tr>
<td>Model base</td>
<td>Can be added, often not included or limited in nature</td>
<td>The core of DSS: extensive modeling and analysis capabilities</td>
<td>Standard models are available, but are not managed</td>
</tr>
<tr>
<td>Construction</td>
<td>By vendors, IS specialists, or EIS staff</td>
<td>By DSS teams, users and info center staff</td>
<td>By Is specialists</td>
</tr>
</tbody>
</table>
EIS failures in the early days were attributed to inadequate hardware and software for developing and maintaining these systems (Watson, Houdeshel and Rainer, 1997). Today, EIS failures are less likely to be due to inadequate hardware and software than the underutilization of these systems. More is known about the hardware and software requirements for developing and maintaining a successful EIS and workable alternative solutions to tackle hardware and software problems are available.

The motivation to undertake this study is to identify the important factors that explain user behavior in using EIS. Knowing these important factors will assist in the planning, development, implementation and the use of these systems that will address EIS failures resulting from the underutilization of these systems.

The next subsection presents examples of hardware and software configurations which are available today to meet the requirements of developing and maintaining a successful EIS.

2.6 Hardware and Software Requirements of EIS

There are hardware components available in the market today that are configured to meet the requirements of developing and maintaining a successful EIS. There are also general-purpose as well as special-purpose software available to meet the requirements of developing and maintaining a successful EIS.
**Hardware**

Figure 2.1 illustrates key hardware components of an EIS configuration. An EIS configuration usually comprises a personal computer. The executive’s personal computer is networked to a mainframe that serves as the executive workstation. The hardware component includes secondary storage which is in the form of hard disk that houses the executive database. The central computer pre-processes the information and data that has been contained in the executive database. The system enables the executive to develop preformatted screen displays or to conduct a minimum amount of processing by selections from menus. Additionally, it also provides the utilization of an electronic mail system and access to environmental information and data (McLeod and Schell, 2001).

![Figure 2.1: An EIS Configuration showing Internal and External Databases and Executives' workstations. (Source: McLeod and Schell, 2001, p. 330)](image-url)
There are also EIS configurations available that incorporate the newer technologies in order to increase the flexibility, ease to use and the power of EIS. Figure 2.2 shows an example of a three-layer EIS configuration, proposed by Kirkgoze et al. (1997), which incorporates some of the newer technologies such as Internet/Intranet, World Wide Web (WWW), OLAP and Data Warehouse.

Figure 2.2: A Three Layer EIS Configuration incorporating some of the latest Technologies - Internet/Intranet, World Wide Web, OLAP and Data Warehouse (Source: Kirkgoze et al., 1997)
The data warehouse forms the bottom layer. It contains information from external and internal operational sources and supports easy analyses and querying. The data warehouse needs to be supported by tools such as Oracle DBMS to read, process and store data without being taken off-line.

The analysis layer is the connection between the data warehouse and the EIS applications. It amalgamates data requests, metadata and query building algorithms to create SQL queries to send to the data warehouse. Before sending data to the presentation layer, a meta script form of data is generated. The presentation layer interprets this script and generates appropriate screens for the end-user.

The presentation layer is the interface between the end-user and the analysis layer. User input is transformed to meta script language and sent to the analysis layer. In order to have a common interface, web browsers are used as a visualization tool for the presentation layer. The information server which lies in the heart of the presentation layer checks if data is needed from the data warehouse and if it is, the description of the specific data is sent to the analysis layer and the received information is integrated into a generated HTML page.

Software

Almost all general-purpose software such as spreadsheet, databases, report generators or WWW technology provide graphical front end required for an EIS.
There are other general-purpose software available which are configured with the above mentioned to meet the requirements of developing and maintaining a successful EIS. There are also special-purpose software available today that meet the requirements of developing and maintaining a successful EIS.

Figure 2.3 shows an example of a variety of general-purpose software that are configured to build and maintain an EIS (Watson, Houdeshel and Rainer, 1997).

![Figure 2.3: General-purpose software and EIS](Source: Watson, Houdeshel and Rainer, 1997)

The next subsection presents future trends in EIS.
2.7 Future Trends in EIS

There are reports of various future trends in EIS as a result of the advances in the technologies that support these systems. A report of the Illinois Institute of Technology (IIT) Research Institute, an affiliation of Illinois Institute of Technology, on the future trends in EIS some few years ago (Dobrzeniecki, 1994) still holds valid today. The IIT Research Institute’s work on EIS, on which the report was based, was carried out under a contract awarded by the US Department of Defense. The report suggests that the future of EIS would lie in the successful migration away from mainframe computer systems. This trend, the report adds, would eliminate the need to learn different computer operating systems and substantially reduce the cost of implementation. This trend also would utilize existing software applications and minimize the need to learn a new or special language for the EIS package. The report continues by predicting that future EIS would be based on super personal computers that organize and integrate existing software application packages into a useful EIS. The trend would be not only to provide a system that supports senior executives but to include the information needs of middle managers also.

The report predicts further that one popular new solution would be visual information access and analysis (VIAA) systems. These systems are based on personal computers and make use of Windows, open systems computing, and object-oriented programming. The systems are easier to build, use and maintain, as well as less expensive than existing EIS. VIAA systems provide access to
company and external information through visual screens that combine text, numerical data, graphical data and images. The visual screens provide users quick and easy access to data, improving their decision-making capabilities.

According to the report, the trend to integrate applications and technology makes the future very promising for EIS. A number of technological and conceptual advances in information systems as well as in the telecommunications area provide a glimpse into possible future EIS features and potential new applications.

**Incorporating Artificial Intelligence (AI) into EIS**

The amount of data provided to a user is often overwhelming. This is especially true in the case of an executive. Even with an EIS, there is a potential for information overload. Artificial Intelligence (AI) could perform some of the data screening for the executive, reducing the amount of time spent searching for relevant data.

The inclusion of voice input capabilities also promotes the use of AI. Voice input would reduce the amount of data entry time and errors committed by the executive. Voice input and output add flexibility to the system and provide further understanding and comprehension of the information. The current state of speech recognition technology has limited the use of voice input as an interface. Managing the large storage requirements for handling voice input is also a problem. Physically storing a system that can recognize all the language
instruction, accents, and other natural speech phenomena has proven to be difficult. However, natural language systems are currently being developed to handle the speech recognition problem.

Another branch of AI is expert systems (ES). ES can be used within an EIS to assist the user with appropriate model selection for analyzing a problem. Based on rules provided to the ES, the ES can instruct the user on which model would best fit the problem. An ES is similar to an EIS in that they both contain components that manipulate data. They differ in the way knowledge is maintained. An EIS uses predefined models and associated algorithms while an ES operation is based on heuristics.

**Integrating Multimedia Characteristics into an EIS**

A database component is necessary within an EIS for retrieving, analyzing, manipulating, and updating files. A multimedia database management system (MMDBMS) can increase the ability of an EIS to effectively manipulate text, voice, and images within an integrated database structure. MMDBMS provide the traditional benefits of a database management system as well as concatenation of voice, transformation of information, rotation of images, scaling of objects, and merging of various data types. The problem with these systems, especially for the executive user, is the complex interface. As the functionality of these systems continues to increase, more applications for their use will be developed. Combining more applications with an easy-to-use system will lead to
an opportunity to use the systems for a competitive advantage. Future technical innovations with optical disks as well as speech recognitions systems must occur for this integration to be able to take place.

**Integrating ISDN Technology with an EIS.**

Telecommunications play an important role in building many information systems. This is also true in building an EIS, especially if much of the data is located off-site. For an executive to be able to quickly access these data, an effective telecommunications network must be in place. Future trends are also leading towards data becoming more voice-related. The goal of ISDN is to provide the same transmission path for speech, data, text and image contents via one line using standard communication sockets and only one directory number. This will be an entirely digital system. ISDN will allow the executive to talk to the computer (on-site) and have output (e.g., stockholder reports) sent to other users (e.g., board members) for approval. The benefits of voice and non-voice data being integrated into one network should tremendously expand the executive's capabilities and at the same time reduce the time and effort to perform day-to-day activities. Communication standards and vendor support must also occur for ISDN and EIS capabilities to merge.

In the next subsection the nature of executives' work and how an EIS fits into their work is described.
The previous sections reviewed the literature on the historical evolution of EIS, and the benefits and characteristics of EIS. This section reviews the nature of executives’ work and how an EIS fits into the managerial work of executives.

According to Rockart (1979), “there is no position in the organizational hierarchy that is less understood than that of the executives” (p. 82). Furthermore, the functions and the way those functions are performed vary between organizations and between executives within organizations. Indeed, one of the reasons for EIS failures reported by many researchers is the lack of understanding of the nature of executives’ work by the system designers.

An executive’s role in an organization has, however, traditionally been related to identifying problems and opportunities and making the decision of what to do about those problems and opportunities. In addition, executives are expected by their subordinates to play other leadership roles. Much of the executive’s work evolves around: developing agendas, strategies, goals, priorities and plans (that may not be documented); establishing networks; developing corporate relationships between people inside and outside their organizations who may play a role in developing and implementing future agendas (Hoven, 1996).

Weter (1988) indicates that each executive has a unique way of performing their jobs and breaks down their work functions as follows:

- Reviewing reports from their subordinates on the activities of many areas of their organizations;
- Monitoring news of the outside world;
• Meeting with managers in their organizations to discuss operations and strategies;
• Identifying problems and opportunities and formulate plans to capitalize on them; and
• Leading the people who work with them to carry on the goals set by them.

In relation to levels of management and decision making activities, management activities in an organization fall into the following three categories, based on Anthony’s framework for planning and control (Anthony 1965):

**Strategic planning:** The process of deciding on objectives for the organization, changes in these objectives, the resources used to attain these objectives, and the policies that are to govern the acquisition, use and disposition of these resources.

**Tactical (Management) control:** The process by which managers assure the resources are obtained and used effectively and efficiently in the accomplishment of the organization’s objectives.

**Operational control:** The process of assuring specific tasks are carried out effectively and efficiently.

Each activity has different information requirements. The operational control decision levels are based on highly detailed information generated by or available within the organization. Operational control decisions require a high information frequency and the information must be recent as well as accurate. Strategic planning is at the other end of the continuum, relying on summary or aggregated
information as well as data from external sources. Both the scope and the variety of the information are quite large. The information requirements for management control fall between these two levels.

The overall picture is that, at the strategic level, executives are concerned with planning and in the other levels they are concerned with controlling those plans.

Perhaps, Mintzberg's (1973) model is the best known characterization of the activities of executives. He categorizes executive activities into ten distinct roles, which are divided into three groups of interpersonal roles, informational roles and decisional roles. All these three groups involve dealing with information or acting upon information, and an effective executive information system can assist an executive in all these roles.

**Interpersonal Roles**

According to Mintzberg, interpersonal roles cover three managerial roles:

1. *Figurehead* - the executive represents the organization in all matters of formality, including duties of legal or social nature.
2. *Liaison* - the executive develops and maintains a personal network of internal and external contacts that provide information and favors.
3. *Leader* - the executive motivates subordinates and is responsible for staffing, training and promoting.

EIS, particularly through Office Automation capabilities such as voice mail, electronic mail, facsimile, video and audio conferencing, calendaring and
scheduling, and other emerging technologies most commonly referred to as “groupware”, are designed to assist the executive in carrying out the activities in these roles and allow the sharing of information quickly.

Informational Roles

The informational roles of the executive, according to Mintzberg, are:

1. **Monitor** - the executive receives and collects a wide variety of information in order to develop a thorough understanding of his or her organization and the environment. The executive is a key nerve center of external and internal information about the organization.

2. **Disseminator** - the executive transmits information received from outsiders or subordinates to other members of the organization.

3. **Spokesman** - the executive communicates information to outsiders on the organization plans, policies, actions, results, and other relevant areas.

EIS capabilities are designed to assist the executive in fulfilling all of these roles. EIS capabilities are designed to assist the executive to monitor his/her organization’s environment and to enable the construction of a better mental model of the organization. EIS provide rapid access to timely and accurate information in a very user-friendly manner. Office Automation capabilities also provide the facilities for the timely monitoring and the dissemination of information.
Decisional Roles

According to Mintzberg, decision-making roles are "probably the most crucial part of the manager's work - the part that justifies his/her great authority and his/her powerful access to information". Mintzberg describes four decisional roles as:

1. *Entrepreneur* - the executive searches the organization and the environment for threats and opportunities and initiates projects to bring about changes.

2. *Disturbance Handler* - the executive is responsible for corrective action when the organization is threatened with unexpected disturbances.

3. *Resource Allocator* - the executive allocates organizational resources of all kinds (e.g., money, materials, equipment and personnel).

4. *Negotiator* - the executive represents his or her organization in major negotiations with other organizations and individuals.

EIS are designed with the capabilities to assist the executive to quickly search and scan the organization's environment for any threats and opportunities enabling prompt and appropriate decisions. They are designed as tools to support and improve the decision-making process of the executive by providing the basic usable and relevant information from both internal and external environments of the organization. In addition, because executives devote significant amounts of time to acquiring and analyzing information through their interactions with people and processing of documents, EIS are designed to save considerable amounts of time by facilitating the collection, storage, retrieval, and analysis of information. The "what-if" analysis capabilities of an EIS combined with the decision maker's imagination and judgment is designed to help the executive to arrive at decisions quickly and accurately.
Other reasons are given in the literature as to why executives use EIS. The reasons vary from keeping up-to-date with activities, to communicating, and manipulating data for decision support. Senn (1990) states seven reasons why executives use EIS as shown in Table 2.4 below.

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>To keep informed</td>
<td>Enables executive to stay abreast of day-to-day activities by viewing first-hand information from representative business activities and transactions without getting down to details.</td>
</tr>
<tr>
<td>To understand a new situation quickly</td>
<td>Enables rapid access to details describing business activities that provide insight into an unexpected or recently uncovered situation.</td>
</tr>
<tr>
<td>To browse through data</td>
<td>Provides first-hand view of activities that often cannot be achieved through the review reports and business summaries.</td>
</tr>
<tr>
<td>To maintain surveillance</td>
<td>Allows monitoring of a situation of special interest through specified details.</td>
</tr>
<tr>
<td>To perform strategic scanning</td>
<td>Enables viewing of information that provides insight into a particular strategy or opportunity or brings to light the opportunity to develop a new strategy having significant potential for the organization.</td>
</tr>
<tr>
<td>To analyze data</td>
<td>Enables examination of data or alternative scenarios through creation of spreadsheets or other forms of models; supports both “what is” and “what if” forms of analysis.</td>
</tr>
<tr>
<td>To get at data directly</td>
<td>Enables viewing of data without waiting for staff to retrieve and extract details; also enables viewing of actual details before summarization.</td>
</tr>
</tbody>
</table>
Watson, Rainer and Koh (1992) give further reasons why executives use EIS as:

- EIS provides data analysis and graphical presentation functions, allowing executives to make critical decisions quickly, using reliable, accurate, timely and relevant information;

- With EIS, executives can share information with others more quickly and easily;

- Executives can select information to tell them where, when, and towards what their attention should be directed and help them formulate and define organizational problems; and

- Depending on functionality and preference, EIS may be used for performance monitoring, “what-if” analysis, trend spotting, problem identification and resolution, and generally keeping up to date. All of these can improve and increase the efficiency and effectiveness of the executive decision making process by:

  * providing improved ways of viewing and solving a problem;
  * providing easy access to relevant and accurate information in a timely manner and increasing the executives productivity;
  * facilitating wider coverage of possible information sources;
  * providing all critical information to the executive to help see the effect of certain decisions on the organization; and
  * providing faster turnaround on decision opportunities.
Having reviewed the nature of executives' work and how EIS fit into the managerial work of executives, the next section critically examines previous research studies on EIS usage. The deficiencies found in these previous studies have motivated the study undertaken and presented in this thesis.

2.9 Previous Research Studies On EIS Usage

There are several factors that contribute to EIS failures: some technical, others managerial and organizational (Watson, Houdeshel and Rainer, 1997). Some of these failures may also result from the failure of the intended users, the executives, to use the systems for one reason or the other. Some users may initially support and accept the systems but reject them later as a result of several factors: some of which may be behavior-related.

Early EIS research efforts consisted of descriptions of current implementations in organizations (Applegate, 1987, 1988; Rockart and DeLong, 1988; Osborn and Applegate, 1989); studies of why EIS were adopted (Watson, et al., 1991); studies on benefits of the use of EIS (Bergeron, Raymond and Lagorge, 1991; Watson, et al., 1991); and studies on design approaches (Carisson and Widmeyer, 1990; Mannheim, 1989; Walls, et al., 1992; Westland and Walls, 1991). Much of these prior research efforts focused on EIS from the systems’ or the users’ perspective.
As failures of EIS began to emerge, some research efforts were directed at isolating factors contributing to these failures. Three categories of factors relating to EIS failures have been identified: technology-related factors, support-related factors, and user-related factors (Young and Watson, 1995).

The focus of these prior EIS research studies can be classified broadly into two groups. One group of studies focuses on EIS development and implementation while the other group focuses on EIS usage as shown in Table 2.5. The research studies on the development and implementation side are more thorough and extensive and form the bulk of the EIS research literature.

The research studies on EIS usage are relatively few and mixed, with only a very small number addressing the actual use of the systems. Of this small number, only very few use appropriate reference theories to address system usage. The focus of these usage research studies seems to be in line with the four frameworks suggested by Carisson and Widmeyer (1990) for researching EIS usage based on executives management activities. They are: 1) EIS as a decision making or problem solving tool; 2) EIS as a scanning and searching tool; 3) EIS as an internal monitoring tool; and 4) EIS as a communication tool. There is an almost complete absence of research studies into the actual use of EIS. The managerial activities in Carisson and Widmeyer's frameworks can only be realized if the executives are the real users of EIS.
The focus of the few research studies on EIS usage can be broken into six areas as shown in Table 2.5.

Table 2.5: Classification of EIS Research Studies by Research Focus

<table>
<thead>
<tr>
<th>Focus of Research Study</th>
<th>Researchers (for example)</th>
</tr>
</thead>
</table>

Usage:

i. Impact of use on:
   - managerial activities
   - decision-making

ii. Overall benefits from use

iii. Use to respond to competitive advantage & other business problems

iv. Mode of use (e.g. searching and scanning)

v. Pattern of use (including frequency of use)

vi. Factors that influence/explain use


Volonino, et al., 1995.


Out of the six research focus areas on EIS usage presented in Table 2.5, it is only the sixth focus area (Factors that influence/explain EIS use) that deals with actual engagement of the systems. Without actual engagement of these systems the outcomes of the other five usage areas cannot be realized. However, the research studies on actual engagement are quite few, and of the few only a small number used appropriate reference theories to address system use as a behavior (e.g., Bergeron, et al., 1995; Kim, 1996; Elkordy, 2000; Elkordy and Khalil, 2002).

As can be seen from Table 2.5, some of the research studies on EIS usage consider the impact of using the systems on managerial activities in general and decision-making processes in particular (e.g., Rockart and DeLong, 1992; Singh et al., 2002). Others are looking at the overall benefits such as, increase in profit, better communication, increased confidence in decision-making, access to unavailable information, and reduction in staff and clerical personnel from using the systems (e.g., Nord and Nord, 1995). Some studies consider the use of the systems to respond to major business problems that are being intensified by global recessionary and competitive forces such as adaptability to customer requirements, quality improvement and cost-containment (e.g., Volonino et al., 1995). Other studies examine the mode of use of the systems, such as searching and scanning, and improving the executive's mental model of their organization (e.g., Vandenbosch, 1999). Some studies consider the patterns of EIS use by executives (e.g., Seeley and Targett, 1999) while other studies are simply seeking answers as to how frequently EIS are used by executives (e.g., Thodenius, 1995).
As mentioned previously, it is only the sixth focus area in Table 2.5 that deals directly with the actual use of the systems. Since system use is a behavior (Trice and Treacy, 1988) we need appropriate reference theories in order to be able to study it thoroughly. We address the issues related to appropriate reference theories in Chapter 3 but at this stage, based on the surveyed literature, we present the research problem and the two research questions for this study.

The research problem that this study seeks to provide solutions to is: **the failure of executive information systems in organizations due to the underutilization or non-usage of these systems**, and the two main research questions for the study are:

1. **What are the important social, cultural, political and organizational factors that explain the behavior of executives in using executive information systems in organizational settings?**

2. **What is the relative importance of these factors in determining executive information systems use by executives in organizational settings?**

### 2.10 Conclusion

This chapter reviewed the relevant literature for this study and presented the research issues arising from the literature review. The historical reviews of the evolution of EIS and the popularity of EIS have also been presented in this chapter. Various definitions of EIS have been presented to highlight the complex nature of these systems, and the simple definition to be used in this study has
been presented. The benefits and characteristics of EIS, some models of EIS, and the future trends in EIS have also been examined and presented. Also, the nature of executives' work and how EIS fit into their work have been evaluated. Finally, a critical examination and evaluation of previous research studies on EIS usage has been presented.

One conclusion that can be drawn from the review of the previous research studies on EIS is that there is a marked lack of research studies on EIS usage that examine the factors that influence/explain system usage. System usage as a behavior has not been well represented with appropriate reference theories in the few studies that have been done on EIS usage. This deficiency has motivated the study undertaken and presented in this thesis.

Chapter 3 presents Triandis' Theoretical Framework upon which this study is based. The research model and the hypotheses to be tested in this study are also presented in Chapter 3.
3.1 Introduction

Chapter 2 reviewed the relevant literature for this study and presented the research issues resulting from the literature review. This chapter presents, first, the theoretical perspectives in IS research studies and then Triandis' Theoretical Framework upon which this study is based. The research model, based on the theoretical framework for this study is presented next, followed by the hypotheses to be tested. In the conclusion to this chapter we summarize the key constructs, the strengths and weaknesses of the theoretical framework.

3.2 Theoretical Perspectives in IS Research Studies

Prior IS researchers (e.g., Goodhue, 1988; Straub, 1989) criticized IS research for lack of theoretical bases and insufficient attention to methodological and measurement issues when IS researchers study individual's reaction to information technology. IS researchers generally did not draw on other disciplines for their work and some IS researchers have argued that these shortcomings may explain the conflicting results that have been obtained (Goodhue, 1988; Swanson, 1982).

As a result of these criticisms a variety of theoretical perspectives are used by IS researchers in studying the individual's reactions to computing technology. Some of the theoretical frameworks used in those studies include: the
Technology Acceptance Model (TAM), which is an adaptation of Fishbein and Ajzen's Theory of Reasoned Action (TRA); the Theory of Planned Behavior (TPB); the Social Cognitive Theory (SCT); and Innovations Diffusion. The body of research based on these theoretical frameworks has produced some useful insights into the cognitive, affective and behavioral reactions of individuals to technology, and into the factors that influence these reactions.

However, as Compeau et al. (1999) noted, in each of the above theoretical frameworks, behavior (e.g., the use of computers) is viewed as the result of a set of beliefs about technology and a set of affective responses to the behavior. The beliefs are represented by the perceived characteristics of innovating in Innovation Diffusion research, by perceived usefulness and perceived ease of use in the Technology Acceptance Model, by behavioral beliefs and outcome evaluations in the Theory of Planned Behavior, and by outcome expectations in the Social Cognitive Theory. Seddon (1997) refers to these as the net benefits (realized or expected) accruing from the use of a system. Affective responses are typically measured by attitudes towards use - an individual's evaluation of the behavior as either positive or negative. The commonalities in these models reflect a belief in the cognitive basis of behavior.

Compeau et al. (1999) also suggest that, while TAM and the Diffusion of Innovations perspectives focus almost exclusively on beliefs about a technology and the outcomes of using the technology, SCT and the TPB include other beliefs which are independent of perceived outcomes and might influence behavior. The TPB model incorporates the notion of Perceived Behavioral Control (PBC) as an
independent influence on behavior, recognizing that there are circumstances in which a behavior might be expected to result in positive consequences (or net benefits), yet not be undertaken due to a perceived lack of ability to control the execution of the behavior. PBC encompasses perceptions of resource and technology facilitating conditions, similar to those measured by Thompson, et al. (1991, 1994), as well as perceptions of ability or self-efficacy (Taylor and Todd, 1995).

The results from the research based on the above theoretical frameworks provide useful insights into the individual's reaction to computing technology. However, none of the above theoretical frameworks addresses explicitly the social, cultural, political and organizational factors which may influence and/or explain the user's behavior in using an information system.

Earlier studies (Trice and Treacy, 1988) asserted that system use is a behavior whose determinants are not well understood in IS research and that system use could best be explained by referring to an appropriate reference theory. This assertion has guided some system use studies (e.g., Trice and Treacy, 1988; Davis et al., 1989; Young and Watson, 1995; Kim, 1996; Venkatesh, 1999; Venkatesh and Morris, 2000). A number of IS researchers (e.g., Trice and Treacy, 1988; Davis, 1989; Davis, et al., 1989; Venkatesh & Davis, 1996; Kim, 1996; Elkordy, 2000; Venkatesh, 1999; Venkatesh and Morris, 2000; Elkordy and Khalil, 2002) relied on Fishbein and Ajzen's Theory of Reasoned Action in their attempts to explain user behaviors. While TRA is very useful, it is somewhat incomplete. TRA has been tested widely in sociological and
psychological research and has been found to be lacking in certain respects (Thompson et al., 1991, 1994). For example, TRA leaves aside factors that could also have influence on behavioral intentions and on behavior itself.

Some other researchers (Thompson et al., 1991, 1994; Bergeron et al., 1995) sought to explain personal computer usage and information systems use by grounding their research models on a similar, but richer, theoretical framework developed by Triandis (1971, 1980), which explicitly addresses the social, cultural, political and organizational factors that may influence and/or explain the user’s behavior in a theoretical framework. In addition to addressing social, cultural, political and organizational factors, the theory proposed by Triandis (1971, 1980) incorporates many of the same concepts and constructs as TRA but also modifies and redefines them. For example, while Fishbein and Ajzen’s theory considers all beliefs that a person has about an act or behavior, Triandis makes a distinction between beliefs that link emotions to the act (occurring at the moment of action) and beliefs that link the act to future consequences.

This research study employs Triandis’ Framework as a theoretical foundation and the research model for this study is adapted from this theoretical framework. The research model incorporates the social, cultural and organizational factors that explain the behavior of executives in using EIS. The model is used to test empirically the hypothesized relationships among the factors. A further analysis is done to determine the relative importance of the independent variables in explaining EIS use by executives. In the following section, Triandis’ Theoretical Framework and its concepts and constructs are presented.
3.3 Triandis' Theoretical Framework

Triandis' Theoretical Framework is a model from social psychology and organizational behavior. In an attempt to encompass a larger number of relevant variables, Triandis proposed a theoretical network of interrelated hypotheses around the constructs of attitude and behavior, placing them in the broadest possible context. The major constructs of the theoretical framework and the relations among them leading to their influence/explanation of the behavior of an individual are shown in Figure 3.1. The theoretical grounding for this present study is based on Triandis' (1971, 1980) work.

3.3.1 Concepts Underlying Triandis' Theoretical Framework

The concepts and constructs of Triandis' (1980) Theoretical Framework are diagrammatically depicted in Figure 3.1.

Triandis (1980) argues that behavior has "objective consequences, (that occur 'out there' in the real world) which are interpreted (occur inside the person)" (p. 198). He argues that as a result of these interpretations, the person feels reinforced. Reinforcement, Triandis argues, "affects the perceived consequences of the behavior in two ways: it changes the perceived probabilities that the behavior will have particular consequences and it changes the value of these consequences" (p. 198). These probabilities and values, in turn, constitute one of the determinants of behavioral intentions to behave, which are one of the determinants of behavior.
Triandis further argues that habits and relevant arousal are also determinants of behavior. He argues that, even when the intentions are high, the habits well established, and the arousal optimal, there may be no behavior if the geography of the situation makes the behavior impossible: thus, he adds, facilitating conditions should be seen as important determinants of behavior. In other words, facilitating conditions are objective factors that will make utilization of a computer technology easy or difficult. The interpretation of the objective
consequences, Triandis argues, may differ because of genetic/biological influences or because of the previous situation-behavior-reinforcement sequences that the individual has encountered in his/her history, that is, the individual's personality. Personality, Triandis argues, internalizes culture's way of perceiving the social environment, called the subjective culture of a group.

According to Triandis, subjective culture consists of norms (self-instructions to do what is perceived to be correct and appropriate by members of a culture in certain situations); roles (which are concerned with behaviors that are considered correct but related to persons holding a particular position in a group, society, or social system); and values (the broad tendencies to prefer certain states of affairs over others, that is, what makes a group or a category of people distinguish between, for example, good and evil; clean and dirty; beautiful and ugly; natural and unnatural; normal and abnormal; logical and paradoxical; and rational and irrational). These internalizations, according to Triandis, correspond with, but are not identical to, the group's subjective culture, and form the social factors that influence the intention to behave. In addition, Triandis argues, previous experiences of the individual with particular behaviors result in affect towards the behavior, which in turn are among the determinants of intentions. Triandis adds that, personality is an outcome of situation-behavior-reinforcement sequences and the subjective culture to which the individual is exposed. This subjective culture, Triandis explains, reflects the human-made part of the environment, which is shaped by historical and ecological forces. In turn, personality has an
impact on the way people will interpret the objective consequences of the behavior.

Triandis argues that any behavior occurs in a particular social situation, which influences the facilitating conditions and the relevant arousal of the person while simultaneously activating specific levels of the social factors. For interpersonal behavior, the social situation includes particular individuals, in a behavior setting, as well the other's previous behavior.

Triandis notes that the arrows in the model in Figure 3.1 show the directions of probable causalities, although he admits that there are several bi-directional relationships that are not shown in order to keep the diagram simple.

### 3.3.2 Definitions of Constructs in the Framework

Triandis (1980) defines habits on one hand as "situation-behavior sequences that are or have become automatic, so that they occur without self-instruction" (p. 204). According to Triandis, habits are what people usually do and the individual is usually not conscious of the sequences, for example, driving a car. They are closely related to an individual's past experience and ability to perform a given act. His model suggests that the habitual nature of a behavior, in addition to intentions, will have an influence on the individual's response to a given situation. Triandis argues that habits are more important than intentions for many behaviors. Thompson et al. (1991, 1994) ignored habits in their studies but
acknowledged that habits are clearly an important determinant of behavior and suggested their inclusion in further studies.

Triandis (1980), on the other hand, defines behavior as "a broad class of reactions by an organism to any stimuli (internal or external to the organism) [which] includes acts" (p. 201). Acts he defines as "socially defined pattern of muscle movements" (p. 201). He gave an example of the specific act of hitting someone. Such acts he said have no meaning in themselves but acquire meaning from the social context, particularly the perceived causes of the acts. "For instance, 'to hit' is very different if it is done accidentally, as a joke, to 'correct' a naughty child, or with the intention to hurt" (p. 201). According to the framework, behavior consists of the frequency, duration and/or intensity of the reactions by an organism to stimuli. This view is shared by Homans (1974) who proposed "frequency" as one of the measures of behavior. Triandis (1980) defines behavioral intentions, which trigger behavior, as “instructions that people give to themselves to behave in certain ways” (p. 203). They involve ideas such as “I must do X”, “I will do X”, and “I am going to do X” and are influenced by social factors, affect, and the behavior’s consequences (p. 203).

The clear distinction that can be drawn between habits and behaviors from Triandis’ Theoretical Framework is that, whereas habits are automatic and occurring in the individual without self-instruction and with the individual usually not conscious of the reactions, behaviors are not. It can be deduced from
the framework that *habits* are *behaviors* that have become automatic and acquired through the individual's past experience and ability to perform an act. In other words, *habits* lead to continued use of a technology without a conscious decision to do so.

*Relevant arousal* is a physiological factor. Triandis (1980) states: "the physiological arousal of the organism that is relevant to the act facilitates the act, and increases its probability" (p. 205). The model suggests that *relevant arousal* directly influences behavior and is influenced by *genetic and biological factors*, as well as by the *social situation*, that is, the behavior setting.

According to Triandis, it may happen that an individual has the intention to do something, but is unable to do it because the environment prevents the act from being performed. Consequently, the level of *facilitating conditions* is an important factor in explaining an individual's *behavior*, and must be taken into account. In turn, *facilitating conditions* are dependent on the *social situation*.

Triandis (1971) argues that behavior is influenced by *social norms*, which depend on messages received from others and reflect what individuals think they should do. In his later work, Triandis (1980) expands the term *social norms* and called it *social factors* which he describes as "the individual's internalization of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations" (p. 210). Thus,
in addition to influencing intentions, social factors are themselves dependent on
the social situation, and on the individual’s perception of subjective culture
variables.

According to Triandis, affect refers to an individual’s “feelings of joy, elation, or
pleasure, or depression, disgust, displeasure, or hate associated by the individual
with a particular act” (p. 211). Positive feelings will increase the intention
toward a given behavior, while negative feelings will decrease them. Affect is
influenced by the individual’s habits and by his/her perceptions of subjective
culture variables.

Triandis considers the consequences factor as a function of the perceived
consequence of the behavior and the value of each consequence. Perceived
consequences, what Davis (1989) called perceived usefulness in TAM, refers to
the probability that a given consequence will follow from performing a behavior.
According to Triandis (1980), the value of the consequence is the "affect attached
to the consequence" (p. 203). The model hypothesized that the higher the
expected value of a behavior, the more likely the person will intend to perform
the behavior. Consequences are influenced by an individual’s perception of
subjective culture variables as they are by social factors and affect variables.
According to the model, consequences, in addition to influencing behavior
through intentions, are also influenced by behavior. That is, the individual
interprets the objective consequences of a behavior, and as a result of these
interpretations, the person feels reinforced.
3.3.3 Past Research using Triandis’ Framework

Triandis’ (1980) theory has been well accepted within the psychological literature, but has been used very little within the IS context. There are very few research studies in the IS literature which used Triandis’ Framework as a theoretical foundation. The reason for this lack of use of the framework as a theoretical foundation is two fold. One, there are very few IS research studies focusing on the use of the IS technology as a behavior, and two, the few that did, were applying theoretical foundations that are incomplete for such studies. For example, the theoretical foundations used leave aside factors that also could have an influence on behavioral intensions and on behavior itself. The theoretical foundations used in those studies also do not address explicitly the social, cultural, political and organizational factors that may influence/explain user behavior towards the use of technology. The only IS studies found explicitly using Triandis’ Framework as a theoretical foundation are those by Thompson et al., (1991, 1994) and Bergeron et al., (1995).

While Thompson et al.’s studies sought to have better understanding of the factors that influence the use of PCs, Bergeron et al.’s study sought to better understand the factors that explain the behavior of EIS users towards the use of EIS. Both studies advocate the use of Triandis’ Framework as a theoretical foundation in understanding and explaining user’s behavior towards technology use because of the framework’s comprehensiveness and appropriateness for such studies.
3.4 Research Model and Hypotheses

In the preceding sections, Triandis' Theoretical Framework, the concepts and constructs underlying the framework, and some past research based on the framework have been presented. The following two subsections present the research model for the present study, which is based on the Triandis' Theoretical Framework, and identify the hypotheses to be tested in this study.

3.4.1 Research Model

Bergeron et al. (1995), who based their research model on Triandis' Theoretical Framework, suggested in their conclusion that "future investigations should aim for a cumulative tradition by continuing to employ Triandis' Framework as a theoretical foundation to further understand the phenomenon of EIS use" (p. 142). In line with this suggestion, the research model for this study has been developed using Triandis' Framework as a theoretical foundation.

As the description of the model shows, Triandis' Framework is not only very complete, but it also very complex. It is therefore appropriate to focus on the subset of the model that includes variables that are most relevant to understanding and explaining the utilization of EIS. The research model adopted from the framework is depicted in Figure 3.2, and it is similar to that used by Bergeron et al. in 1995 in a study on EIS use.
The similarity in this research model and that of Bergeron et al. is the constructs addressed by model. The constructs are the same in each model. The difference between this research model and that of Bergeron et al. is in the variables and sub-variables addressed by the model. There are more variables and sub-variables in this research model than in that of Bergeron et al. Some of the variables and sub-variables were included in this research model following the suggestions made by Bergeron et al. for further studies in the field when using Triandis' Framework. Others variables and sub-variables were included following from other studies and the objectives of this study.

The variables for social factors construct in this study are subjective norms, subjective roles, subjective values and social situations. By including the social factors construct in the research model, the individual's perceptions of subjective culture in using EIS could be measured, as well as the social situations' effect on EIS use. The variables for the affect construct in this study consist of satisfaction with EIS information, satisfaction with EIS system, satisfaction with EIS support, and satisfaction with EIS development plans. The variables for the facilitating conditions construct are EIS development processes, EIS management processes, and organizational environment. Consistent with the Triandis' Framework, the variable for the consequences construct is perceived usefulness (consequences) of EIS use. The variables for the behavior construct for this study are frequency of EIS use and internalization of EIS use, similar to
Bergeron et al.'s (1995) study. The reasons for including these constructs and variables in the research model are further explained in the next section.

The variables in the research model have been classified into social, organizational, political and cultural factors. This classification is made by taking into account the definitions and concepts of the variables and the survey questionnaire for this study.
Table 3.1 below shows the classification. In classifying the variables, some variables by definition and concept overlap some of the factors. For example, norms and roles are social factors while at the same time are part of an organizational culture. EIS development processes, EIS management processes, and organizational environment (facilitating conditions) are organizational factors while at the same time involved the power and politics within an organization. Because of this potential problem of variables overlapping the social, organizational, political and cultural factors, the constructs in the research model are used in the analysis. It is however important to point out that, these factors need to be taken into account in discussing the findings and implications of this study.

Table 3.1: Classification of Research Variables into Social, Organizational, Political and Cultural Factors

<table>
<thead>
<tr>
<th>Social Factors</th>
<th>Organizational Factors</th>
<th>Political Factors</th>
<th>(Organizational) Cultural Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norms</td>
<td>CBIS experience*</td>
<td>EIS development processes</td>
<td>Norms</td>
</tr>
<tr>
<td>Roles</td>
<td>EIS experience</td>
<td>EIS management processes</td>
<td>Roles</td>
</tr>
<tr>
<td>Values</td>
<td>Ability to use EIS</td>
<td>Organizational environment</td>
<td>Values</td>
</tr>
<tr>
<td>Social situations</td>
<td>EIS development processes</td>
<td>Position*</td>
<td></td>
</tr>
<tr>
<td>Position*</td>
<td>EIS management processes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Organizational environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information satisfaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EIS features satisfaction</td>
<td></td>
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<tr>
<td></td>
<td>EIS support satisfaction</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>EIS plan satisfaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Perceived usefulness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Position*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Included in the revised Research Model
The measurement of the variables in the research model is based on Triandis (1980) suggested operationalizations of constructs defined in his framework in addition to other relevant studies (e.g. Bergeron et al., 1995; Thompson et al., 1991, 1994).

*Habits* are operationalized by assessing the number of years of an executive's experience in using EIS and his/her ability to use the systems. *Consequences* are operationalized by assessing executive's perceived consequences (usefulness) of using EIS in his/her work and assessing the impact of using EIS on his/her performance. *Social factors* are operationalized by measuring the subjective norms, roles and values and the social situations in which the executive uses EIS. *Affect* is operationalized by measuring the executive's satisfaction with the information provided by EIS, with EIS itself, with the support provided in using the system, and with the system development plans now and into the future. *Facilitating conditions* are operationalized by measuring the influences that the EIS development processes, the EIS management processes and the organizational environment have on the executive's behavior in using EIS. Finally, *Behavior* is operationalized by measuring the frequency and the internalization of EIS use. Detail operationalization of the constructs is described in the following section.
3.4.2 Research Hypotheses

In this subsection the hypotheses to be tested in this study are presented. The hypotheses to be tested are embedded in the research model. In addition, previous studies have been used in formulating the hypotheses.

3.4.2.1 Habits and Behavior

According to Triandis’ Framework, habits make a major contribution to the explanation of behavior. This is supported by a previous study (Sugar, 1967), which shows that habits are a strong predictor of behavior. Sugar measured the attitudes, norms and habits of college students concerning cigarette smoking. On a separate occasion, the same students were offered a cigarette. The strongest single predictor of behavior was found to be habit, followed by norms and attitudes. According to Triandis, habits are closely related to an individual's past experience and ability to perform a given act. In his earlier work in 1972 (in association with Vassiliou, Vassiliou, Tanaka, and Shanmugam and with the assistance of Davis, Kilty, McGuire, Saral & Yang) Triandis also acknowledged experiences as habits.

Previous IS studies also identified computer experience as a determinant of user attitude towards information technology (e.g., Fazio and Zanna, 1981; Fuerst and Cheney, 1982; Arndt et al., 1983; Howard, 1986; DeLone, 1988; Rivard & Huff, 1988; Yaverbaum, 1988; Davis et al., 1989; Levin and Gordon, 1989; Thompson et al., 1991, 1994; Jackson et al., 1997; Al-Gahtani and King, 1999). Successful
experience with an information technology may usually reduce or eliminate any fears and improve a person's perceptions and attitudes towards using technologies. Rivard and Huff (1988), for example, found that heterogeneity of users' computer experience was a significant variable in explaining why some viewed a tool as easy to use while others perceived the same tool as difficult to use, while Yaverbaum (1988) reported an increase in the internal motivation to use computers as the number of years of computing experience grew.

In a study of the effect of computer experience on attitudes towards computers, Loyd et al. (1987) also found that increased computer experience reduced anxiety and augmented positive perceptions and attitudes. A similar conclusion was drawn by Arndt et al. (1983) and Howard (1986) who found significant negative correlation between experience and anxiety. Levin and Gordon (1989) also reported that subjects with computer experience were more motivated to become familiar with computers, were more impressed by the computer's capabilities, and had more favorable perceptions and attitudes towards computers than did subjects without computer experience.

In a study of critical success factors for computer usage in small business, DeLone (1988) found that chief executives' knowledge of computers resulted in IS success, while Fazio and Zanna (1981), in a study of direct experience and attitude-behavior consistency, found that attitude resulting from direct experience was a strong predictor of behavior. Recently, Thompson et al. (1994) conducted
a study, based on Triandis' Framework, which investigated the influence of prior experience on personal computer utilization and contended that the relationship between experience and behavior (IT usage) is not straightforward. They suggested three different possibilities in which such a relation could exist: 1) experience exerts a direct influence on behavior; 2) experience exerts an indirect influence on behavior through intervening variables such as perception and attitude; and 3) experience moderates the effect of antecedent factors on intentions and behavior. By testing the above mentioned relationships they found that: experience influenced utilization directly; indirect effects of experience on utilization were weakly present; and the moderating effect of experience on perception and attitude, and utilization was quite strong.

According to Triandis' Framework, habits lead to the derivation of some satisfaction or dissatisfaction (affect), which in turn explains behavior, while habits themselves directly explain behavior. The framework asserts that the frequency of doing or using something constitutes a behavior. The framework further asserts that the internalization of the probabilities and values of an act constitutes one of the determinants of behavioral intentions to behave. Thus, the frequency of doing or using something and the internalization of an act are determinants of behavior.

Individuals will undertake a behavior if they are convinced they have the ability to successfully perform such a behavior. Bandura and his colleagues (Bandura, 1977, 1982, 1986; Bandura et al., 1977; Bandura and Schunk, 1981) showed that
personal ability has a positive impact on the formation of perceptions and attitudes. Compeau and Higgins (1995) also emphasized that ability influences decisions about what behaviors to undertake, the effort and persistence exerted in the face of difficulties to perform those behaviors, and the attitudes of the individual performing the behaviors. Kim (1996) further showed that the higher the level of executives’ computer ability the higher their perceived usefulness of an EIS and the effect of computer ability on EIS utilization would be mediated by perceived ease of use and perceived usefulness. Recently, Elkordy (2000) and Elkordy and Khalil’s (2002) studies also showed that the higher the level executives’ ability to use EIS the higher the influence on executives’ perceived ease of use of these systems.

Following from the findings on the individual’s experience and ability in relation to information technology presented above, it is hypothesized that:

**H1:** EIS experience correlates positively with:

a. frequency of EIS use, and

b. internalization of EIS use.

**H2:** Ability to use EIS correlates positively with:

a. frequency of EIS use, and

b. internalization of EIS use.

### 3.4.2.2 Habits, Affect and Behavior

Previous research studies indicate that executives who have been using computer systems for a greater length of time were seen to have better attitudes in terms of
user comprehension and participation (Raymond, 1988). Similarly, Sanders and Courtney (1985) found the length of DSS use to be positively related to user satisfaction.

Swanson (1974) defines user satisfaction as a set of user beliefs about the relative value of an information system in terms of providing timely, accurate and easy-to-understand information to support his/her decision making. This definition, however, focuses on only one component of user satisfaction, that is, information satisfaction. Previous studies show that user satisfaction correlates with the quality of information provided by a system, as well as with the features of the system and with the support provided by the support group of information systems. Tafti (1992) synthesized the research in this area into information satisfaction, system satisfaction, and support group satisfaction. Each of these consists of unique attributes, which correlate with user satisfaction of information systems. Previous studies (Amoako-Gyampah and White, 1993) also show that system development plans correlate with user satisfaction of information systems. Thompson et al. (1994) who based their study on Triandis’ Framework also found a correlation between technical support and PC use. Bergeron et al. (1995) who also based their study on Triandis’ Framework found correlations between satisfaction with: EIS technical support and EIS experience; EIS technical support and internalization of EIS use; EIS information and frequency of EIS use; EIS information and internalization of EIS use; EIS features and internalization of EIS use.
Consequently, it is hypothesized that:

**H3:** The longer the experience with EIS, the higher the satisfaction with:
   a. EIS information attributes,
   b. EIS features,
   c. EIS support services, and
   d. EIS development plans.

**H4:** The more the ability to use EIS, the higher the satisfaction with:
   a. EIS information attributes,
   b. EIS features,
   c. EIS support services, and
   d. EIS development plans.

**H5:** Satisfaction with EIS information attributes correlates positively with:
   a. frequency of EIS use, and
   b. internalization of EIS use.

**H6:** Satisfaction with EIS features correlates positively with:
   a. frequency of EIS use, and
   b. internalization of EIS use.

**H7:** Satisfaction with EIS support services correlates positively with:
   a. frequency of EIS use, and
   b. internalization of EIS use.

**H8:** Satisfaction with EIS development plans correlates positively with:
   a. frequency of EIS use, and
   b. internalization of EIS use.
3.4.2.3 Consequences and Behavior

The perceived consequences construct is consistent with the Expectancy Theory of motivation proposed by Vroom (1964). The basic premises of the Expectancy Theory is that, individuals evaluate the consequences of their behavior in terms of potential rewards and base their choice of behavior on the desirability of the rewards. Perceived consequences are also what Davis (1989) refers to as perceived usefulness in the Technology Acceptance Model (TAM). Davis (1989) defines *perceived usefulness* "as the extent to which a person believes that using a particular technology will enhance his/her job performance" (p. 320). Perceived usefulness, which reflects perceptions of the performance-use contingency, has been closely linked to outcome expectations, instrumentality, and extrinsic motivation (Davis, 1989, 1993; Davis et al., 1989, 1992). A significant body of TAM research has shown that perceived usefulness is a strong determinant of user acceptance, adoption, and usage behavior (e.g., Davis, 1989; Davis et al., 1989; Mathieson, 1991; Taylor and Todd, 1995; Venkatesh and Davis, 1996; Venkatesh, 1999; Venkatesh and Morris, 2000; Elkordy, 2000; Elkordy and Khalil, 2002). Accordingly, it is hypothesized that:

**H9:** Perceived usefulness correlates positively with:

a. frequency of EIS use, and  

b. internalization of EIS use.
3.4.2.4 Social Factors and Behavior

As described earlier, subjective culture consists of norms, roles, and values. Subjective norms are defined by Fishbein and Ajzen (1975) as the degree to which an individual believes that people who are important to him/her think he/she should perform a behavior in question. Superior, peer, and subordinate influences in the workplace have been shown to be strong determinants of subjective norms in the technology domain (Mathieson, 1991; Taylor and Todd, 1995; Venkatesh & Davis, 1996; Venkatesh, 1999; Venkatesh and Morris, 2000; Elkordy, 2000; Elkordy and Khalil, 2002). It follows from the above that subjective roles and values, which are also social factors, will as well have superior, peers, and subordinate as determinants. Subjective culture constitutes a work group’s influence on the individual in the workplace. Bergeron et al. (1995) also indicated that social factors determine EIS users behavior. According to Triandis (1980), subjective culture is the subjective aspect of the social environment.

According to Triandis’ Framework, any behavior occurs in a particular social situation which triggers specific levels of social factors. Adamopoulos’ (1976) study of the perception of social situations, using an adaptation of the role differential, reveals two dimensions: formality-informality (reflecting the public-private character of the situation) and constraining-unconstraining (reflecting the number of different behaviors that can appropriately occur in the situation). According to Triandis, social situations include behavior settings. A behavior
setting has place-time coordinates, it consists of physical entities and process, and it evokes particular behaviors. Triandis cites a classroom as a behavior setting which has a particular location and a particular time when a class meets; it also has physical entities such as chairs and tables, black/whiteboards, and in it people act in certain ways, for example, talk, listen, take notes, and so on.

Following the above premises, it is hypothesized that:

**H10**: Subjective norms correlate positively with:
- a. frequency of EIS use, and
- b. internalization of EIS use.

**H11**: Subjective roles correlate positively with:
- a. frequency of EIS use, and
- b. internalization of EIS use.

**H12**: Subjective values correlate positively with:
- a. frequency of EIS use, and
- b. internalization of EIS use.

**H13**: Social situations correlate positively with:
- a. frequency of EIS use, and
- b. internalization of EIS use.

### 3.4.2.5 Facilitating Conditions and Behavior

As mentioned in the literature review, EIS development attracts much of the EIS research effort. Much of the effort in this area is directed at creating or suggesting the right conditions for deriving the maximum benefits from these
systems. Critical factors for successful EIS development have been linked to executive sponsorship, user involvement and participation. Other critical factors revealed are plan for development and spread, management of data problems, resistance to the systems, and technical and other resources problems. One of the main reasons for user involvement and participation, for example, is to facilitate implementation (that is, to ensure follow-up), overcome resistance, ensure acceptance, avoid conflicts and ensure continuous resources / support (Nandhakumar and Jones, 1997). Nandhakumar’s (1996) in-depth case study of EIS in an organization suggests that, in addition to these development success factors, developers need to have some understanding of the social and organizational context in which the systems are used. He mentioned contextual elements such as assumptions, beliefs, shared norms, and perspectives.

Systems development processes are ongoing and therefore create facilitating conditions for the use of the systems. As well, management processes, such as company policies and rules with regard to information systems use in organizations, will create facilitating conditions for their use. Policies regarding EIS may refer to making the systems accessible to executives anywhere, anytime. This may require the provision of laptops and connectivity facilities that will allow executives to dial into the systems from home, on business trips even overseas. McBride’s (1997) nine-year case study of the rise and fall of an EIS in a UK manufacturing company also suggests the importance of the interactions between the business environment, the organizational environment and the
perceptions and interpretations of events and facts by stakeholders on the success or failure of an information system.

From the above analysis, it will therefore be appropriate to investigate how these facilitating conditions relate to EIS users' behavior. Accordingly, and consistent with Triandis Framework, it is hypothesized that:

**H14:** EIS development processes correlate positively with:
   a. frequency of EIS use, and
   b. internalization of EIS use.

**H15:** EIS management processes correlate positively with:
   a. frequency of EIS use, and
   b. internalization of EIS use.

**H16:** Organizational environment correlate positively with:
   a. frequency of EIS use, and
   b. internalization of EIS use.

### 3.5 Conclusion

This chapter presented Triandis' Framework which is the theoretical foundation upon which this research study is based. We derived and presented the research model and the hypotheses to be tested in this study. The chapter highlighted that system usage is a behavior, and therefore there is a need to treat system usage as a behavior in any research that is concerned with the use of information systems. Based on the theoretical framework, we also detailed factors to be considered that influence/explain behavior in using EIS which we depicted in the research
model in Figure 3.2. Also, other theoretical foundations used in information system use research and the need for an alternative theoretical model for IS usage research have been highlighted. Finally, we presented the few EIS research studies based on Triandis Framework and their advocacy for the use of this model as a theoretical foundation for IS usage research.

The objectives of this study are to investigate and better understand and explain the factors that influence users to use EIS. The results of this study, in part, will enable us to improve the design and the implementation of EIS in the workplace, which subsequently will increase usage and success in the workplace. The Triandis’ Framework, upon which this research is based, includes constructs that provide a rich and thorough assessment of the behavior of an IS user towards the use of the system. The key constructs and the strengths of the framework may be summarized as:

- *Habits, social factors, affect, consequences, and facilitating conditions* which can all influence/explain the behavior of the individual towards using an information system are well exemplified by the theoretical framework;

- The development of *personality* through the network of *habits, social factors, subjective culture, affect, consequences, and intentions to behave* is well exemplified by the theoretical model;

- *Social, cultural, political and organizational factors* which may influence and/or explain the user’s behavior in using an EIS have all been addressed by the theoretical model; and
Adequate steps and suggestions for operationalizing the variables involved have been provided. More details on this point are presented in the next chapter.

Without doubt, Triandis’ Framework has its weaknesses, as do most theoretical models. For one, the model is very complex and it would be difficult to employ it in its entirety. This is not however a severe limitation since the model was intended to serve as a framework for research and not as a model of human behavior. A second limitation is that some of the constructs are related in the sense that it may be difficult to operationalize the constructs without introducing some redundancy in the measures.

Although Triandis’ Framework has not been as widely accepted as alternative models such as the Theory of Reasoned Action (TRA) it has been tested and used in other contexts. With respect to empirical findings, Valois et al. (1988) conducted a study to compare the Triandis’ Framework with TRA in the prediction of exercise intention and behavior. They found Triandis’ Framework to be at least as powerful as TRA in terms of prediction. However, their study found that the results obtained from Triandis model demonstrate the importance of the habit of exercise behavior. Moreover, the results of their study showed that Triandis model is superior to TRA in explaining behavior intention, particularly in the salience of affective, social and personal belief components of Triandis model.
Bergeron et al. (1995) used the Triandis' Framework as the base for their investigation of EIS usage and found it provided a good explanatory model.

In the next chapter the research design, research methodology, conceptualization and operationalization of constructs and variables, and the data collection method for this study are presented.
4.1 Introduction

In the previous Chapter 3 the theoretical framework, the research model, and the hypotheses to be tested in this study have been presented. This chapter presents the research design, the research methodology, and the operational measures of the variables in this study required to test the hypotheses presented in the previous chapter. The chapter also presents the rationale for the selection of the specific procedures and methods.

4.2 Research Design

A research design is a plan and structure of investigation used to obtain answers to research questions (Kerlinger, 1986). Research design enables researchers to answer research questions as validly, objectively, accurately and economically as possible. The research questions for this study are:

1. What are the important social, cultural, political and organizational factors that explain the behavior of executives in using executive information systems in organizational settings?

2. What is the relative importance of these factors in determining executive information systems use by executives in organizational settings?

The research design for this study is based on the guidelines provided by Babbie (2001). Table 4.1 describes the important research design and methodology aspects employed in this study. More specific details are discussed below.
Table 4.1: Summary of Research Design and Methodology

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of Research</td>
<td>Exploratory and Explanatory</td>
</tr>
<tr>
<td>Unit of Analysis</td>
<td>Individuals</td>
</tr>
<tr>
<td>Time Dimension</td>
<td>Cross-sectional</td>
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<tr>
<td>Research Methodology</td>
<td>Field Study</td>
</tr>
<tr>
<td>Data Collection Method</td>
<td>Mail Questionnaire Survey</td>
</tr>
</tbody>
</table>

4.2.1 Nature of Research

There are three common types of research in social science (Babbie, 2001): exploratory, descriptive, and explanation. Exploratory research is generally conducted to develop initial rough understanding of some phenomenon. A descriptive research is undertaken to describe the precise measurement and reporting of the characteristics of some population or phenomenon under study. An explanatory research is conducted to discover and report some relationships among different aspects of the phenomenon under study.

Since the primary purpose of this study is to identify the important social, cultural, political and organizational factors that explain the behavior of executives towards using executive information systems in organizational settings, the nature of this study is both exploratory and explanatory.
4.2.2 Unit of Analysis

A unit of analysis refers to the primary empirical object, individual or group that a researcher wants to study (Davis, 1996). The unit of analysis should be accurately described for the conceptual and methodological operationalization of the research (Huck et al., 1974). An inappropriate unit of analysis may influence the researcher to choose erroneous tools, distorting the results and confounding the conclusions of the research. Units of analysis primarily investigated in social science are individuals, groups, organizations and social artifacts (Babbie, 2001). In studying human behavior, three facets of behavior should be considered: (1) the actor or actors engaging; (2) behavior-toward-an-object; and (3) a setting or context (Runkel and McGrath, 1972). Actors, behaviors and objects exist in contexts.

Since this study is interested in the factors that may influence an individual’s behavior to use EIS, the unit of analysis is an individual (actor). In this study the individual is an executive or a senior manager who uses EIS (object) in an organization (context). The individual’s behavior can be influenced by elements, such as social factors and facilitating conditions, in the organizational context (Triandis, 1980). Therefore, any results derived from this study will have important implications for the whole organization.
4.2.3 The Time Dimension

Time plays an important role on the design and execution of a research (Babbie, 2001). Researchers have basically two options in terms of the time dimension: *cross-sectional* and *longitudinal*. In a *cross-sectional* study, the unit of analysis is observed at only one point in time. On the other hand, in a *longitudinal* study the unit of analysis is investigated over a long period of time. A heavy cost in both time and money often precludes researchers from conducting a longitudinal study. In addition, unanticipated changes in the unit of analysis and the research environment threaten the generalizability of the study.

It is considered that a cross-sectional approach is most appropriate and feasible for this study. This study seeks to explain behavior towards the use of EIS but not to predict it and, therefore, a longitudinal study is not necessary (Bergeron et al., 1995).

4.3 Research Methodology

Four methodologies have been identified for empirical IS research studies, namely: *case studies*, *field studies*, *field tests (quasi-experimental)*, and *laboratory studies (experimental)* (Kim, 1996). This study employs the field study approach because of the nature of the variables involved. That is, given the individual and the organizational variables in the research model, a field study in a real setting appears most appropriate. By using a field study, data can be gathered on a number of ongoing, uncontrolled situations. In addition, field
study is usually deemed to be the most feasible and economical method to examine a complex phenomenon and field study produces relatively strong effects of independent variables on dependent variables and thus enhances the statistical conclusion of the results (Cook and Campbell, 1979; Kim, 1996).

4.4 Data Collection Method

There are three main methods of administering survey questionnaires (Babbie, 2001):

1. *Self-administered questionnaires*, in which respondents are asked to complete the questionnaire themselves. The most common form of self-administered questionnaires is *mail survey*. Traditionally, mail survey is administered by mailing the questionnaire through the ordinary traditional "snail" mail, and/or by personal delivery to respondents. However, mail survey nowadays can be electronic, ranging from email and web to Interactive Voice Response (IVR) (Dillman, 2000);

2. *Telephone survey*, in which the survey questionnaire is read over the telephone by the researcher to the respondent for the respondent’s verbal responses to the questions; and

3. *Face-to-face*, where the survey questionnaire is administered by interviewing the respondent in a face-to-face encounter.

Choosing a specific method depends on financial resources and the circumstances of the research (Kerlinger, 1986; Kim, 1996). Mail survey is
probably the best method available to collect original data from a sample population too large to observe directly (Babbie, 2001).

The mail survey method using ordinary mail was chosen for this study for three main reasons. First, because there has been no study on user behavior towards the use of EIS in Australia, this study sought to collect data across a vast country in order to have a broad picture of user behavior towards EIS use. Second, following the first reason, and given the required response rate for statistical analysis, data collection by the face-to-face method was considered economically infeasible for this study. Also, collecting data by telephone was ruled out due to the large sample size, the time required to complete the survey, and the high cost associated with it. Third, the very busy schedule of the survey participants involved in this study makes scheduling face-to-face or telephone survey very time consuming and economically infeasible.

The major disadvantages of mail survey are: response rates are typically low; there is lack of control over the survey administration; and the inability to examine vague responses (Babbie, 2001; Dillman, 2000). Knowing that response rates for mail surveys are typically low, the response rate from busy executives and senior managers is expected to be even much lower than usually. However, there are many benefits that far outweigh the drawbacks of mail survey. For example, it is easy for the researcher to administer a mail survey for a large sample of the population and to provide respondents with anonymity for frank
responses. Also, the questionnaires are stable, consistent and uniform, and can be completed at the respondent's convenience (Sarantakos, 2002; Babbie, 2001; Dillman, 2000). In addition, studies have shown that executives favor mail surveys (Babbie, 2001; Broadbent, 2002).

Dillman (1978) views the process of sending questionnaires to prospective respondents, getting them to complete the questionnaires and return them as a special case of "social exchange". Applying the theory of social exchange as developed by Thibaut and Kelly (1959), Homans (1961) and Blau (1964), Dillman assumes that a person is most likely to answer a questionnaire when the perceived costs of doing so are minimized, the rewards are maximized, and the respondent trusts that the expected rewards will be delivered.

According to Dillman, respondents' costs can be reduced in many ways, such as packaging the questionnaire to look slim and easy to fill out, asking interesting, clear and concise questions, and including prepaid self-addressed return envelopes. Social rewards can also be provided in various forms, including explaining how a study will be useful to the respondent, saying "Thank you", and offering copies of the study results. Trust may be established through sponsorship by trusted authorities, the use of letterhead from legitimate sponsor, inclusion of the name(s) of some prominent members of the trusted authorities, and so on. These views are shared by Wiersma (2000).
Exchange theory suggests that the three concepts of costs, rewards, and trust interact and may offset each other. For example, attempts to reduce costs (e.g., an easy to fill out questionnaire) may be offset by failure to offer rewards (e.g., not explaining the benefits of the study). Dillman believes that willingness to respond to a questionnaire is based on an overall evaluation of the survey rather than an isolated reaction to specific aspects of the survey. In other words, every aspect of the survey implementation must be planned in detail and integrated in order to encourage a good response.

Based on exchange theory, Dillman (1978) developed a set of survey procedures that may be applied to achieve higher response rates. Dillman based his approach on the premise that, "to maximize both the quantity and the quality of responses, attention must be given to every detail that might affect response behavior" (p. viii). Dillman called his approach the Total Design Method (TDM) and it consists of two parts:

1. identifying and designing each aspect of the survey process that may affect either the quantity or the quality of response so as to maximize response rates;

2. organizing the survey efforts in a way that the design intentions are carried out in complete detail.

The TDM relies on a theoretically based view of why people do not respond to questionnaires and a well-confirmed belief that attention to administrative details is essential to conducting successful surveys. In the latest edition of his book,
Dillman (2000) goes further to describe additional shaping of procedures and techniques for particular surveys based on a more precise considerations of costs, rewards and trust associated with specific populations, sponsorship, and/or content.

TDM provides specific guidelines for constructing a questionnaire and implementing a survey. In questionnaire construction, detailed instructions govern the use of paper, typefaces, sequencing of questions, page layout, and so on. In survey implementation, comprehensive rules are given on the content and personalization of the cover letter, signing of the letter, the mailed out package, and follow-up procedures to non-respondents. These procedures and guidelines were followed in designing the questionnaire and the administration of the survey for this study.

The next section presents the conceptualization and operationalization of the constructs and variables used in this study before the questionnaire and survey designs are presented.

4.5 Conceptualization and Operationalization of Constructs and Variables

The six constructs involved in this study are habits, consequences, affect, social factors, facilitating conditions, and behavior, plus the associated variables as shown in the Research Model in Figure 3.2. A brief definition of terms is given before the descriptions of the conceptualization of the constructs and the operationalization of the variables.
4.5.1 Definition of Terms

Conceptualization is the process that redefines a concept to give it a conceptual or theoretical definition. It refers to the process of identifying and clarifying concepts: ideas we have about the nature of things (Babbie, 2001). It is the specification of the meaning of the concepts and variables to be studied. Conceptualization helps in linking theory with research. A concept is a thought, general notion, or a generalized idea about a class of objects or events expressed as symbols or words. Concepts are borne out of experience, creative thinking or observation, and they are the building blocks of a theory. A theory is a logical construction that explains a natural phenomenon (Kuhn, 1970). Kerlinger (1986) defines a theory in more detail as:

".... a set of interrelated constructs (concepts), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining and predicting the phenomena" (p. 9).

Kerlinger’s definition qualifies Triandis’ Framework as a theory.

The terms concept and construct have similar meanings and are used by scientists and researchers interchangeably: although there is an important distinction between the two terms. A concept expresses an abstraction formed by generalization from particulars (Kerlinger, 1986). For example, “weight” is a concept that expresses numerous observations of things that are more or less
“heavy” or “light”. A concept turned into systematically organized ideas is referred to as a construct (Neuman, 2000).

Concepts in natural science theories are more concrete and are often expressed in symbolic forms, whereas concepts in social science theories are more complex and abstract, and are often expressed using words, and can take on several definitions. Social science theories require well-defined concepts (Neuman, 2000).

Conceptualization results in a working definition of a variable. A variable is a concept that differs in degree or kind and can be measured. In practice, however, scientists and researchers use the term variable as a synonym for the construct or the property being studied (Cooper and Emory, 1995). In this context, a variable “is a symbol to which numerals or values are assigned” (Kerlinger, 1986, p. 27). The working definition of a variable establishes the theoretical position from which the variable is measured.

There are situations where the measure for a variable is determined by a measure of a number of further variable items. For example, to determine the measure for user satisfaction of EIS support services variable, one may measure how adequate, timely and relevant support services are. These variable items that determine a measure of another variable are referred to as sub-variables in this
study. The variables for this study are shown in the research model in Figure 3.2, while sub-variables can be identified from the survey questionnaire.

Whereas conceptualization is concerned with the intellectual clarification of concepts for measurement, operationalization is the construction of the actual, concrete measurement techniques (Babbie, 2001). Operationalization gives an operational definition of the variable in terms of specific operations, measuring instruments, and procedures used in measuring the variable. Operationalization answers the question: "How will we actually measure the variables under study?" Neuman (2000) made five recommendations for developing good measures of variables. These recommendations were followed in the operationalization of the variables in this study. Neuman's five recommendations are shown in Box 4.1.

**Box 4.1: Neuman (2000)'s Five recommendations for developing good measures of Variables** (Source: Neuman (2000, p. 161)

1. *Remembering the conceptual definition:* that is, the underlying principle for any measure to match the specific conceptual definition of the variable;
2. *Keeping an open mind:* that is, being creative and constantly looking for better measures;
3. *Borrowing from others:* that is, using good ideas for measures from other studies, and with modifications if necessary;
4. *Anticipating difficulties:* that is, thinking in advance logical and practical problems that may arise when trying to measure variables of interest and avoiding these problems with careful forethought and planning; and
5. *Not forgetting units of analysis:* that is, making sure measures fit the units of analysis and permitting generalization to the universe of interest.
In designing the measuring instruments for the variables in this study, the \textit{reliability} and \textit{validity} of the instruments were taken into account. These are two essential characteristics of measurement that must be considered in establishing the appropriateness and usefulness of a measuring instrument (Youngman, 1979; Sekaran, 1992; Wiersma, 2000).

\textit{Reliability} indicates the degree to which a measuring instrument performs consistently. That is, the consistency with which the instrument is measuring whatever it measures. Will the measure yield the same results on different occasions assuming no real change in what is to be measured? The reliability of a scale indicates how free it is from random error.

On the other hand, the \textit{validity} of an instrument indicates the degree to which a measuring instrument measures what it is designed to measure. That is, the degree to which a procedure produces genuine and credible information (Youngman, 1979; Sommer and Sommer, 1997; Wiersma, 2000).

Both definitions for reliability and validity specify degree rather than perfection. It is rare to achieve perfect reliability and validity (Neuman, 2000). To obtain figures ranging from 0.70 to 0.81 for reliability for example is perfectly acceptable (Youngman, 1979).
Neuman (2000) classified reliability into three types. The first is *stability reliability*, which is reliability across time. It indicates whether a measure or indicator delivers the same answer when applied in different time periods. The second is *representative reliability*, which is reliability across subpopulations or groups of people. It indicates whether a measure or indicator delivers the same answer when applied to different subpopulations (e.g., different classes, races, sexes, age groups). The third is *equivalence reliability*, which is applied when researchers use multiple indicators or measures. This occurs when multiple specific measures are used in the operationalization of a construct (e.g., several items in a questionnaire all measure the same construct). Equivalence reliability indicates the consistency of results across different indicators or measures. There are special statistical measures (e.g., Cronbach’s alpha) to determine this type of reliability. Equivalence reliability was applied in this study.

There are two main aspects of validity – *internal validity* and *external validity*. Internal validity is the degree to which a procedure measures what it is supposed to measure. That is, whether the operational definition is consistent with other ways of identifying and measuring a variable. On the other hand, external validity refers to the generalizability of the findings of a study. That is, can the results of a study be extended beyond the immediate setting or situation? In other words, what is the probability that the patterns observed in a sample will also be present in the wider population from which the sample is drawn? There is a third aspect of validity, which is *statistical validity*. Statistical validity
requires that the correct statistical procedure is chosen and that its assumptions are fully satisfied. The procedures for statistical validity were applied in this study, and are described in the Methodology section.

Sekaran (1992) classified validity into eight types. All eight validity types were considered in the conceptualization and operationalization of the constructs and variables in this study. Sekaran’s eight validity types are shown in Box 4.2.

**Box 4.2: Sekaran’s (1992) Eight classifications of Validity (Source: Sekaran (1992))**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Content validity:</strong> which is to ensure that a measure includes an adequate and representative set of items that would tap the concept. That is, ensuring that a measurement instrument adequately measures the concept;</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Face validity:</strong> which is to ensure that experts in the field of the study will agree that the instrument measures what its name suggests it measures;</td>
</tr>
<tr>
<td>3.</td>
<td><strong>Criterion-related validity:</strong> which is to ensure that a measure differentiates individuals on a criterion it is expected to predict. That is, the measure differentiates in a manner that helps to predict a criterion variable. This is done by establishing concurrent validity or predictive validity;</td>
</tr>
<tr>
<td>4.</td>
<td><strong>Concurrent validity:</strong> which is to ensure that a measure differentiates individuals in a manner that helps predict a criterion variable currently. That is, classifying units of analysis in manner that ensures that the results of a measure are acceptable for predicting a present criterion variable;</td>
</tr>
<tr>
<td>5.</td>
<td><strong>Predictive validity:</strong> which is to ensure that a measure differentiates individuals in a manner that helps predict a future criterion;</td>
</tr>
<tr>
<td>6.</td>
<td><strong>Construct validity:</strong> which is to ensure that the result obtained from a measure fits well the theories around which the study is designed. This is assessed through convergent and discriminant validity;</td>
</tr>
<tr>
<td>7.</td>
<td><strong>Convergent validity:</strong> which establishes that the scores obtained by two different measurement instruments measuring the same concept are highly correlated; and</td>
</tr>
<tr>
<td>8.</td>
<td><strong>Discriminant validity:</strong> which is established when, based on theory, two variables are predicted to be uncorrelated, and the scores obtained by measuring them are indeed empirically found to be so.</td>
</tr>
</tbody>
</table>
4.5.2 The Measures

The concepts underlying Triandis' Framework and the definitions of some constructs in the framework have been presented in Chapter 3 sections 3.3.1 and 3.3.2 respectively. These sections define the conceptualization process for the constructs in this study.

The operationalization of the variables for this study is presented below. The operationalization follows Triandis (1980) as described in Chapter 3 section 3.3.2. In addition, relevant studies (e.g., Thompson et al., 1991, 1994; Bergeron et al., 1995) are also referenced in the operationalization. Further, the statistician consultant on this project has been consulted constantly during the development of the scales in the questionnaire in order to ensure their reliability and validity.

In the following subsections the various measures used are described. A 5-point Likert scale is used throughout except where otherwise stated. This was done to facilitate a good response rate (Wiersma, 2000). The Cronbach's alpha for the measuring scales is presented in Table 4.2 on page 110.

4.5.2.1 Habits

From Triandis' (1980) Theoretical Framework, habits can be measured by the past experience an individual has had with an act and the ability of the individual to perform the given act. A body of research studies on the relationships between
computer experience and IT usage was presented in Chapter 3 section 3.4.2.1. Yaverbaum (1988), for example, reported an increase in the internal motivation to use computers as the number of years of computing experience grew and DeLone (1988) found that chief executives’ knowledge of computers resulted in IS success, while Fazio and Zanna (1981) found that attitude resulting from direct experience was a strong predictor of behavior. An earlier IS research also found that users learn experientially (Martin et al., 1973). Accordingly, habits are operationalized by assessing the number of years of experience an executive has had in using EIS, and his/her ability to use the systems. Thus, the question posed to assess the number of years of an executive’s experience in using EIS was:

How many years have you personally been using EIS? (Please tick one)

☐ 0 - 4  ☐ 5 - 9  ☐ 10 - 14  ☐ 15 - 19  ☐ 20 or more years

A similar question is posed in the questionnaire to assess executives’ experience in using computer-based information systems (CBIS) in general. This was done in order to assess an executive’s experience in using any CBIS prior to using an EIS.

Computer system users are classified by computer experience (ability to use the system) into novice users, knowledgeable intermittent (casual) users, and frequent or expert users (Shneiderman, 1998). Therefore the ability to use an EIS was measured by assessing the executive’s user class. The question posed was:
In which class of EIS users would you place yourself? (Please tick one)

Novice casual (intermittent) user  
Novice frequent user  
Expert (knowledgeable) casual user  
Expert (knowledgeable) frequent user  

4.5.2.2 Consequences

As stated in Chapter 3 section 3.3.2, perceived consequences is the same as perceived usefulness in the technology acceptance model, and perceived usefulness is defined as the extent to which a person believes that using a particular technology will enhance their job performance. As in Triandis’ model, perceived consequences of a behavior (or subjective utility) is the product of the individual’s beliefs ($P_c$) that such consequences (usefulness) will occur and the value ($V_c$) attached to the usefulness. Triandis suggests some methods for the measurement of ($P_c$) as “asking the person to indicate his or her certainty that the consequence will or will not follow an act”, or using a rating scale in which the middle point is labeled “uncertain” and the end points are labeled “certain it will happen” and “certain it will not happen”.

Another method Triandis suggests is to “provide individuals with a list of conceivable consequences and ask them to select the consequences they consider to be most likely to follow the act. Then, a $P_c$ of 1.00 can be assigned to the consequences that are selected and a $P_c$ of 0.00 to the remaining consequences”. A method of measuring $V_c$, Triandis suggests, is to “use a set of prescaled,
affectively positive or negative stimuli (e.g., going to a good movie or being told by one’s boss that one is doing a poor job) and ask the subject to match a particular consequence on the ‘pleasant-unpleasant dimension’ with one of these prescaled stimuli”.

This study adopted Triandis’ methods together with the steps suggested by Ajzen and Fishbein (1980, pp. 261-263), which were also used by Bergeron et al. (1995), to measure the perceived usefulness of EIS. Similar to Bergeron et al. (1995), perceived usefulness was measured by assessing an executive’s beliefs in using an EIS and values attached to these beliefs in using an EIS. A set of six 5-point Likert scales was used to assess the executive’s beliefs for using EIS. A second set of six 5-point Likert scales was used to assess the values the executive attached to the beliefs in the first set. The corresponding scores in each set were multiplied and then the products summed up. Final measure was obtained by averaging over the six scales. The scales were adapted from Bergeron et al. (1995).

The following are the questions together with the scales used to measure the consequences of EIS use in this study. The scales were found to be reliable, with Cronbach’s alpha equal to 0.85.
1. Based on my experience with EIS I have observed that an EIS:

(SA – Strongly Agree  A – Agree  U – Uncertain  D – Disagree  SD – Strongly Disagree)

- Increases an organization’s performance SA A U D SD
- Provides an organization with a competitive advantage SA A U D SD
- Provides a greater level of control over managerial activities SA A U D SD
- Provides information that allows problems to be detected SA A U D SD
- Improves the quality of decision-making in an organization SA A U D SD
- Increases the speed of decision-making in an organization SA A U D SD

2. I believe using EIS in an organization has the potential to:

- Increase the organization’s performance SA A U D SD
- Provide the organization with a competitive advantage SA A U D SD
- Provide a greater level of control over managerial activities SA A U D SD
- Provide information that allows problems to be detected SA A U D SD
- Improve the quality of decision-making in the organization SA A U D SD
- Increase the speed of decision-making in the organization SA A U D SD

4.5.2.3 Affect

As mentioned in Chapter 3 section 3.3.2, the affect construct refers to an individual’s feelings (satisfaction-dissatisfaction) associated with a given behavior. In this study, it is operationalized through four variables. The first variable measures the executive’s satisfaction with the EIS, using seven 5-point Likert scales. The second variable measures the satisfaction with information derived from the EIS, using eight 5-point Likert scales and the third measures the satisfaction with the EIS support services using five 5-point Likert scales. The
fourth measures the executive’s satisfaction with the EIS development plans, using seven 5-point Likert scales. All scales were adapted from Bergeron et al. (1995) and Amoako-Gyampah and White (1993).

The following are the questions together with the scales used in this study to measure the EIS satisfaction, information satisfaction, EIS support satisfaction, and EIS development plans satisfaction respectively. The scales were found to be reliable, with Cronbach’s alpha equal to 0.88, 0.90, 0.92, and 0.92 respectively.

1. The **EIS** I use is always:
   - available
   - reliable
   - effective
   - flexible
   - easy-to-use
   - fast
   - overall satisfactory

<table>
<thead>
<tr>
<th>Scale</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>available</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>reliable</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>effective</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>flexible</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>easy-to-use</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>fast</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>overall satisfactory</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
</tbody>
</table>

2. The **information** I need from my EIS is always:
   - available
   - reliable
   - accurate
   - timely
   - precise
   - adequate
   - meaningful
   - overall satisfactory

<table>
<thead>
<tr>
<th>Scale</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>available</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>reliable</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>accurate</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>timely</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>precise</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>adequate</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>meaningful</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
<tr>
<td>overall satisfactory</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
</tr>
</tbody>
</table>
3. The **support services** provided by the information systems personnel for the EIS I use are always:

- adequate
- relevant
- provided within an acceptable time
- provided with a positive attitude
- overall satisfactory

<table>
<thead>
<tr>
<th>Service Provided</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>adequate</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>relevant</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>provided within an acceptable time</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>provided with a positive attitude</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>overall satisfactory</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
</tbody>
</table>

4. The **development plans** for the EIS systems in my organization are always:

- available
- reliable
- complete
- flexible
- attainable
- future-oriented
- overall satisfactory

<table>
<thead>
<tr>
<th>Development Plan</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>available</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>reliable</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>complete</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>flexible</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>attainable</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>future-oriented</td>
<td>SA</td>
<td>A</td>
<td>U</td>
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<td>SD</td>
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<tr>
<td>overall satisfactory</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
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**4.5.2.4 Social Factors**

As stated in Chapter 3 section 3.3.2, the **social factors** construct consists of the reference group’s subjective culture which influences an individual group member’s notion of appropriate or desirable behavior. In the present context, this refers to the influence of the executive’s work group (peers, superiors, subordinates, IS director) on their use of an EIS. Subjective culture consists of norms, roles, and values. In addition, social situations also evoke particular behaviors.
In this study, this construct was operationalized through four variables. The scales and procedures for the four variables are adapted from Triandis et al. (1968), Kohn (1969) and Bergeron et al. (1995).

The first variable measured the subjective norms (self-instructions to do what is perceived to be correct and appropriate by the work group) by obtaining the executive’s assessment of the influence of the work group upon their behavior in general, using four 5-point Likert scales (ranging from -2: strongly disagree, to +2 strongly agree). This score was then multiplied by their evaluation of the probability that the work group does in fact want them to use an EIS which was measured using four 5-point Likert scales (ranging from 0: strongly disagree to 4: strongly agree). The final measure is obtained by averaging over the four scales similar to Bergeron et al. (1995). The scales were constructed from the steps suggested by Ajzen and Fishbein (1980, pp. 74-75; pp. 261-263), which were also used by Bergeron et al. (1995) to measure the subjective norms of EIS users.

The subjective norms variable was measured in this study with the following questions and scales. The scales were found to be reliable, with Cronbach’s alpha equal to 0.81.

1. The following people think that I should use an EIS:

<table>
<thead>
<tr>
<th>Role</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>My colleagues</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>My superiors</td>
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<tr>
<td>The IS director</td>
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<td></td>
</tr>
<tr>
<td>My subordinates</td>
<td></td>
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</tr>
</tbody>
</table>

106
2. Generally, I want to do what the following people think I should do:

<table>
<thead>
<tr>
<th></th>
<th>SA</th>
<th>A</th>
<th>U</th>
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<tbody>
<tr>
<td>My colleagues</td>
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<tr>
<td>My superiors</td>
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<tr>
<td>The IS director</td>
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<tr>
<td>My subordinates</td>
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</table>

The second variable measured the subjective roles (expected correct behaviors associated with the executive's role and the use of an EIS), using four 5-point Likert scales.

The third measured the subjective values (the broad tendencies of the work group to prefer certain states of affairs over others in relation to the executive's use of EIS), using four 5-point Likert scales.

The fourth measured the social situations in the workplace settings by obtaining the executive's assessment of the interpersonal relationships with peers, superiors, subordinates, the IS director and the EIS support group in using the EIS. This was measured using five 5-point Likert scales. The scales were constructed following Bergeron et al. (1995).

The subjective roles, the subjective values, and social situations variables were measured using the following questions and scales respectively. The scales were found to be reliable, with Cronbach's alpha equal to 0.82, 0.91 and 0.86 respectively.
1. By virtue of my roles in the organization, the following people expect that I will use an EIS:

<table>
<thead>
<tr>
<th>Role</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>My colleagues</td>
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<tr>
<td>My superiors</td>
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<td>The IS director</td>
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<td>My subordinates</td>
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</table>

2. The use of EIS is generally considered in my organization to be:

<table>
<thead>
<tr>
<th>Quality</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rational</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. The social working relationships between me and the following make it easier for me to use an EIS:

<table>
<thead>
<tr>
<th>Role</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>My colleagues</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My superiors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The IS director</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My subordinates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.5.2.5 Facilitating Conditions

The *facilitating conditions* construct was operationalized through three variables. The first variable measured the degree to which the organizational environment facilitates executives’ use of EIS, using five questions derived from Nandhakumar (1996), Nandhakumar and Jones (1997), and McBride (1997) with 5-point Likert scales.
The second measured the degree to which the EIS development processes facilitate executives' use of EIS, using five questions derived from Nandhakumar (1996), and Nandhakumar and Jones (1997) with 5-point Likert scales.

The third measured the degree to which the EIS management processes facilitate executives' use of EIS using four questions derived from Nandhakumar (1996), and Nandhakumar and Jones (1997) with 5-point Likert scales. The scaling followed those used by Bergeron et al. (1995).

The organizational environment, the development processes, and the EIS management processes variables were measured with the following questions and scales respectively. The scales were found to be reliable, with Cronbach's alpha equal to 0.76, 0.74 and 0.70 respectively.

1. The following aspects of my organization encourage me to use an EIS:

   The organizational culture
   The pace of changing business environment
   The interactions among the business units
   The power and politics of the organization
   The commitment of the organization to EIS

   SA  A  U  D  SD
2. The following aspects of the EIS development processes in my organization encourage me to use an EIS:

- Executive sponsorship
- My involvement and participation in the development
- The availability of technical and other resources
- The use of a development plan
- Follow-ups made after the implementation of an EIS

3. The following aspects of the EIS management processes in my organization encourage me to use an EIS:

- Management policies and rules
- Data management
- Availability of support
- The availability and accessibility of the system

4.5.2.6 Behavior

The behavior construct is operationalized through two variables.

The first variable measured the frequency with which executives use an EIS. Similar to Leidner and Elam (1994b), the value for this variable was obtained by asking executives to indicate the average number of terminal sessions per month they initiate in using an EIS.

The second variable measured the internalization of EIS use by ascertaining the executive's probabilities and values associated with the use of the system.
According to Bergeron et al. (1995), "one of the fundamental aspects of behavior which can be measured is its intensity, that is, the degree to which it is 'internalized' by the actor" (p. 138). Three relevant aspects of internalization in terms of system use are identified by Trice and Treacy (1988). The first relates to the user's level of dependence upon the system. The second is the extent of system ownership felt by the user. The third refers to the routinization of system usage. These suggestions are followed by Bergeron et al. (1995) in their studies. This present study also followed these suggestions and used a measure which consists of four 5-point Likert scales, which characterized the extent to which the system has become an integral part of the executive's work activities.

The following questions were used to measure the frequency of use.

1. On average, how many times do you logon to use an EIS? (Please tick one)
   - Several times a day
   - Once a day
   - 1 - 4 times a month
   - Once a month
   - Less than once a month

The following questions and scales were used to measure internalization and the scales were found to be reliable, with Cronbach's alpha equal to 0.81.

2. Using an EIS helps me personally to:
   - Accomplish my usual tasks
   - Identify trends and obtain critical information
   - Make strategic decisions
   - Not using EIS any more would disadvantage me

SA A U D SD

SA A U D SD

SA A U D SD

SA A U D SD
Table 4.2: Reliability Coefficients of Scales (Cronbach’s Alpha) for scaled Variables used in this Study (N = 144, Scale = 5-point Likert scale).

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. of Items</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Usefulness</td>
<td>6</td>
<td>0.85</td>
</tr>
<tr>
<td>EIS System</td>
<td>7</td>
<td>0.88</td>
</tr>
<tr>
<td>EIS Information</td>
<td>8</td>
<td>0.90</td>
</tr>
<tr>
<td>Support Services</td>
<td>5</td>
<td>0.92</td>
</tr>
<tr>
<td>Development Plans</td>
<td>7</td>
<td>0.92</td>
</tr>
<tr>
<td>Subjective Norms</td>
<td>4</td>
<td>0.81</td>
</tr>
<tr>
<td>Subjective Roles</td>
<td>4</td>
<td>0.82</td>
</tr>
<tr>
<td>Subjective Values</td>
<td>4</td>
<td>0.91</td>
</tr>
<tr>
<td>Social Situations</td>
<td>4</td>
<td>0.86</td>
</tr>
<tr>
<td>Organizational Environment</td>
<td>5</td>
<td>0.76</td>
</tr>
<tr>
<td>EIS Development Processes</td>
<td>5</td>
<td>0.74</td>
</tr>
<tr>
<td>EIS Management Processes</td>
<td>4</td>
<td>0.70</td>
</tr>
<tr>
<td>EIS Internalization</td>
<td>4</td>
<td>0.81</td>
</tr>
</tbody>
</table>

4.6 Questionnaire Design

Babbie (2001) defines a questionnaire as “an instrument specifically designed to elicit information that will be useful for analysis” (p. 239). The key word in this definition is “elicit”. For a questionnaire to elicit and solicit the desired information, specific guidelines must be followed in designing the questionnaire.
There are two options available to researchers in posing questions in a questionnaire:

1. *Open-ended questions*, in which case the respondent is asked to provide their own answers to the questions;

2. *Closed-ended questions*, in which the respondent is asked to select an answer from among a list provided by the researcher.

Closed-ended questions are more popular in survey research because they provide a greater uniformity of responses and are more easily processed (Robson, 1996; Babbie, 2001). Open-ended questions must be coded before computer analysis can be done. The coding process often requires that the researcher interprets the meaning of the responses. This can lead to the possibility of misunderstanding and researcher bias. There is also the danger that some respondents will give answers that are essentially irrelevant to the researcher’s intent. Closed-ended questions, on the other hand, can often be transferred directly into a computer format.

The main shortcoming of closed-ended questions lies in the researcher’s structuring of responses. The researcher may overlook some important responses. Babbie (2001) gives two structural requirements that should guide the construction of closed-ended questions. First, the response categories provided should be exhaustive, that is, they should include all the possible responses that might be expected. Second, the answer categories must be mutually exclusive, that is, the respondent should not feel compelled to select more than one
response. This can be achieved by carefully considering each combination of response categories and where there is still doubt that the respondent might not be selecting only one response then an instruction to select one best answer must be added.

4.6.1 The Design of the Survey Questionnaire

In designing the survey questionnaire for this study, the procedures and guidelines provided by Sarantakos (2002), Babbie (2001), Dillman, (1978, 2000), Wiersma (1986, 2000) and Robson (1996) were followed. Some questions in the questionnaire were also adopted from Bergeron et al. (1995). The questionnaire was designed in two stages.

In stage 1, the questionnaire was pre-tested in full three times on six colleagues at their workplace. Each time, the questionnaire was refined with feedback received and pre-tested again. Each time a pre-test was completed, a statistician assigned to this project verified the statistical validity and reliability of the questionnaire. The statistical consultant involved with this research is engaged in the Statistical Consulting Service at the University where this research was conducted.

In stage 2, a pilot study was undertaken with the final questionnaire developed in stage 1. The pilot study was done for two main objectives. 1) To pre-test the questionnaire on a representative sample and to use the feedback from the pilot
study to refine the questionnaire for the main survey. 2) To serve as an exploratory study in order to develop an initial understanding of which factors influence the use of EIS in organizations.

A general description of what this research is about was provided in the cover letter with the mailed out questionnaire, as shown in the cover letter template in Appendix A. In addition, brief descriptions and definitions were provided at the beginning of each section of the questionnaire so the respondent would know exactly what was being asked. Instructions as to how to select responses to questions were also provided. The sections, statements and questions in the questionnaire were laid out so that the flow of the statements and questions kept on reminding the respondent what the research was about (Sarantakos, 2002; Babbie, 2001; Dillman, 2000; Wiersma, 2000; Robson, 1996).

A five-point Likert scale was used throughout the questionnaire for statements that required scaling in order to keep the respondent’s mind more focused on the statements. Colored paper was used in printing the questionnaire mailed out to the respondents. This was done in order to make the questionnaire conspicuous and to subsequently assist to ensure a good response rate (Babbie, 2001; Dillman, 2000; Wiersma, 2000; Robson, 1996).

The codes for strongly agree (SA), agree (A), uncertain (U), disagree (D), and strongly disagree (SD) were used throughout the questionnaire where statements
required respondents to choose one of these options, instead of any other code or symbol such as a box. This was done so as to make it easier and faster for the respondent to know the response they were circling without having to look back continually to check what the codes stand for (Babbie, 2001; Wiersma, 1986).

The section requiring personal information from the respondent was placed at the end of the questionnaire. This was done to assist the respondent to move straight to responding to questions related to the main purpose of the survey after reading the cover letter (Babbie, 2001; Dillman, 2000; Wiersma, 2000). On the very last page of the questionnaire the respondent was thanked for their valuable contribution made and asked to make any further comments they wished to contribute.

An application was initially made to the Human Research Ethics Committee (HREC) to approve the conduct of this survey as required by law in Australia. The cover letter to the questionnaire included a statement guaranteeing the confidentiality of the respondent and a statement of how the research had been reviewed and approved by the HREC. The HREC was provided with a copy of the cover letter in case of any concerns or complaints regarding the conduct of the research (see Appendix A). The design of the cover letter followed the suggestions and guidelines provided by Sarantakos (2002), Babbie (2001), Wiersma (2000) and Robson (1996).
4.7 The Pilot Study

A pilot study was undertaken using the final questionnaire obtained from the pre-tests. Data for the pilot study was collected from three large organizations in Australia identified as users of EIS. The respondents were CEOs, CFOs or equivalent and two other executives in the three selected organizations.

The cover letter to the questionnaire included a statement guaranteeing confidentiality and a statement that the research had been reviewed by the Human Research Ethics Committee as required in Australia and their contact for any concerns or complaints regarding the conduct of the research. The cover letter was personalized by using the respondent’s full name, title and position at the top of the mailing address.

Twelve (12) questionnaires were mailed out and ten (10) were returned all of which were suitable for analysis. The questionnaire was further refined using the feedback received from the pilot survey in order to arrive at the final questionnaire for the main survey, as shown in Appendix B. The feedback received include suggestions to number the questions in the questionnaire; swapping some of the questions to preserve a logical flow; including our e-mail address for contact and including additional sub-variables in the questionnaire to address some organizational issues. The last suggestion, for example, led to the inclusion of “The pace of changing business environment” as a sub-variable for the Organizational environment variable.
The analysis of the data collected from the pilot study was qualitative because of the size of the sample. Preliminary results suggested that there was a very high perceived usefulness for EIS in organizations. The results also suggested that social factors were seen as highly relevant by users in using EIS. The results suggested that users considered satisfaction with information from EIS, support for the EIS and the EIS itself as more important than the EIS development plans. The preliminary results suggested that users considered management processes associated with EIS more important than the EIS development processes and the organizational environment.

4.8 The Main Survey

This section presents the administration of the survey questionnaires, the organizations surveyed and the survey results.

4.8.1 Administration of Survey Questionnaires

This section describes the process undertaken in distributing the questionnaire packages to the respondents; monitoring of returned questionnaires; and the follow-up with non-respondents.

The basic method for collecting data through the mail was to send the questionnaire accompanied by a cover letter explaining the purpose of the survey, and a pre-paid self-addressed envelope for the return of the questionnaire. One
of the common reasons why respondents fail to return questionnaires is the effort required on their part to complete and return the questionnaires (Babbie, 2001). This effort was reduced by making it easy for the respondent to put the completed questionnaire in the pre-paid self-addressed envelope without the respondent having to fold the questionnaire.

4.8.1.1 Survey Questionnaire Distribution and Return

The survey questionnaire packages were mailed out in batches through the ordinary “snail” mail to the respondents. The survey questionnaire packages were batched to facilitate a good administration of the survey. There were seven batches in all. The first batch was mailed out on November 9, 2001. The second and the third batches were mailed out on November 12 and 14, 2001 respectively. The fourth, fifth and the sixth batches were mailed out on November 19, and the last batch was mailed out on November 23, 2001. The number of questionnaire packages in each batch is as follows:

<table>
<thead>
<tr>
<th>Batch</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>2</td>
<td>62</td>
</tr>
<tr>
<td>3</td>
<td>128</td>
</tr>
<tr>
<td>4</td>
<td>128</td>
</tr>
<tr>
<td>5</td>
<td>128</td>
</tr>
<tr>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>90</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>700</strong></td>
</tr>
</tbody>
</table>
The survey questionnaire package was contained in a pre-paid A-4 size envelope with the University's name, emblem and the return address at the left-hand corner of the envelope. A package consisted of the questionnaire, a cover letter, and a pre-paid self-addressed A-4 size envelope having the University's name, emblem and return address at the left-hand corner as well.

The questionnaires were pre-numbered to help provide a record of returns and facilitate the mailing of follow-ups to non-respondents. A statement to this effect was provided in the cover letter. The cover letter also included the purpose of the study, how the name of the respondent was obtained, a guarantee of the confidentiality of the respondent, what the respondent needed to do, and by what date the completed questionnaire should be returned. The return dates were made two weeks from the date of the cover letter.

The review of this research by the University's Human Research Ethics Committee (HREC) was also included in the cover letter. The cover letter concluded by thanking the respondent, a promise to inform the respondent of the findings of the study before any final publication, and an invitation to discuss any part of the research if they so wished. The cover letter was formatted to fit one page and was printed on the University letterhead and signed by the main supervisor of this PhD research project (see Appendix A).
4.8.1.2 Monitoring Questionnaire Returns

A table for each batch of questionnaires was prepared with the respondent’s name, the pre-number of the questionnaire sent to the respondent, the date the questionnaire was dispatched to the respondent, the date the questionnaire was returned, and the date any follow-up questionnaires were received.

A table was also prepared to record the cumulative totals for the number of questionnaires completed and satisfactory for analysis, the number of completed and uncompleted questionnaires not useful for analysis, the number of questionnaire packages marked "return to sender", number of emails received, and the number of telephone calls received from respondents regarding the questionnaires.

As the questionnaires were returned, the date on which each was received was recorded in the receipt date column against the respondent’s name, using the pre-number on the questionnaire. This was done to facilitate follow-ups to non-respondents. Some of the questionnaire packages were returned because the respondents had either changed jobs and left the organizations, or they had retired from the workforce. In some cases, emails or telephone calls were received asking whether the current occupants of the positions could complete the questionnaires. We agreed to these requests. In other cases, some emailed, telephoned or wrote to inform us of their company policies not to participate in surveys. We respected these and excluded them from our follow-ups. Some other respondents emailed and/or telephoned to discuss the research and offered
additional valuable comments, while some other respondents emailed, telephoned or returned the questionnaires with the explanation that they were not using EIS as indicated by the database which we purposely purchased for this study.

4.8.1.3 Follow-up Mailings to Non-respondents

The follow-up mailings to non-respondents were delayed until February 2002. This was done for the obvious reason that the months of December and January would be Christmas and New Year holiday breaks for most organizations we were surveying. It was observed from the pattern of the returns of the questionnaires from the first mail out that the timing of our mailing was not good. The mailings were too close to the end of year when business activities are usually at their peak, with executives being extra busy.

Each follow-up questionnaire package consisted of all items as in the first mail out plus a follow-up cover letter reminding the respondent of the first mail out and the date by which to return the questionnaire. Though the follow-up cover letter followed the practice of encouraging immediate response, as did the initial cover letter, the follow-up was firmer than the initial letter. (See Appendix C for the template of the follow-up cover letter). This was done because studies (Jackson and Schuyler, 1984) show that fewer responses were received from respondents who received “cute” reminders than those whose reminders are more businesslike.
A total of 115 responses were received from the follow-up mailings which was higher than expected.

### 4.8.2 Comparison of Initial and Follow-up Responses

Table 4.3 below shows a comparison between the responses received from the initial mailed out and the follow-up mailed out of the survey questionnaires.

<table>
<thead>
<tr>
<th></th>
<th>Used</th>
<th>Not Used</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>95</td>
<td>50</td>
<td>145</td>
</tr>
<tr>
<td>Follow-up</td>
<td>49</td>
<td>66</td>
<td>115</td>
</tr>
<tr>
<td>Total</td>
<td>144</td>
<td>116</td>
<td>260</td>
</tr>
</tbody>
</table>

The 116 responses were not usable because there were too many missing values (53 responses), or they were returned with notes that the organizations were not using EIS (45 responses), or they were returned with notes expressing no interest to participate in the study (18 responses). The number of responses with missing values was relatively high and seemed to suggest that these respondents did not treat the survey questionnaires with the attention required.

### 4.8.3 Organizations Surveyed

The organizations surveyed were identified through a database specially purchased from Fairfax Business Media. The database purchased contains 700
records from 255 organizations in Australia who are using EIS. The database provides the following details:

- Respondent’s title, first name, last name, position title, position code (that is, for example, CEO for position title "Chief Executive Officer), address, city, state, postcode, country, and telephone number.

- The company details including: company ID; legal name; address; city; state; postcode; country; telephone number; fax number; industry code; email domain; email convention; and web address.

An industry codes and industry groups table is also included on the database. This table has a column for the industry code, industry description and industry group or sector respectively. The table is reproduced and shown in Appendix D.

The organizations surveyed were either private or public, and they ranged from small to very large organizations employing a minimum of 1,010 to a maximum of 750,000 people. The number of IT staff ranged from 0 to 4000 and turnover ranged from US$0 to over US$1000. A breakdown of the database by industry sector, number of employees, number of IT staff, turnover, number of companies in a sector and number of respondents surveyed in each industry sector is shown in Table 4.4. The industry codes and industry groups table in Appendix D was used to produce Table 4.4.
Table 4.4: A Breakdown of Records in the Database used in the Survey

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>No. of Employees</th>
<th>No. of IT Staff</th>
<th>Turnover (million US$)</th>
<th>No. of Companies</th>
<th>No. of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT Supplier</td>
<td>1100 - 12000</td>
<td>1 - 4000</td>
<td>0 to &gt; 1000</td>
<td>11</td>
<td>32</td>
</tr>
<tr>
<td>Agriculture &amp; Mining</td>
<td>1200 - 40000</td>
<td>2 - 120</td>
<td>0 to &gt; 1000</td>
<td>12</td>
<td>35</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>1100 - 100000</td>
<td>1 - 2000</td>
<td>0 to &gt; 1000</td>
<td>66</td>
<td>211</td>
</tr>
<tr>
<td>Utilities &amp; Construction</td>
<td>1400 - 7500</td>
<td>2 - 200</td>
<td>0 to &gt; 1000</td>
<td>20</td>
<td>51</td>
</tr>
<tr>
<td>Wholesale &amp; Retail</td>
<td>1100 - 149000</td>
<td>1 - 1200</td>
<td>0 to &gt; 1000</td>
<td>29</td>
<td>69</td>
</tr>
<tr>
<td>Transport &amp; Storage</td>
<td>1270 - 42000</td>
<td>2 - 1000</td>
<td>101 to &gt; 1000</td>
<td>11</td>
<td>29</td>
</tr>
<tr>
<td>Communications</td>
<td>1350 - 750000</td>
<td>19 - 4000</td>
<td>101 to &gt; 1000</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Finance &amp; Business</td>
<td>1100 - 17700</td>
<td>1 - 2500</td>
<td>0 to &gt; 1000</td>
<td>34</td>
<td>88</td>
</tr>
<tr>
<td>Govt &amp; Defence</td>
<td>1010 - 23000</td>
<td>10 - 1200</td>
<td>0 - 1000</td>
<td>17</td>
<td>48</td>
</tr>
<tr>
<td>Community Services</td>
<td>1200 - 30000</td>
<td>1 - 600</td>
<td>0 - 1000</td>
<td>36</td>
<td>90</td>
</tr>
<tr>
<td>Personal &amp; Other Services</td>
<td>1200 - 17000</td>
<td>0 - 370</td>
<td>0 - 1000</td>
<td>14</td>
<td>33</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>255</strong></td>
<td><strong>700</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.8.3 Survey Results

A total of 700 questionnaires were mailed out for the initial main survey to mainly CEOs, CFOs, and CIOs in the 255 organizations using EIS in Australia. One hundred and forty five (145) responses were received, out of which 95 were usable for analysis. Follow-up questionnaires were sent to non-respondents and 115 responses were received out of which 49 were usable for analysis. This brings the overall response total to 260 (145 + 115) giving a gross response rate of 37.14% (260 ÷ 700), of which 144 (95 + 49) responses, that is, 20.57% (144/700) are usable for analysis.
Table 4.5: Summary Responses to Questionnaires

<table>
<thead>
<tr>
<th>Table 4.5: Summary Responses to Questionnaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Questionnaires Distributed</td>
</tr>
<tr>
<td>Total Number of Questionnaires Returned</td>
</tr>
<tr>
<td>Total Number of Unusable Questionnaires</td>
</tr>
<tr>
<td>Total Number of Usable Questionnaires for Analysis</td>
</tr>
<tr>
<td>Gross Response Rate</td>
</tr>
</tbody>
</table>

The total number of responses and usable questionnaires received in this study is good compared with similar EIS studies in the US, the UK and Canada. In a recent study in the US, Singh et al. (2002) reported having received 51 responses from EIS users giving a response rate of 17%, while Leidner and Elam (1994) sent out 303 questionnaires to EIS users and received 97 responses giving a response rate of 32%. Kim (1996) sent out 400 questionnaires to EIS users in the US and received 112 giving a response rate of 28%. In the UK, Elkordy and Khalil (2002) sent out 960 survey questionnaires and received 216 giving a 22.5% response rate, whereas Bergeron et al. (1995) reported obtaining field data from 38 EIS users in nine organizations in Canada for their study. Based on the above and considering the comparative size of commerce in Australia, the number of participants and the total number of responses obtained for this study is satisfactory.

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4.9 Test for Non-response Bias

One of the most important questions surrounding any survey is the degree to which one can generalize results to the population at large. This is because non-response can bias survey estimates if those who do not participate in the survey hold substantially different attitudes than those who do participate.

In this study, the population of interest consists of all users of EIS in Australia. Given both the length of the questionnaire and the targeted population who are senior managers and above, we expected a relatively low response. Therefore, an important question to examine is whether or not respondents to the questionnaire differ in any important ways from the non-respondents.

The most common method used to examine non-response bias is to compare results between respondents to a first mailing and the respondents to a follow-up mailing (Anderson and Epstein, 1996). The assumption that respondents to a follow-up mailing are potential non-respondents and the follow-up procedure is a way of weakening the resistance (Wallace and Cooke, 1990). If there are no significant differences between the two samples, our confidence is enhanced that no important biases have been introduced and that the sample results can be generalize to population of interest (Anderson and Epstein, 1996).

We compared the results to each of the questions analyzed in this study between respondents to the first mail out and the respondents to the second mail out using
the chi-square statistic, as suggested by Anderson and Epstein (1996). All questions analyzed include both demographic questions and questions related to EIS usage. The results indicate that there are almost no statistically significant differences between the two samples. This suggests that the results of this study can be generalized to the population of interest.

4.10 Conclusion

This chapter presented the research design and methodology for this study. The research design and methodology were based on previous studies. The nature of the research, the unit of analysis, the dimension, the research methodology, and data collection attributes and characteristics employed in this study were also presented in this chapter. The data collection method has been elaborated and justified in this chapter. The conceptualization and operationalization of the constructs and variables were presented based on the theoretical framework and the research model presented in the previous chapter. Reliability and validity were taken into account in the conceptualization and operationalization described in this chapter.

The survey questionnaire design, based on procedures and guidelines from previous studies, was presented. The pilot survey, the main survey, and the administration of the main survey were discussed. A conclusion was drawn that the timing of a survey is essential to ensure good response rate.

In the next Chapter 5 the data analysis and the results are presented.
CHAPTER 5  DATA ANALYSIS AND RESULTS

5.1 Introduction

Chapter 4 described the research design, the research methodology and the operational measures. The administration of the survey questionnaires and the results of the survey were also described in Chapter 4. This chapter presents the data analysis and the results.

Preliminary evaluations of the research model and the hypotheses associated with the model were performed by calculating Pearson's product-moment correlation coefficients (Pearson's r). A further analysis was conducted by using stepwise regression analysis to determine the relative importance of the predictor (independent) variables in explaining EIS use. Analyses were also performed to ensure there were no violations of the assumptions of normality, linearity and homoscedasticity. SPSS Release 11.0 for Windows was used in the analysis.

5.2 Description of Respondents

Of the total 700 questionnaires distributed, 144 out of the 260 responses returned were suitable for analysis, as described in Chapter 4. Demographics of the 144 respondents are shown in Table 5.1. 122 (84.7%) of the respondents were male and 22 (15.3%) were female. The modal age group of the respondents was from 36 to 45 (40.3%) followed closely by the age group from 46 to 55 (36.8%). As expected, the respondents were highly educated with 72 (50%) of them postgraduate degree holders and 58 (40.3%) bachelor degree holders. The positions reported indicated that 90 (62.5%) of the respondents occupied top-
level management positions (CEOs, CFOs, CIOs and the like), 45 (31.3%) occupied middle management positions, and the remaining 9 (6.3%) of the respondents occupied lower-level management positions. This research was aimed at top-level manager respondents but the spread of EIS to others levels in organizations made this unachievable. The demographics statistics presented showed that almost two-thirds of the respondents were top-level managers and almost one-third were middle-level managers. Despite this proportion of respondents from the other levels of the organizations other than the top-level targeted by this study, the responses were nonetheless valuable for the objectives of the study.

Table 5.1: Description of Respondents (n = 144)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>122</td>
<td>84.7</td>
</tr>
<tr>
<td>Female</td>
<td>22</td>
<td>15.3</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>26-35</td>
<td>23</td>
<td>16.0</td>
</tr>
<tr>
<td>36-45</td>
<td>58</td>
<td>40.3</td>
</tr>
<tr>
<td>46-55</td>
<td>53</td>
<td>36.8</td>
</tr>
<tr>
<td>Over 55</td>
<td>10</td>
<td>6.9</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School Certificate</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Higher School Certificate</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>TAFE Qualification</td>
<td>10</td>
<td>6.9</td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>58</td>
<td>40.3</td>
</tr>
<tr>
<td>Postgraduate Degree</td>
<td>72</td>
<td>50.0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Position</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top-level Manager</td>
<td>90</td>
<td>62.5</td>
</tr>
<tr>
<td>Middle-level Manager</td>
<td>45</td>
<td>31.3</td>
</tr>
<tr>
<td>Lower-level Manager</td>
<td>9</td>
<td>6.3</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
5.3 Reliability Test

As presented in Chapter 4, the reliability of a measure refers to its stability over a variety of conditions (Nunnally and Bernstein, 1994). Reliability is concerned with the dependability, consistency, accuracy, predictability and stability of the measuring instruments (Kerlinger, 1986). It was acknowledged that poor reliability could result from various sources such as contestable instrument items, research bias, and unreliable subjects.

Cronbach’s alpha coefficient was used for estimating the internal consistency reliability of the measures. Since there are no definite values for evaluating the reliability of a measure, the suggestion (Youngman, 1979; Nunnally and Bernstein, 1994; Pedhazur, 1997) that an alpha coefficient greater than or equal to 0.7 signifies high reliability was used to assess the reliability of the measures.

The results of the reliability testing for the measures, as presented in Table 4.2 in Chapter 4, suggested that all the measures in this study were reliable. The alpha coefficients for the measures ranged from 0.70 to 0.92. These results were expected, as all the constructs and variables used in the study were based on well-established instruments with high reliability scores from previous studies.
5.4 Dealing with Missing Data

Missing value analysis helps address several concerns caused by incomplete data. Cases with missing values that are systematically different from cases without missing values can obscure results. Also, missing data may reduce the precision of calculated statistics because there is less information than originally planned. Another concern is that the assumptions behind many statistical procedures are based on complete cases, and missing values can complicate the theory required.

Missing data procedures perform three primary functions:

- Describes the pattern of missing data: where the missing values are located, how extensive they are, whether pairs of variables tend to have values missing in different cases, whether data values are extreme, and whether values are missing randomly.

- Estimates means, standard deviation, covariances, and correlations using a listwise, pairwise, regression, or EM (expectation-maximization) method. The pairwise method also displays counts of pairwise complete cases.

- Fills in (imputes) missing values with estimated values using regression or EM methods.

In the *Pairwise Deletion* method, pairs of variables that have values missing in different cases are omitted from the analysis. This method may result in the number cases for each variable in the analysis not being the same.
In the *Replace with mean* method, missing values are replaced with the mean of valid surrounding values. The span of nearby points is the number of valid values above and below the missing value used to compute the mean. The number of cases produced by this method for each variable in the analysis will be the same, and will always be equal to the number of cases for analysis that the researcher begins with. The main disadvantage of this method is that the mean values replacing the missing values may not be representative of responses from participants, and hence may lack credibility.

In the *Listwise Deletion* method, cases that have missing values for any of the variables named are omitted from the analysis. This method also results in complete cases that are actual responses from participants with the number of cases for each variable the same for the analysis. This method may however sometimes severely reduce cases for analysis if there is lot of missing data.

All of the above three methods produce complete cases for analysis and remove any concerns for any statistical procedures that are based on complete cases.

In analyzing the data for this study, all three methods were used and after consideration of the results from the three methods, the results from the *Listwise Deletion* method were found to be most appropriate for the study.
5.5 Analysis and Test Results for the Research Model

The research model was tested using correlation and multiple regression analyses. As a preliminary analysis, Pearson's product-moment correlation coefficients (r) were computed to assess association. Multiple regression analysis (stepwise) was performed to identify the important variables that explain the behavior of users in using EIS. This section presents the analyses and the identification of the important variables that explain the behavior of users in using EIS. Summary statistics for the data collected are presented in Table 5.2. It shows relatively high means for all variables except that of EIS experience.

Table 5.2: Summary Statistics for Variables in the Study (n = 144)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position of User</td>
<td>2.00</td>
<td>4.00</td>
<td>3.56</td>
<td>0.611</td>
</tr>
<tr>
<td>2. CBIS Experience</td>
<td>1.00</td>
<td>5.00</td>
<td>2.70</td>
<td>1.32</td>
</tr>
<tr>
<td>3. EIS Experience</td>
<td>1.00</td>
<td>5.00</td>
<td>2.06</td>
<td>1.08</td>
</tr>
<tr>
<td>4. Ability to use EIS</td>
<td>1.00</td>
<td>4.00</td>
<td>2.65</td>
<td>1.02</td>
</tr>
<tr>
<td>5. Satisfaction with EIS information</td>
<td>1.00</td>
<td>5.00</td>
<td>3.40</td>
<td>0.73</td>
</tr>
<tr>
<td>6. Satisfaction with EIS System</td>
<td>1.00</td>
<td>5.00</td>
<td>3.51</td>
<td>0.70</td>
</tr>
<tr>
<td>7. Satisfaction with EIS Support Services</td>
<td>1.00</td>
<td>5.00</td>
<td>3.46</td>
<td>0.84</td>
</tr>
<tr>
<td>8. Satisfaction with EIS Development Plan</td>
<td>1.00</td>
<td>5.00</td>
<td>3.04</td>
<td>0.70</td>
</tr>
<tr>
<td>9. Perceived Usefulness of EIS</td>
<td>-3.00</td>
<td>8.00</td>
<td>3.19</td>
<td>2.21</td>
</tr>
<tr>
<td>10. Subjective Norms in relation to EIS use</td>
<td>-1.50</td>
<td>8.00</td>
<td>2.35</td>
<td>1.82</td>
</tr>
<tr>
<td>11. Subjective Roles in relation to EIS use</td>
<td>2.00</td>
<td>5.00</td>
<td>3.99</td>
<td>0.60</td>
</tr>
<tr>
<td>12. Subjective Values of EIS</td>
<td>2.00</td>
<td>5.00</td>
<td>3.73</td>
<td>0.72</td>
</tr>
<tr>
<td>13. Social Situations in relation to EIS use</td>
<td>2.00</td>
<td>5.00</td>
<td>3.52</td>
<td>0.70</td>
</tr>
<tr>
<td>14. EIS Development processes</td>
<td>2.00</td>
<td>5.00</td>
<td>3.45</td>
<td>0.67</td>
</tr>
<tr>
<td>15. EIS Management processes</td>
<td>1.75</td>
<td>5.00</td>
<td>3.59</td>
<td>0.67</td>
</tr>
<tr>
<td>16. Organizational Environment</td>
<td>2.00</td>
<td>5.00</td>
<td>3.65</td>
<td>0.67</td>
</tr>
<tr>
<td>17. Frequency of EIS use</td>
<td>1.00</td>
<td>5.00</td>
<td>3.61</td>
<td>1.21</td>
</tr>
<tr>
<td>18. EIS Internalization</td>
<td>1.00</td>
<td>5.00</td>
<td>3.95</td>
<td>0.72</td>
</tr>
</tbody>
</table>
5.5.1 Analysis for the Research Hypotheses

Pearson's product-moment correlation matrix was used to analyze the degree of relationship or association among the variables. The correlation matrix provided an insight into the relationships among predictor (independent) variables as well as relationships between response (dependent) variables and the predictors. A high correlation between a predictor variable and a response variable suggested a strong association between the variables, and therefore the predictor variable was designated as a potentially good predictor of the response variable.

Table 5.3 presents Pearson's product-moment correlations among the variables together with their significance levels. Table 5.4.1 to Table 5.4.15 in Appendix E present the correlations matrix among the sub-variables (as defined in Chapter 4) for each of the variables in the research model that have sub-variables. The significance of each correlation was evaluated by a two-tailed test and listwise deletion option.

As shown in Table 5.3, correlations among the predictor variables (variables numbered 1 – 14) were overall statistically significant, with the correlations for any pair of the predictor variables not exceeding the multicollinearity criteria (0.9 and above) as suggested by Hair et al. (1995). The correlations among the predictor variables ranged from -0.022 to 0.759. Based on this result, it was concluded that there exists no multicollinearity among the predictor variables.
Similarly, Table 5.4.1 to Table 5.4.15 show that, overall, correlations among the predictor sub-variables were statistically significant. The correlations ranged from 0.189 in Table 5.4.14 to 0.863 in Table 5.4.5.
Table 5.3: Pearson’s Product-moment Correlations Among Variables in Research Model (n = 144)

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 EIS Experience</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Ability to use EIS</td>
<td>.212*</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Information satisfaction</td>
<td>.000</td>
<td>.164</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 EIS system satisfaction</td>
<td>.032</td>
<td>.230**</td>
<td>.759**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Support service satisfaction</td>
<td>-.022</td>
<td>-.014</td>
<td>.514**</td>
<td>.539**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Development plan satisfaction</td>
<td>.031</td>
<td>.036</td>
<td>.438**</td>
<td>.528**</td>
<td>.544**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Perceived usefulness of EIS</td>
<td>.197*</td>
<td>.307**</td>
<td>.177*</td>
<td>.211*</td>
<td>.203*</td>
<td>.280**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Subjective Norms</td>
<td>.103</td>
<td>.281**</td>
<td>.130</td>
<td>.092</td>
<td>.008</td>
<td>.228**</td>
<td>.337**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Subjective Roles</td>
<td>.090</td>
<td>.413**</td>
<td>.249**</td>
<td>.215*</td>
<td>.152</td>
<td>.187*</td>
<td>.389**</td>
<td>.663**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Subjective Values</td>
<td>.025</td>
<td>.245**</td>
<td>.506**</td>
<td>.431**</td>
<td>.332**</td>
<td>.448**</td>
<td>.385**</td>
<td>.415**</td>
<td>.418**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Social Situations</td>
<td>.002</td>
<td>.195*</td>
<td>.235**</td>
<td>.239**</td>
<td>.175*</td>
<td>.288**</td>
<td>.232**</td>
<td>.212*</td>
<td>.412**</td>
<td>.337**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Development Processes</td>
<td>.175*</td>
<td>.097</td>
<td>.326**</td>
<td>.239**</td>
<td>.251**</td>
<td>.342**</td>
<td>.309**</td>
<td>.230**</td>
<td>.295**</td>
<td>.251**</td>
<td>.447**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Management Processes</td>
<td>.105</td>
<td>.122</td>
<td>.405**</td>
<td>.255**</td>
<td>.227**</td>
<td>.276**</td>
<td>.329**</td>
<td>.361**</td>
<td>.416**</td>
<td>.333**</td>
<td>.573**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Organizational Environment</td>
<td>.052</td>
<td>.160</td>
<td>.328**</td>
<td>.314**</td>
<td>.255**</td>
<td>.398**</td>
<td>.496**</td>
<td>.457**</td>
<td>.528**</td>
<td>.572**</td>
<td>.449**</td>
<td>.384**</td>
<td>.510**</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Frequency of EIS use</td>
<td>.231**</td>
<td>.400**</td>
<td>.329**</td>
<td>.312**</td>
<td>.160</td>
<td>.208**</td>
<td>.259**</td>
<td>.373**</td>
<td>.413**</td>
<td>.283**</td>
<td>.179**</td>
<td>.249**</td>
<td>.285**</td>
<td>.281**</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>16 Internalization of EIS use</td>
<td>.119</td>
<td>.413**</td>
<td>.311**</td>
<td>.389**</td>
<td>.205*</td>
<td>.250**</td>
<td>.600**</td>
<td>.383**</td>
<td>.569**</td>
<td>.497**</td>
<td>.377**</td>
<td>.298**</td>
<td>.388**</td>
<td>.573**</td>
<td>.364**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Note: Significant at **p < 0.01, *p < 0.05 (Listwise, n = 138)

Values < 0.175 are not significant at the 5% level. p-values for selected other values of r are:

\[
r = .175 \quad .177 \quad .195 \quad .205 \quad .211 \quad .212 \quad .215 \quad .228 \quad .231 \quad .235 \quad .249 \quad .259 \quad .276 \quad .307 \\
p = .041 \quad .037 \quad .022 \quad .016 \quad .013 \quad .012 \quad .011 \quad .007 \quad .006 \quad .005 \quad .003 \quad .002 \quad .001 \quad .0001
\]

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5.5.2 Test Results for the Research Hypotheses

Tables 5.5 and 5.6 present extracts from the correlations matrix showing the results of testing the hypotheses associated with the research model (Figure 3.2). Table 5.7 presents a summary of the results of the hypotheses tested.

The majority of correlations were statistically significant. Thus, most variables considered in these analyses showed a significant positive pairwise association. No pairs of variables showed significant negative association. The highest correlations were those between:

1. Perceived usefulness of EIS use and internalization of EIS (H9b, \( r = 0.600 \));
2. Organizational environment and internalization of EIS use (H16b, \( r = 0.573 \));
3. Subjective roles and internalization of EIS use (H11b, \( r = 0.569 \));
4. Subjective values of EIS and internalization of EIS use, (H12b, \( r = 0.497 \));
5. Ability to use EIS and internalization of EIS use (H2b, \( r = 0.413 \));
6. Subjective roles and frequency of EIS use, (H11a, \( r = 0.413 \));
7. Ability to use EIS and frequency of EIS use (H2a, \( r = 0.400 \)).

The associations that were not significant were those correlations between:

1. EIS experience and internalization of EIS use (H1a, \( r = 0.119 \));
2. Satisfaction with EIS support and Frequency of EIS use (H7a, \( r = 160 \));
3. Satisfaction with EIS information and internalization of EIS (H4a, \( r = 0.164 \));
4. Satisfaction with EIS support and internalization of EIS (H4c, \( r = -0.014 \));
5. Satisfaction with EIS development and internalization of EIS (H4d, \( r = .036 \));
6. All the correlations between affect variables and EIS experience (H3a, \( r = 0.000 \); H3b, \( r = 0.032 \); H3c, \( r = -0.022 \); H3d, \( r = 0.031 \)).
### Table 5.5: Pearson’s Product-moment Correlations between Predictor variables and Response variables - *Frequency of EIS use and Internalization of EIS use* (n = 144)

<table>
<thead>
<tr>
<th>Predictor Variable (Hypothesized)</th>
<th>Frequency of EIS use</th>
<th>Internalization of EIS use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. EIS Experience (H1a, H1b)</td>
<td>.231** .006</td>
<td>.119 ns</td>
</tr>
<tr>
<td>2. Ability to use EIS (H2a, H2b)</td>
<td>.400** .000</td>
<td>.413** .000</td>
</tr>
<tr>
<td>3. Satisfaction with EIS Information (H5a, H5b)</td>
<td>.329** .000</td>
<td>.311** .000</td>
</tr>
<tr>
<td>4. Satisfaction with EIS system (H6a, H6b)</td>
<td>.312** .000</td>
<td>.389** .000</td>
</tr>
<tr>
<td>5. Satisfaction with EIS Support (H7a, H7b)</td>
<td>.160 ns</td>
<td>.205* .016</td>
</tr>
<tr>
<td>6. Satisfaction with EIS Development Plan (H8a, H8b)</td>
<td>.208* .014</td>
<td>.250** .003</td>
</tr>
<tr>
<td>7. Perceived Usefulness of EIS (H9a, H9b)</td>
<td>.259** .002</td>
<td>.600** .000</td>
</tr>
<tr>
<td>8. Subjective Norms in relation to EIS use (H10a, H10b)</td>
<td>.373** .000</td>
<td>.383** .000</td>
</tr>
<tr>
<td>9. Subjective Roles in relation to EIS use (H11a, H11b)</td>
<td>.413** .000</td>
<td>.569** .000</td>
</tr>
<tr>
<td>10. Subjective Values of EIS (H12a, H12b)</td>
<td>.283** .001</td>
<td>.497** .000</td>
</tr>
<tr>
<td>11. Social Situations in relation to EIS use (H13a, H13b)</td>
<td>.179* .036</td>
<td>.377** .000</td>
</tr>
<tr>
<td>12. EIS Development processes (H14a, H14b)</td>
<td>.249** .003</td>
<td>.298** .000</td>
</tr>
<tr>
<td>13. EIS Management processes (H15a, H15b)</td>
<td>.285** .001</td>
<td>.388** .000</td>
</tr>
<tr>
<td>14. Organizational environment (H16a, H16b)</td>
<td>.281** .001</td>
<td>.573** .000</td>
</tr>
</tbody>
</table>

Note: Significant at **p < 0.01, *p < 0.05 (Listwise, n = 138)

### Table 5.6: Pearson’s Product-moment Correlations between Predictor variables and Response variables - *EIS Experience and Ability to use EIS* (n = 144)

<table>
<thead>
<tr>
<th>Predictor Variable (Hypothesized)</th>
<th>EIS Experience</th>
<th>Ability to use EIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Satisfaction with EIS Information (H3a, H4a)</td>
<td>.000 ns</td>
<td>.164 ns</td>
</tr>
<tr>
<td>2. Satisfaction with EIS Features (H3b, H4b)</td>
<td>.032 ns</td>
<td>.230** .007</td>
</tr>
<tr>
<td>3. Satisfaction with EIS Support Services (H3c, H4c)</td>
<td>-.022 ns</td>
<td>-.014 ns</td>
</tr>
<tr>
<td>4. Satisfaction with Development plan (H3d, H4d)</td>
<td>.031 ns</td>
<td>.036 ns</td>
</tr>
</tbody>
</table>

Note: Significant at **p < 0.01, *p < 0.05 (Listwise, n = 138)
Table 5.7: Summary of Results of Tests for Research Hypotheses

<table>
<thead>
<tr>
<th>Research Hypotheses</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a: EIS experience correlates positively with frequency of EIS use.</td>
<td>Supported</td>
</tr>
<tr>
<td>H1b: EIS experience correlates positively with internalization of EIS use.</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H2a: Ability to use EIS correlates positively with frequency of EIS use.</td>
<td>Supported</td>
</tr>
<tr>
<td>H2b: Ability to use EIS correlates positively with internalization of EIS use.</td>
<td>Supported</td>
</tr>
<tr>
<td>H3a: The longer the experience with EIS, the higher the satisfaction with EIS</td>
<td>Not Supported</td>
</tr>
<tr>
<td>information attributes.</td>
<td></td>
</tr>
<tr>
<td>H3b: The longer the experience with EIS, the higher the satisfaction with EIS</td>
<td>Not Supported</td>
</tr>
<tr>
<td>features.</td>
<td></td>
</tr>
<tr>
<td>H3c: The longer the experience with EIS, the higher the satisfaction with EIS</td>
<td>Not Supported</td>
</tr>
<tr>
<td>support services.</td>
<td></td>
</tr>
<tr>
<td>H3d: The longer the experience with EIS, the higher the satisfaction with EIS</td>
<td>Not Supported</td>
</tr>
<tr>
<td>development plan.</td>
<td></td>
</tr>
<tr>
<td>H4a: The more the ability to use EIS, the higher the satisfaction with EIS</td>
<td>Not Supported</td>
</tr>
<tr>
<td>information attributes.</td>
<td></td>
</tr>
<tr>
<td>H4b: The more the ability to use EIS, the higher the satisfaction with EIS</td>
<td>Supported</td>
</tr>
<tr>
<td>features.</td>
<td></td>
</tr>
<tr>
<td>H4c: The more the ability to use EIS, the higher the satisfaction with EIS</td>
<td>Not Supported</td>
</tr>
<tr>
<td>support services.</td>
<td></td>
</tr>
<tr>
<td>H4d: The more the ability to use EIS, the higher the satisfaction with EIS</td>
<td>Not Supported</td>
</tr>
<tr>
<td>development plan.</td>
<td></td>
</tr>
<tr>
<td>H5a: Satisfaction with EIS information attributes correlates positively with</td>
<td>Supported</td>
</tr>
<tr>
<td>frequency of EIS use.</td>
<td></td>
</tr>
<tr>
<td>H5b: Satisfaction with EIS information attributes correlates positively with</td>
<td>Supported</td>
</tr>
<tr>
<td>internalization of EIS use.</td>
<td></td>
</tr>
<tr>
<td>H6a: Satisfaction with EIS system features correlates positively with frequency</td>
<td>Supported</td>
</tr>
<tr>
<td>of EIS use.</td>
<td></td>
</tr>
<tr>
<td>H6b: Satisfaction with EIS features correlates positively with internalization of</td>
<td>Supported</td>
</tr>
<tr>
<td>EIS use.</td>
<td></td>
</tr>
<tr>
<td>H7a:</td>
<td>Satisfaction with EIS support services correlates positively with frequency of EIS use.</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>H7b:</td>
<td>Satisfaction with EIS support correlates positively with internalization of EIS use.</td>
</tr>
<tr>
<td>H8a:</td>
<td>Satisfaction with EIS development plan correlates positively with frequency of EIS use.</td>
</tr>
<tr>
<td>H8b:</td>
<td>Satisfaction with EIS development plan correlates positively with internalization of EIS use.</td>
</tr>
<tr>
<td>H9a:</td>
<td>Perceived usefulness positively correlates with frequency of EIS use.</td>
</tr>
<tr>
<td>H9b:</td>
<td>Perceived usefulness positively correlates with internalization of EIS use.</td>
</tr>
<tr>
<td>H10a:</td>
<td>Subjective norms correlate positively with frequency of EIS use.</td>
</tr>
<tr>
<td>H10b:</td>
<td>Subjective norms correlate positively with internalization of EIS use.</td>
</tr>
<tr>
<td>H11a:</td>
<td>Subjective roles correlate positively with frequency of EIS use.</td>
</tr>
<tr>
<td>H11b:</td>
<td>Subjective roles correlate positively with internalization of EIS use.</td>
</tr>
<tr>
<td>H12a:</td>
<td>Subjective values correlate positively with frequency of EIS use.</td>
</tr>
<tr>
<td>H12b:</td>
<td>Subjective values correlate positively with internalization of EIS use.</td>
</tr>
<tr>
<td>H13a:</td>
<td>Social situations correlate positively with frequency of EIS use.</td>
</tr>
<tr>
<td>H13b:</td>
<td>Social situations correlate positively with internalization of EIS use.</td>
</tr>
<tr>
<td>H14a:</td>
<td>EIS development processes correlate positively with frequency of EIS use.</td>
</tr>
<tr>
<td>H14b:</td>
<td>EIS development processes correlate positively with internalization of EIS use.</td>
</tr>
<tr>
<td>H15a:</td>
<td>EIS management processes correlate positively with frequency of EIS use.</td>
</tr>
<tr>
<td>H15b:</td>
<td>EIS management processes correlate positively with internalization of EIS use.</td>
</tr>
<tr>
<td>H16a:</td>
<td>Organizational environment correlate positively with frequency of EIS use.</td>
</tr>
<tr>
<td>H16b:</td>
<td>Organizational environment correlate positively with internalization of EIS use.</td>
</tr>
</tbody>
</table>
5.5.3 Multiple Regression Analysis to Identify Important Variables

The bivariate analysis presented above established support or otherwise for the hypotheses tested in this study. In order to identify the variables that were most important in explaining EIS user behavior, Multiple Regression analysis was performed.

Multiple Regression analysis extends the ideas from bivariate regression by allowing a researcher to include several explanatory factors in the model. As in simple regression, a regression coefficient measures the impact of changes in each explanatory variable on the response variable. Multiple Regression techniques fit the variables to a linear equation of the form:

\[ y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n + \epsilon, \]

where,

- \( y \) is the response variable;
- \( x_1, x_2, \ldots, x_n \) are the predictor variables;
- \( \beta_0, \beta_1, \beta_2, \ldots, \beta_n \) are the coefficients;
- and \( \epsilon \) is the error or residual (noise) which is assumed to be random and normally distributed, with equal variances at each \( x \) point.

In the analyses for this study, \( y \) represented either \textit{Frequency of EIS use} or \textit{Internalization of EIS use} in the respective equations, and the \( x \)s were the predictor variables or sub-variables, as defined in Chapter 4.
5.5.3.1 Selecting the Right Multiple Regression Technique

The research question which the Multiple Regression technique sought to address is: **What is the relative importance of social, cultural, political and organizational factors in determining executive information systems use by executives in organizational settings?**

Stepwise regression was used as a means of developing simple regression models by allowing addition and removal of variables at various steps in progressively building the regression model.

The criteria for adding and removing variables are based on the $F$-statistic routinely used in ANOVA. Significance levels for addition and deletion of variables can be set by the user. Stepwise regression screens all variables included in the analysis but does not choose those variables which have no significant predictive value given the other variables already selected.

For the analysis in this study, a variable was not entered into the regression model unless the $p$-value for that variable was less than or equal to 0.05. The same level was set for removal of variables.
5.5.3.2 Selecting the Best Models

In order to select the best stepwise regression model for each of the two response variables (*Frequency of EIS use* and *Internalization of EIS use*) in order to address the research question, analyses were performed separately for:

1. the predictor variables as in the research model, and
2. the predictor sub-variables as in the research questionnaire.

In progressively building the stepwise regression models for each of the two response variables, no variable was eliminated after it entered a model. The results of each analysis were checked to ensure there were no violations of the assumptions of normality, linearity and homoscedasticity. More details on the checking of the assumptions are presented in Appendix F.

The best models selected for each of the two response variables were the models using the predictor sub-variables with the listwise deletion option. The best model for *Frequency of EIS use* is presented in Table 5.8 and the best model for *Internalization of EIS use* is presented in Table 5.9.
5.5.3.3 Results of the Stepwise Regression Analysis

The results of the stepwise regression analysis are shown in Tables 5.8 and 5.9 for Frequency of EIS use and Internalization of EIS use respectively.

Table 5.8 shows that about 45 percent of the variance in Frequency of EIS use was explained by seven (7) variables: - Ability to use EIS, EIS experience, CBIS experience (Habits), Subjective norms relating to the IS director, Position of user in the organization (Social Factors), EIS system reliability (Affect), and Interaction among business units (Facilitating Conditions).

Overall, the results tended to indicate that Habits were most important in explaining Frequency of EIS use with EIS experience, CBIS experience and Ability to use EIS variables contributing to this explanation. This was followed by the contributions of the variables from the Social Factors, Facilitating Conditions and Affect constructs which also entered the equation.

CBIS experience and Position were not included in the research model but were included in the survey questionnaire. CBIS experience was included to obtain information about participants’ CBIS experience prior to using EIS, while position was included as part of collecting demographic information about participants. As the results of the regression analysis shows, these variables however entered the regression model in explaining Frequency of EIS use.
Table 5.9 shows that about 64 percent of the variance in Internalization of EIS use was explained by five (5) variables – Pace of change of business environment (Facilitating Conditions), Perceived usefulness (Consequences), Ability to use EIS (Habits), Subjective productive values of EIS and Subjective norms relating to colleagues (Social Factor).

Overall, the results tended to indicate that Facilitating Conditions were most important in explaining Internalization of EIS use with the Pace of change of business environment variable uniquely contributing to this explanation. This was followed by the unique contributions of the variables from the Social Factors, Consequences and Habits constructs which also entered the equation.

In summary, the results tended to indicate that Internalization of EIS use is a more appropriate measure of user behavior than Frequency of EIS use. However, the contributions of both variables in explaining user behavior towards EIS use are quite significant and worth taking into consideration in deciding on the development, implementation and use of EIS in organizations.
Table 5.8: Stepwise Regression Analysis – *Frequency of EIS use*

\[ R^2 = 0.447 \]
\[ F = 14.649 : \text{Sig.} \ F = 0.000 \]

<table>
<thead>
<tr>
<th>Variables Entered (in order)</th>
<th>From Construct</th>
<th>Estimated Coeff. (Beta)</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ability to use EIS</td>
<td>Habits</td>
<td>.244</td>
<td>3.396</td>
<td>.001</td>
</tr>
<tr>
<td>2. Because of my role, IS director thinks I should use EIS</td>
<td>Social Factors – Subjective norms</td>
<td>.215</td>
<td>3.039</td>
<td>.003</td>
</tr>
<tr>
<td>3. EIS system always reliable</td>
<td>Affect – EIS features</td>
<td>.229</td>
<td>3.334</td>
<td>.001</td>
</tr>
<tr>
<td>4. Interaction among business units encourages EIS use</td>
<td>Facilitating conditions</td>
<td>.264</td>
<td>3.676</td>
<td>.000</td>
</tr>
<tr>
<td>5. Position</td>
<td>Social Factor – Subjective roles</td>
<td>-.166</td>
<td>-2.284</td>
<td>.024</td>
</tr>
<tr>
<td>6. EIS Experience</td>
<td>Habits</td>
<td>.379</td>
<td>4.180</td>
<td>.000</td>
</tr>
<tr>
<td>7. CBIS Experience</td>
<td>Habits</td>
<td>-.301</td>
<td>-3.276</td>
<td>.001</td>
</tr>
</tbody>
</table>

Table 5.9: Stepwise Regression Analysis – *Internalization of EIS use*

\[ R^2 = 0.642 \]
\[ F = 38.317 : \text{Sig.} \ F = 0.000 \]

<table>
<thead>
<tr>
<th>Variables Entered (in order)</th>
<th>From Construct</th>
<th>Estimated Coeff. (Beta)</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pace of change of business environment encourages EIS use</td>
<td>Facilitating conditions</td>
<td>.362</td>
<td>5.633</td>
<td>.000</td>
</tr>
<tr>
<td>2. Perceived usefulness of EIS</td>
<td>Consequences</td>
<td>.264</td>
<td>4.096</td>
<td>.000</td>
</tr>
<tr>
<td>3. Ability to use EIS</td>
<td>Habits</td>
<td>.214</td>
<td>3.599</td>
<td>.000</td>
</tr>
<tr>
<td>4. Productive value of EIS</td>
<td>Social Factor – Subjective values</td>
<td>.161</td>
<td>2.638</td>
<td>.009</td>
</tr>
<tr>
<td>5. Because of my role, Colleagues think I should use</td>
<td>Social Factor – Subjective norms</td>
<td>.152</td>
<td>2.359</td>
<td>.020</td>
</tr>
</tbody>
</table>
5.6 Conclusion

This chapter presented the data analysis and the results. The results of the bivariate analysis indicated that 27 of the 36 hypothesized relationships were supported. Eight of the 9 hypotheses that were not supported were from the relationships between habits and affect variables with the remaining unsupported one being the relationship between EIS experience and internalization of EIS use.

The results of the multiple regression analysis indicated that Internalization of EIS use was a more appropriate measure of user behavior than Frequency of EIS use. About 64 percent of the variance in Internalization of EIS use was explained by the variables: Pace of change of business environment; perceived usefulness of EIS; Ability to use EIS; Subjective productive values of EIS and Subjective norms relating to colleagues. Overall, the results tended to indicate that Facilitating Conditions were most important in explaining Internalization of EIS use with Pace of change of business environment variable uniquely contributing to this explanation.

About 45 percent of the variance in Frequency of EIS use is explained by the variables: Ability to use EIS; Subjective norms relating to the IS director; EIS system reliability; Interaction among business units; Position of user in the organization; EIS experience and CBIS experience. Overall, the results tended to indicate that Habits were most important in explaining Frequency of EIS use.
with *EIS experience*, *CBIS experience* and *Ability to use EIS* variables uniquely contributing to this explanation.

It was observed that *Position* and *CBIS experience* which were not included in the research model but only in the survey questionnaire entered the regression model in explaining *Frequency of EIS use*.

The final chapter, Chapter 6, presents the conclusions and implications of this research study. The limitations of the study and future directions for research in this field are also presented.
CHAPTER 6 DISCUSSIONS AND CONCLUSIONS

6.1 Overview of the Study

This research study was motivated by reports of executive information systems (EIS) failures in organizations. The study began on the premise that underutilization or non-usage of EIS contributes to the failure of these systems. A further premise was that system usage is a behavior and therefore appropriate reference theories should be used to study system usage.

The research problem that the study therefore sought to solve was the failure of executive information systems in organizations due to the underutilization or non-usage of these systems, and the two main research questions addressed in the study were:

1. What are the important social, cultural, political and organizational factors that explain the behavior of executives in using executive information systems in organizational settings?

2. What is the relative importance of these factors in determining executive information systems use by executives in organizational settings?

The study was therefore undertaken with the primary aim of identifying, examining and providing an understanding of the social, cultural, political and organizational factors that explain the behavior of executives in using EIS in order to provide solutions to the problem of underutilization or non-usage of EIS in organizations. Triandis’ Framework, a model from social psychology and
organizational behavior, was used as a theoretical foundation to address the issues in the research study.

The main objectives of the study were to use the results to assist EIS designers / developers, implementers and managers of organizations to improve EIS usage in organizations. Details of these main objectives include:

- Improving the design, development, implementation and management of EIS;
- Better education and training of EIS users;
- Improving EIS usage leading to the success of EIS in organizations;
- Better allocation of scarce resources for EIS;
- Further research into EIS usage factors;
- Further research into usage factors for other information systems; and
- Further research into usage factors for information technology.

Chapter 1 of this thesis introduced the background to the research study, the research problem, the research questions, the conceptual framework upon which the research study was built, the significance of the study, the delimitations of scope and key assumptions of the study, and the organization of the thesis.

Chapter 2 presented the review of the relevant EIS literature and critically examined the research focus on EIS usage and presented six classifications of EIS usage by research focus. A historical review of the evolution of EIS and the popularity of EIS were also presented in Chapter 2. Various definitions of EIS
were presented to highlight the complex nature of these systems, and the simple
definition to be used in this study was presented. The benefits and characteristics
of EIS, some models of EIS, and the future trends in EIS were also examined and
presented. The nature of executives' work and how EIS fit into their work were
evaluated. Based on the literature review, the research problem and research
questions for the study as restated above were presented.

Conclusions drawn from the literature review were that:

- *Technologies* in the form of hardware and software were available to meet
  the requirements of developing and maintaining a successful EIS;

- There is justification in the literature that *system usage is a behavior*;

- There were more EIS research studies focusing on *technology-related factors*
  of these systems than on *user-related factors*; and

- Of the six research focus areas on EIS usage, only one area (factors that
  influence/explain system usage) focused on *actual engagement* of these
  systems. Also for most of the studies in this area of actual engagement did
  not use *appropriate reference theories* to address system usage as a *behavior*.

Chapter 3 presented some theoretical perspectives from which information
systems usages were studied and argued that *system usage is a behavior* and
should be studied using *appropriate reference theories*. Triandis' Theoretical
Framework which we considered to be an appropriate reference theory for the
study was described. Based on the theoretical framework and the relevant
literature, we derived and presented the research model and the hypotheses to be tested in the study. We also detailed factors that we considered influence/explain behavior in using EIS which we identified in the research model in Figure 3.2. Finally, we presented EIS research studies based on Triandis’ Framework and their advocacy for the use of this framework as a theoretical foundation for IS usage research.

In concluding Chapter 3, a summary of the key constructs and the strengths of Triandis’ Theoretical Framework, which were relevant to our study, were presented as follows:

• *Habits, social factors, affect, consequences, and facilitating conditions,* which do influence/explain the behavior of the individual in using an information system, are exemplified in the theoretical framework;

• The development of *personality* through the network of *habits, social factors, subjective culture, affect, consequences,* and *intentions* to behave is exemplified by the theoretical framework;

• *Social, cultural, political and organizational factors* which do influence and/or explain the user’s behavior in using an EIS, are all addressed by the theoretical framework;

• Adequate steps and suggestions for the operationalization of the variables involved are provided and details on this point were presented in Chapter 4.
It was noted in Chapter 3 that, without doubt, Triandis' Theoretical Framework has its weaknesses, one of which is its complexity, and as a result we advised researchers of the need to identify and adapt an appropriate subset of the whole framework that would suit their research needs.

Chapter 4 described the research design and the methodology used to collect data to test the hypotheses and the research model. The research design and methodology were based on previous studies. The nature of the research, the unit of analysis, the dimension, the research methodology, and the data collection attributes and characteristics employed in this study were also presented in this chapter. The data collection method was elaborated and justified.

In Chapter 4 the conceptualization and operationalization of the constructs and variables based on the theoretical framework and the research model were presented. Reliability and validity, which were taken into account in the conceptualization and operationalization, were described. The questionnaire design, based on procedures and guidelines from previous studies, was presented. The pilot survey, the main survey, and the administration of the main survey were discussed. We drew a conclusion in Chapter 4 that the timing of the administration of a survey is essential to ensure a good response rate.

In Chapter 5 we presented the data analysis and the results of this study. The results of the bivariate analysis indicated that 27 of the 36 hypothesized relationships were supported. Eight of the 9 hypotheses that were not supported
concerned the relationships between Habits and Affect variables. The remaining unsupported hypothesis concerned the relationship between EIS experience and Internalization of EIS use.

The multiple regression (stepwise) analysis results indicated that Internalization of EIS use was a more appropriate measure of user behavior than Frequency of EIS use. About 64 percent of the variance in Internalization of EIS use was explained by the variables: pace of change of business environment; perceived usefulness of EIS; ability to use EIS; subjective productive values of EIS; and subjective norms relating to colleagues. Overall, the results tended to indicate that Facilitating Conditions were most important in explaining Internalization of EIS use with pace of change of business environment contributing to this explanation.

About 45 percent of the variance in Frequency of EIS use was explained by the variables: ability to use EIS; subjective norms relating to the IS director; EIS system reliability; Interaction among business units; position of user in the organization; EIS experience and CBIS experience. Overall, the results tended to indicate that Habits were most important in explaining Frequency of EIS use with EIS experience, CBIS experience and ability to use EIS variables contributing to this explanation.

In this chapter, which is the final chapter of this thesis, discussion of the findings, implications and conclusions related to the research hypotheses are presented.
This is followed by a discussion of the findings, conclusions and implications related to the research questions. Next are conclusions related to the research problem. We then present updated versions of the original research model based on the results of the study and their implications for EIS and IS/technology usage research. We conclude this chapter with the contributions of this study, the implications for theory and future research, and the limitations of the study.

The next section presents the findings, implications and conclusions related to the hypotheses.
6.2 Findings, Implications and Conclusions related to the Hypotheses

The hypotheses of this study were postulated as a part of the task of providing solutions to the research questions and the research problem for the study. These hypotheses were embedded in the research model in Figure 3.2. The analysis and test results for the hypotheses were presented in Chapter 5 sections 5.5.1 and 5.5.2 respectively.

This section interprets the hypotheses, discusses the findings from test results for each of the hypotheses tested and the implications of the findings for EIS designers/developers, EIS implementers and managers of organizations. The section ends with an overall conclusion for the hypotheses tested in the study.

6.2.1 Findings and Implications related to the Hypotheses

Hypotheses 1a, 1b, 2a and 2b: Habits and Behavior

Hypotheses 1a, 1b and 2a, 2b tested user Habits and their relationships with user Behavior in using EIS.

Hypotheses 1a and 1b

Interpretations

H1a and H1b collectively posited that an executive’s number of years of experience with EIS would lead to a positive Behavior in using EIS. H1a posited that the more years of experience an executive had with EIS the more Frequently
the executive would use an EIS, and H1b postulated that the more years of experience an executive had with EIS the more the executive would Internalize EIS use.

Because the research model assumed the effect of EIS experience on usage to be both direct and indirect, that is, through Affect in the latter case, partial correlation coefficients were also calculated. While controlling for all four Affect variables (satisfaction with EIS information, satisfaction with EIS features, satisfaction with EIS support and satisfaction with EIS plan) the correlation between EIS experience and Frequency of EIS use is significant \((r = 0.235; p = 0.006)\) and the correlation between EIS experience and Internalization of EIS use is non-significant \((r = 0.104; p = 0.225)\).

The results for both the direct and indirect effect of EIS experience on EIS usage in the study indicated that H1a was supported while H1b was not supported.

*Discussions of Findings about H1a*

The support of H1a compares favorably with previous IS studies (Fazio and Zanna, 1981; Rivard and Huff, 1988; Yaverbaum, 1988; Davis et al., 1989; Levin and Gordon (1989); Kim, 1996; Jackson et al., 1997; Al-Gahtani and King, 1999; Elkordy, 2000; Elkordy & Khalil, 2002) and suggest the more experience with EIS an executive has the more Frequently the executive will use an EIS.
The result for H1a however is inconsistent with a similar study by Bergeron et al. (1995). The reason for this inconsistency may be due to any of the following three reasons: (1) The different environment in which the two studies were conducted. This study was conducted across Australia while that of Bergeron et al. (1995) was conducted in the province of Quebec in Canada; (2) The difference between the sample sizes involved in the analyses of the two studies is significant. The sample size in this study is 145 from 255 organizations across Australia while that for Bergeron et al. (1995) is 33 from 9 enterprises located in the Quebec province in Canada; (3) This result may suggest a shift in user behavior from 1995, when Bergeron et al. conducted their study, to 2002 when this study was conducted. This shift in behavior may be due to advances in technology and the popularity and spread of EIS to other levels in organizations. This may also suggest that more and more executives are now using EIS and getting more EIS experience (Habits) which results into automatic Frequency of using EIS (Behavior) (Triandis, 1980).

**Implications of H1a**

The implications of this finding are that, organizations need to aim at giving EIS users more experience needed, for example, through education and training.

**Discussions of Findings about H1b**

The non-support of H1b in the study was surprising and also did not compare favorably with a similar study by Bergeron et al. (1995). This study suggests that
EIS experience (Habits) leads positively to Frequency of EIS use (Behavior). One would expect that the more frequently users use EIS the more positively intensified their behavior would become towards EIS as a result of: their level of dependence upon these systems; the extent of system ownership felt by them; and the routinalization of EIS usage (Trice and Treacy, 1988). However, our study results tend to suggest that EIS users felt EIS did not help them to: accomplish their usual tasks; identify trends and obtain critical information; make strategic decisions; and that not using EIS would not disadvantage them in their work.

Implications of H1b

The implications of these findings are that EIS designers/developers need to address the issue of tailoring these systems to meet the managerial needs of users. The findings may also suggest that with advances in technology, the expectation of EIS users has risen to a higher level than these systems actually deliver. The implications are that, if EIS are not designed, developed and implemented to close the expectation gap quickly, then the positive frequency of use aspect of behavior, as supported by H1a, may deteriorate.

It may be necessary for EIS designers/developers to draw on service quality models from marketing (e.g., the SERQUAL model of Parasuraman et al. (1985) and Zeithaml et al. (1988, 1993)) to narrow expectation gaps. This model was used by Pitt et al. (1995) in their study designed to measure the effectiveness of information systems. It may also be necessary for EIS designers/developers to
ensure that EIS are aligned with the strategic processes of organizations (Chan et al., 1997; Palmer and Markus, 2000; Potter, 2001; Ditsa, 2001; Ditsa and MacGregor, 2001; Singh et al., 2002; Boahene and Ditsa, 2003).

Hypotheses 2a and 2b

Interpretations

H2a and H2b collectively posited that an executive’s ability to use EIS would lead to a positive Behavior in using these systems. H2a postulated that the greater an executive’s ability to use EIS the more Frequently the executive would use these systems. H2b posited that the greater an executive’s ability to use EIS the more the executive would Internalize EIS use.

As the research model assumed the effect of ability to use EIS on usage to be both direct and indirect, that is, through Affect in the latter case, partial correlation coefficients were also calculated. Controlling for all four Affect variables (satisfaction with EIS information, satisfaction with EIS features, satisfaction with EIS support and satisfaction with EIS plan) the correlation between ability to use EIS and Frequency of EIS use is significant \( r = 0.360; \ p = 0.000 \) and the correlation between ability to use EIS and Internalization of EIS use is significant \( r = 0.353; \ p = 0.000 \).
Discussions of Findings and Implications of H2a and H2b

The results for both the direct and indirect effect of ability to use EIS on EIS usage supported H2a and H2b in this study. These results compare favorably with similar previous studies on EIS usage (Kim, 1996; Elkordy, 2000; Elkordy and Khalil, 2002). The results suggest that an increase in an executive’s ability to use EIS leads to a positive Behavior to use these systems.

The implications of these results are that organizations need to aim at giving users the capabilities needed to use these systems, for example, through education and training on the systems.

Hypotheses 3, 4, 5, 6, 7 and 8: Habits, Affect and Behavior

Hypotheses 3a, 3b, 3c, 3d, 4a, 4b, 4c and 4d tested user Habits and their relationships with Affect, while H5a, H5b, H6a, H6b, H7a, H7b, H8a, and H8b tested the relationships between Affect and Behavior to find the mediating effect of Affect on using EIS.

Hypotheses 3 and 4: Habits and Affect

Interpretations of H3 and H4

Hypotheses 3a, 3b, 3c, and 3d postulated that the more EIS experience an executive has, the more satisfied the executive will be with information from an EIS, the EIS features, the EIS support and the EIS plan respectively.
Hypotheses 4a, 4b, 4c, and 4d posited that the greater an executive’s ability to use EIS the more satisfied the executive will be with information from an EIS, the EIS features, the EIS support and the EIS plan respectively.

Discussions of Findings about H3

The results of the study did not support any of the four hypothesized relationships between EIS experience and Affect. The result for H3a compared favorably with that of Bergeron et al. (1995) in a similar study. Bergeron et al. (1995) however found a negative relationship between EIS experience and EIS support (H3c) which they indicated “may appear counter-intuitive”.

The results for H3a, H3b, H3c and H3d also compared favorably with those of H1a and H1b above where the results of both the direct and indirect effect of EIS experience on EIS usage were the same. These results may suggest Affect has no mediating effect on executives’ EIS experience and EIS usage.

Discussions of Findings about H4

Apart from the significant relationship between ability to use EIS and satisfaction with EIS features, the results overall did not support the hypothesized relationships between ability to use EIS and Affect. These results compare favorably with those of H2a and H2b above where the results of both the direct and indirect effect of ability to use EIS on EIS usage were the same. These
results may suggest Affect has no mediating effect on executives’ ability to use EIS and EIS usage.

Overall, the results suggest there is no significant relationship between Habits and Affect. The implications of the findings for H3 and H4 are discussed at the end of the next sub-section.

Hypotheses 5, 6, 7 and 8: Affect and Behavior

Interpretations and Discussions of Findings about H5, H6, H7 and H8

Hypotheses 5a, 5b, 6a, 6b, 7a, 7b, 8a and 8b posited that executives’ satisfaction with information from EIS, EIS features, EIS support and the EIS plan would positively impact on an executives’ Frequency of using EIS and their Internalization of using EIS respectively.

H5a, H5b, H6a, H6b, H7a, H8a and H8b were supported in the study. H7b, the hypothesized relationship between satisfaction with EIS support and Internalization of EIS use, was not supported. The results overall compare favorably with previous IS research (Amoako-Gyampah and White, 1993; Thompson et al. 1994; Bergeron et al.; 1995; Elkordy, 2000; Elkordy and Khalil, 2002) and suggest there is a positive relationship between Affect and Behavior.
Implications of $H3$, $H4$, $H5$, $H6$, $H7$ and $H8$

The findings for the relationships between Habits and Affect, and that of Affect and Behavior suggest that while Affect has no mediating effect on EIS usage, it has direct effect on EIS usage. The implications of these findings are that while habitually Affect may not have any effect on EIS usage in short term, in the long term it may have effect on system usage. Therefore EIS designers/developers need to aim at getting the Affect for EIS right at the beginning or as soon as possible in order to avoid the non-usage of these systems in the long run.

Hypotheses 9a and 9b: Consequences and Behavior

Interpretations and Discussions of Findings about $H9$

H9a and H9b tested the impact of an executive’s perceived usefulness of EIS on the executive’s Behavior to use EIS. H9a postulated that the more an executive perceived the usefulness of an EIS the more Frequently the executive would use these systems, and for H9b, the more an executive perceived an EIS to be useful the more the executive would Internalize the use of these systems.

The test results in the study supported both hypotheses. The results compare favorably with those from previous IS studies (Davis, 1989, 1993; Davis et al., 1989, 1992; Thompson et al., 1991, 1994, Taylor and Todd, 1995; Venkatesh and Davis, 1996; Venkatesh, 1999; Venkatesh and Morris, 2000; Elkordy, 2000; Elkordy and Khalil, 2002).
These results were expected and suggest that EIS users expect these systems to: increase their organization’s performance; provide their organizations with a competitive advantage; provide greater level of control over their managerial activities; provide information that will allow problems to be detected; improve the quality of decision-making in their organizations; and increase the speed of decision-making in their organizations.

Implications of H9

The findings implied that EIS usage might decrease if these user expectations are not met. EIS designers/developers therefore need to aim at meeting these expectations. As mentioned previously, drawing on service quality models from marketing may be necessary to narrow the expectation gaps. It may also be necessary to ensure that these systems are in alignment with the strategic objectives of the organizations.

Hypotheses 10, 11, 12 and 13: Social Factors and Behavior

Interpretations and Discussions of Findings about H10, H11, H12 and H13

Hypotheses 10a, 10b, 11a, 11b, 12a, 12b, 13a and 13b collectively contended that Social Factors in the workplace will positively impact on an executive’s Behavior to use EIS. Some of the Social Factors in this study are cultural and political.
H10a postulated that *subjective norms* in the workplace will positively impact on an executive to *Frequently use EIS*, and H10b posited that *subjective norms* in the workplace will positively impact on an executive to *Internalize EIS use*. H11a posited that *subjective roles* in the workplace will positively impact on an executive to *Frequently use EIS*, and H11b posited that *subjective roles* in the workplace will positively impact on an executive to *Internalize EIS use*.

H12a posited that *subjective values* associated with EIS will positively impact on an executive to *Frequently use EIS*, and H12b posited that *subjective values* associated with EIS will positively impact on an executive to *Internalize EIS use*. Finally, H13a postulated that *social situations* in the workplace will positively impact on an executive to *Frequently use EIS*, and H13b posited that *social situations* in the workplace will positively impact on an executive to *Internalize EIS use*.

The results in the study supported all of these eight hypotheses. The results compare favorably with previous IS studies (Thompson et al., 1991, 1994; Taylor and Todd, 1995; Venkatesh and Davis, 1996; Venkatesh, 1999; Venkatesh & Morris, 2000; Elkordy, 2000; Elkordy and Khalil, 2002) and suggest **Social Factors** in the workplace positively impact on the **Behavior** of executives to use EIS.
Implications of H10, H11, H12 and H13

These findings have implications for EIS designers/developers, EIS implementers, and managers of organizations. EIS designers/developers need to ensure that user perceived values of EIS, such as the productive, efficient and effective values of EIS are incorporated into the design, and the development of these systems through user involvement and participation. Other reasons for user involvement and participation are to facilitate implementation and to ensure follow-ups, overcome resistance, ensure acceptance, avoid conflicts and ensure continuous resources/support (Nandhakumar and Jones, 1997). Top management involvement and participation will also be necessary in order for designers/developers to see the big picture envisaged by managers for these systems.

EIS implementers should understand the social working relationships between users and others in the organization as these relationships may influence/explain their subjective norms, subjective roles and subjective values. With these understandings, EIS implementers will be able to ensure that these systems will be accepted and used. Top management involvement and participation may also assist in identifying these social working relationships. In addition, the formation of user groups in the functional areas and the identification of powerful users may also be helpful.
Finally, managers of organizations need to be proactively involved and participate in designing, developing, implementing and managing EIS in order to ensure positive user behavior towards using these systems, which will eventually lead to the success of the systems in their organizations.

**Hypotheses 14, 15 and 16: Facilitating Conditions and Behavior**

*Interpretations and Discussions of Findings about H14, H15, and H16*

Hypotheses 14a, 14b, 15a, 15b, 16a and 16b collectively postulated that **Facilitating Conditions** in the workplace will positively impact on an executive's **Behavior** to use EIS.

H14a posited that *EIS development processes* will positively impact on an executive to **Frequently use EIS**, and H14b posited that *EIS development processes* will positively impact on an executive to **Internalize EIS use**. H15a posited that *EIS management processes* will positively impact on an executive to **Frequently use EIS**, and H15b contended that *EIS management processes* will positively impact on an executive to **Internalize EIS use**. H16a postulated that the *organizational environment* will positively impact on an executive to **Frequently use EIS**, while H16b posited that the *organizational environment* will positively impact on an executive to **Internalize EIS use**.

The test results in the study supported all the six hypotheses. The results compare favorably with previous IS studies (Volonino et al., 1995; McBride,
and suggest **Facilitating Conditions** in the workplace positively impact on the **Behavior** of executives to use EIS.

These results were expected and suggest that aspects of an organization such as culture, pace of changing business environment, interactions among business units, power and politics, and the commitment of the organization to EIS will encourage EIS users to use these systems. Aspects of the EIS development processes such as executive sponsorship of EIS, user involvement and participation, availability of technical support and other resources, the use of an EIS development plan, and follow-ups made after EIS implementation will encourage EIS users to use these systems. As well, aspects of EIS management processes such as EIS management policies rules, data management, availability of support, and the availability and accessibility of these systems will encourage the users to use the systems.

**Implications of H14, H15, and H16**

These findings have implications for EIS designers / developers, EIS implementers, and managers of organizations. EIS designers/developers need to ensure user involvement and participation in the development processes. They also need to ensure an organization’s commitment and executive sponsorship. EIS designers/developers need to understand the culture of the organizations, the
changing pace of the business environment, the interactions among business units and the power and politics within the organizations.

Political resistance to EIS, for example, is one of the most common causes of development failures. Because an EIS can alter the information flow in an organization and shift the power relationships within a company, there may be resistance to the introduction and operation of the systems. Anticipating and managing the political ramifications of an EIS will remain a potential problem throughout the life of the systems, however, overcoming the political resistance is critical not only to the successful EIS development, but also to the EIS utilization after deployment.

EIS implementers need to ensure that: they use development plans which are futuristic and available to users; there are adequate data management processes in place; the systems are available and accessible most of the time; adequate technical support and other resources are available to guarantee the ongoing use of these systems. EIS implementers also need to understand the culture of the organizations, the changing pace of the business environment, the interactions among business units and the power and politics within the organizations. They need to ensure user involvement and participation, and the organization’s commitment and executive sponsorship in the implementation processes. EIS implementers need to ensure that follow-ups are made after the implementation of these systems.
Finally, managers of organizations need to be proactively involved and participate in the designing, development, implementation and management of these systems in their organizations by providing the needed human and material resources which EIS designers/developers and implementers need in order to ensure positive user behavior towards using these systems.

6.2.2 Conclusions related to the Research Hypotheses

In summary, the results and the findings concerning the research hypotheses indicate that overall all the hypotheses were supported except the hypothesized relationships between Habits and Affect. The findings and their implications for EIS designers/developers, EIS implementers and managers of organizations to improve EIS usage have been presented in this section.

The results and findings also have implications for EIS researchers in particular and IS researchers in general. EIS researchers can apply the research model used for this study by modifying constructs and variables in order to study other relationships that may impact on behavior to use EIS and other information systems.

The next section presents the findings, conclusions and implications about the research questions.
6.3 Findings, Conclusions and Implications related to the Research Questions

The analyses and results addressing the research questions were presented in Chapter 5 section 5.5.3. This section presents the findings and conclusions from the test results and their implications for EIS designers/developers, EIS implementers and managers of organizations to improve EIS usage in organizations.

6.3.1 Findings related to the Research Questions

Stepwise regression analyses were performed on the data collected for the study in order to provide answers to the research questions. The best stepwise regression models selected to address the research questions were presented in Table 5.8 and Table 5.9 in Chapter 5 for Frequency of EIS use and Internalization of EIS use respectively.

The results of the multiple regression analysis indicate that Internalization of EIS use is a more appropriate measure of user Behavior than Frequency of EIS use. About 64 percent of the variance in Internalization of EIS use is explained by the variables: pace of change of business environment; perceived usefulness of EIS; ability to use EIS; subjective productive values of EIS and subjective norms relating to colleagues. Overall, the results indicate that Facilitating Conditions are the most important in explaining Internalization of EIS use with pace of change of business environment contributing to this explanation. Consequences,
Habits and Social Factors follow Facilitating Conditions in decreasing order of importance in explaining the Internalization of EIS use.

About 45 percent of the variance in Frequency of EIS use is explained by the variables: ability to use EIS; subjective norms relating to the IS director; EIS system reliability; interaction among business units; position of user in the organization; EIS experience and CBIS experience. Overall, the results indicate that Habits are the most important in explaining Frequency of EIS use with EIS experience, CBIS experience and ability to use EIS variables contributing to this explanation. Social Factors, Affect and Facilitating Conditions follow Habits in decreasing order of importance in explaining Frequency of EIS use.

The results indicate position of EIS user and CBIS experience, which were not included in the research model but only in the survey questionnaire, entered the regression model for explaining Frequency of EIS use.

6.3.2 Conclusions related to the Research Questions

In summary, the results suggest that Internalization of EIS use was a more important measure of user Behavior in using EIS than Frequency of EIS use. The contributions from both Internalization of EIS use and Frequency of EIS use in explaining user Behavior in using EIS were however quite significant. Both Internalization of EIS use and Frequency of EIS use aspects of behavior therefore
need to be considered when deciding on the design, development, implementation and use of EIS in organizations.

Based on the analysis of the results of the study, organizational factors constitute the most important factors in explaining executives' Behavior in using EIS. This is followed in decreasing order of importance by social, cultural and political factors.

6.3.3 Implications related to the Research Questions

The implications of these findings and conclusions are that, organizations need to play a leading role in influencing the behavior of EIS users towards an increased usage of EIS. Organizations can achieve this by their managers being proactively involved and participatory in the design, development, implementation and management of these systems. Managers need to provide the necessary material and human resources which designers/developers and implementers need in order to ensure positive user behavior towards using these systems.

The next section presents conclusions related to the research problem.
6.4 Conclusions related to the Research Problem

The research problem to be solved by this study is the failure of executive information systems in organizations due to the underutilization or non-usage of these systems. The findings, conclusions and implications about the research hypotheses and the research questions which provided part of the solution to the research problem were discussed in sections 6.2 and 6.3.

Based on the findings presented in those sections, the overall conclusion that can be drawn from this study is that:

- Social, cultural, political and organizational factors represent important variables that explain the Behavior of executives in using EIS and therefore can influence failures of EIS in organizations due to underutilization or non-usage of these systems. Their importance from most influential to least influential is: organizational, social, cultural and political factors.

The next section presents a modified version of the research model based on the results of the study.
6.5 A Modified Version of the Research Model

Based on the results and the findings, the research model in Figure 3.2 is modified to include *CBIS experience* and *Position of user* as shown in Figure 6.1. Figure 6.1 could be used as a research model for further study on EIS usage. Figure 6.1 is therefore accordingly labeled as the **EIS Usage Model (EISUM)**.

**Figure 6.1: EIS Usage Model (EISUM)**

EISUM could be adapted to represent a research model for the study of other information systems/technology usage.
The remaining sections of this chapter summarize the contributions of this study, the limitations of the study and their implications for further research, and the implications of the study for theory.
6.6 Contributions of the Study

The contributions of this study are threefold, namely: theoretical, methodological and practical/managerial.

Theoretically, the study confirmed Triandis' Framework is an appropriate reference theory to study EIS usage. The study confirmed the framework explicitly addresses the social, cultural, political and organizational factors that influence/explain user Behavior to use EIS.

Methodologically, the approach for studying EIS usage as a behavior using Triandis' Framework has been enhanced from previous studies. The theoretical framework and the methodology used in this study can also be applied to investigate factors explaining user behavior in using other information systems/technologies. A model for further studies in EIS usage as well as other information systems/technology usage was derived from the research model and presented in Figure 6.1.

Practically/managerially, the findings of the study have implications for the design, development, implementation and management of EIS in organizations. EIS designers/developers and EIS implementers need to be aware of the Social, Affect, Consequences and Facilitating Conditions factors that affect the behavior of EIS users. The results of the study indicated that, theoretically, both Internalization of EIS use and Frequency of EIS use significantly influence to
Behavior towards using EIS. The results indicate *Internalization of EIS use* is a more appropriate measure of user behavior than *Frequency of EIS use*. This suggests that organizations can improve EIS usage by providing the appropriate user education and training aimed at increasing *Internalization* and *Frequency of EIS* usage and by appropriately allocating the organizations' resources.

In summary, the results and findings of this study suggest *reduction EIS failures in organizations* could be achieved by addressing the users' behavior towards using the systems. From the results of this study, the following actions could be taken to improve users' behavior (internalization and frequency of use) towards the systems:

- Increasing the experience and ability of the users. This could be achieved, for example, through education and training, and user involvement and participation in the development and implementation of the systems.
- Increasing the perceived usefulness of EIS. This could be achieved through the development of an EIS that aims at:
  - Increasing organization's performance
  - Providing an organization with a competitive advantage
  - Allowing users to accomplish their usual tasks
  - Helping users to identify trends and obtain critical information
  - Providing information that allows problems to be detected
  - Improving the quality of decision-making in an organization
  - Increasing the speed of decision-making in an organization
  - Providing greater level of control of managerial activities.
• Improving the social conditions under which the systems are used. This could be achieved through education and training to provide the norms that urge users to use the systems, system policies relating to the values of the systems and the expectations from users, formation of user groups in functional areas to foster social working relationship among the users, and a positive top management involvement of.

• Improving the following aspects of organizations for positive user behavior:
  🔹 Organizational culture that encourages users to use the systems
  🔹 Education on the pace of changing business environment
  🔹 Awareness of interaction among business units
  🔹 Power and politics of organizations should be favorably to EIS use
  🔹 Total commitment of organizations to the systems.

• Improving the following aspects of EIS development process:
  🔹 Executive sponsorship of the EIS development process
  🔹 Involvement and participation of users in the process
  🔹 Availability of technical and other resources
  🔹 The use of development plans
  🔹 Regular follow-ups after implementation of the systems.

• Improving the following aspects of EIS management process:
  🔹 Management policies and rules relating to the systems
  🔹 The management of data for the systems
  🔹 Availability of support for the systems
  🔹 Availability and accessibility of the systems.
• Improving user affect for EIS through developing an EIS that:

  ❖ Available, reliable, effective, flexible, easy-to-use and fast
  ❖ Provides information that is available, reliable, accurate, timely, precise, adequate and meaningful
  ❖ Has support services that are adequate, relevant, provided within an acceptable time and provided with a positive attitude
  ❖ Has development plan that is available, reliable, complete, flexible, attainable and futurist.

Overall, the above suggestions and actions suggested would lead to:

• Improving the design, development and implementation of EIS;
• Better education and training for EIS users;
• EIS usage leading to the success of the systems in organizations;
• Better allocation of resources for EIS; and
• Better management of EIS in organizations.

6.7 Implications for Theory and Future Research

IS research studies have been criticized for a lack of theoretical bases and insufficient attention to methodological and measurement issues when IS researchers study individual's reaction to information systems/technology. IS researchers have been criticized for generally not drawing on other disciplines in their work and these shortcomings have been argued as explanations for the conflicting results that have been obtained in many studies (Swanson, 1982;
Goodhue, 1988; Straub, 1989). In view of these criticisms and a careful review of the theoretical perspectives used in previous IS studies, this study considered and used Triandis' Theoretical Framework to study EIS usage in organizations. The results of this study indicate that Triandis' Theoretical Framework is an appropriate reference theory for studying system usage as a behavior.

For IS researchers, the opportunity exists to adapt the model tested in this study by adding or deleting constructs proposed by Triandis (1980), for example, adding intentions and relevant arousal (motivation). Another way to build on this research would be to adapt the model and the approach to different actors, contexts and objects. For example, it would be useful to adapt the measures in the context of IS developers using CASE tools.

Finally, this study presented a model, EISUM (see Figure 6.1), which can be applied by researchers to further investigate EIS and other IS/technology usage in organizations.

6.8 Limitations and Implications for Further Research

This research study was motivated by reports of EIS failures in organizations. The study has produced results and findings that have implications for practice and research. The practical implications may lead to an improvement in the usage of EIS in organizations and reduce the failure rate of these systems. The research implications provide a way forward for further studies into EIS usage.
and other IS/technology usage in organizations. There are, however, certain limitations and weaknesses of this study.

First, the database purchased purposely for the study could not highlight the level of sophistication and types of EIS in the organizations surveyed. This might mean that some of the respondents might not have been using systems at the level of the EIS expected in the study. Despite this, the findings have implications for EIS and other information systems/technologies in the workplace. Future research should therefore include questions about the level of sophistication and types of EIS in the organizations.

Second, although necessary steps were taken in designing the survey questionnaire to ensure accurate responses, it is difficult to guarantee that all responses were as accurate as hoped. In addition, in an attempt to get a good response rate, all the questions in the survey questionnaire were closed-ended. Although the gross response rate for the study was 37.14 percent, only a net response of 20.57 percent was usable. Despite the 20.57 percent response rate being respectable compared with other studies, it indicates some respondents did not treat the questionnaires with the attention we sought. This is a general problem for any research of this kind. However, future research studies should take steps in the design and administration of survey questionnaires to minimize unusable responses.
Third, due to time and resource constraints, the study adopted a cross-sectional study approach. Since cross-sectional studies address issues at only one point in time, they do not capture the complex interrelationships between variables that come into effect over time. Although this study sought to explain behavior but not to predict it, a longitudinal study may be more appropriate to capture such complex details. Future research should therefore adopt a longitudinal study approach and include open-ended questions in the data collections.

Fourth, the results of this study indicate that Position of user and CBIS experience, which were not included in the research model but only in the survey questionnaire, turned out to be among the variables that explained the Frequency of EIS use. Future studies should therefore aim at including more variables in the research model that may assist in explaining the variance in the user behavior.

Fifth, this research was carried out in an Australian context. Future researchers should consider cross-cultural investigations in order to improve the external/international validity of the findings of this study.
REFERENCES

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APPENDICES
APPENDIX A: Template of Cover letter to Questionnaire
Dear «Title» «LastName»,

**Project Title: Executive Information Systems Use in Organizational Context**

**Researchers: Mr George Ditsa and Professor Graham Winley**

You are invited to participate in this study which is about "Executive Information Systems use in Organizational Context". This research is being conducted as part of a PhD degree by Mr George Ditsa.

**Purpose of the Study**

In the past decade, the use of Computer-based Information Systems (CBIS) in organizations has skyrocketed. Today, the use of CBIS has cut across every functional area and level of management in organizations. The use of a CBIS generally provides the means by which organizations work more efficiently and effectively.

A CBIS is generally designed for collecting data, processing them into information and using the information to support decision making, coordination, planning and control. There are specific CBISs designed for the specific levels of management in organizations to serve managerial purposes. *Executive Information Systems* (EIS) are CBISs specifically designed to aid top-level managers in their managerial roles. They may go by other names in your organization but their primary purpose may remain the same.

Despite the potential that EIS hold in improving managerial roles, research indicates a number of these systems are not meeting the needs and expectations of the users. We, as a team of researchers, from the Department of Information Systems at the University of Wollongong, have embarked on a research effort to better understand EIS users' needs and expectations, and suggest ways of improving these systems from the
viewpoints of users. This study is aimed at a PhD degree and further publications. It is our belief that the findings of this study will be of significant benefit to EIS user community.

Confidentiality
You have been selected to participate in this study because you use an EIS. Your name was obtained, with a signed agreement, from Fairfax Business Media. Your reply will be anonymous and no attempt will be made to identify any response with any participant. We are also asking some personal information from you at the end of the questionnaire which will not identify you, but which will be used in the analysis. The questionnaire has been pre-numbered solely to help provide a record of returns and facilitate the mailing of follow-up questionnaires to achieve a maximum return rate.

As a policy, this research has been reviewed by the Human Research Ethics Committee of the University. If you have any concerns or complaints regarding the way the research is or has been conducted, you can contact the Complaints Officer, Human Research Ethics Committee, University of Wollongong on (02) 4221 4457.

What You Need To Do
If you are willing to participate in this research, please complete the enclosed questionnaire and return it in the enclosed self-addressed stamped envelope. We estimate an average time of 30 minutes in completing the questionnaire. Please return your completed questionnaire to us by 28th November, 2001.

Thank you for your time and effort in participating in this study. We will inform you of our findings before any final publication. If you would like to discuss any part of this research, contact us on (02) 4221 4034 or email george_ditsa@uow.edu.au.

Yours sincerely,

Professor Graham Winley

encl.
APPENDIX B: Survey Questionnaire
Executive Information Systems Use Survey

This questionnaire is part of a study of Executive Information Systems (EIS) use in organizations. EIS are Computer-based Information Systems (CBIS) specifically designed to provide the necessary and critical information managers need to perform their managerial roles. They may go by other names in your organization such as, Enterprise-wide Information Systems, Enterprise Business Intelligence Systems, Balanced Scorecard or simply Scorecard: but their primary purpose may remain the same - to provide the necessary and critical information for managerial roles.

The following questions are about your experiences with CBIS and EIS, your ability to use EIS, and how frequent you use EIS.

1 Your Experience with CBIS
   How many years have you personally been using CBIS? (Please tick one)
   □ 0 - 4 □ 5 - 9 □ 10 - 14 □ 15 - 19 □ 20 or more years

2 Your Experience with EIS
   How many years have you personally been using EIS? (Please tick one)
   □ 0 - 4 □ 5 - 9 □ 10 - 14 □ 15 - 19 □ 20 or more years

3 Your Ability to use EIS
   In which class of EIS users would you place yourself? (Please tick one)
   Novice casual (intermittent) user
   Novice frequent user
   Expert (knowledgeable) casual user
   Expert (knowledgeable) frequent user

4 Your Frequency of using EIS
   On average, how many times do you logon to use an EIS? (Please tick one)
   Several times a day
   Once a day
   1 - 4 times a month
   Once a month
   Less than once a month
B. Perceived Usefulness and Inclination to Use EIS

Below are some statements about your personal opinion about the usefulness of EIS to an organization and your inclination to use EIS. Please circle your response to each of these statements.

1. Based on my experience with EIS I have observed that an EIS:

(SA – Strongly Agree  A – Agree  U – Uncertain  D – Disagree  SD – Strongly Disagree)

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increases an organization’s performance</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Provides an organization with a competitive advantage</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Provides a greater level of control over managerial activities</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Provides information that allows problems to be detected</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Improves the quality of decision-making in an organization</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Increases the speed of decision-making in an organization</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
</tbody>
</table>

2. I believe using EIS in an organization has the potential to:

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase the organization’s performance</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Provide the organization with a competitive advantage</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Provide a greater level of control over managerial activities</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Provide information that allows problems to be detected</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Improve the quality of decision-making in the organization</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Increase the speed of decision-making in the organization</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
</tbody>
</table>

3. Using an EIS helps me personally to:

<table>
<thead>
<tr>
<th>Activity</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accomplish my usual tasks</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Identify trends and obtain critical information</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Make strategic decisions</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Not using EIS any more would disadvantage me</td>
<td>SA</td>
<td>A</td>
<td>U</td>
<td>D</td>
<td>SD</td>
</tr>
</tbody>
</table>
An information system user's satisfaction with the system can be measured by some attributes of the system. Below are some statements about your satisfaction with the EIS itself, the information you need from the EIS, the support services for the EIS, and the development plans for the EIS. Please circle your response to each of these statements.

1. The EIS I use is always:
   - available
   - reliable
   - effective
   - flexible
   - easy-to-use
   - fast
   - overall satisfactory

<table>
<thead>
<tr>
<th>Attribute</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>available</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>reliable</td>
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<tr>
<td>effective</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>flexible</td>
<td></td>
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<tr>
<td>easy-to-use</td>
<td></td>
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<tr>
<td>fast</td>
<td></td>
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<tr>
<td>overall satisfactory</td>
<td></td>
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</tr>
</tbody>
</table>

2. The information I need from my EIS is always:
   - available
   - reliable
   - accurate
   - timely
   - precise
   - adequate
   - meaningful
   - overall satisfactory

<table>
<thead>
<tr>
<th>Attribute</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>available</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>reliable</td>
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<td>accurate</td>
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<td>timely</td>
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<td>precise</td>
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<td>adequate</td>
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<tr>
<td>meaningful</td>
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<tr>
<td>overall satisfactory</td>
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</tbody>
</table>

3. The support services provided by the information systems personnel for the EIS I use are always:
   - adequate
   - relevant
   - provided within an acceptable time
   - provided with a positive attitude
   - overall satisfactory

<table>
<thead>
<tr>
<th>Attribute</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>adequate</td>
<td></td>
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<tr>
<td>relevant</td>
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<tr>
<td>provided within an acceptable time</td>
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<tr>
<td>provided with a positive attitude</td>
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<tr>
<td>overall satisfactory</td>
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</tbody>
</table>

214
4 The *development plans* for the EIS systems in my organization are always:

<table>
<thead>
<tr>
<th>Feature</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>available</td>
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<td></td>
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<tr>
<td>reliable</td>
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<td>complete</td>
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<tr>
<td>flexible</td>
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<tr>
<td>attainable</td>
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<td>future-oriented</td>
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<tr>
<td>overall satisfactory</td>
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</tbody>
</table>

D. Norms, Roles and Values in relation to the EIS Use

Some people use information systems as a result of self-instructions to do so because it is perceived to be correct and appropriate by some members of the organization *(organizational norms)*. And some people, by virtue of their *roles* in the organization, may be expected by some members of the organization to use particular systems. Further, some broad tendencies in the organization to prefer certain states of affairs over others *(values)* may dictate that some systems are used. Below are some statements about norms, roles and values in relation to the use of EIS. Please circle your response to each of these statements.

(SA – Strongly Agree  A – Agree  U – Uncertain  D – Disagree  SD – Strongly Disagree)

1. The following people think that I should use an EIS:

<table>
<thead>
<tr>
<th>Group</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>My colleagues</td>
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<td></td>
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<tr>
<td>My superiors</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>The IS director</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>My subordinates</td>
<td></td>
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</tr>
</tbody>
</table>

2. Generally, I want to do what the following people think I should do:

<table>
<thead>
<tr>
<th>Group</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>My colleagues</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My superiors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The IS director</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My subordinates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 By virtue of my roles in the organization, the following people expect that I will use an EIS:

- My colleagues
- My superiors
- The IS director
- My subordinates

4 The use of EIS is generally considered in my organization to be:

- Productive
- Rational
- Efficient
- Effective

E. Social Working Relationship and Organizational Environment in relation to EIS use

The social working relationships among workers in an organization may make it easier to use information systems. The organizational environment may also encourage people in the organization to use information systems. Below are some statements about the social working relationships and the organizational environment in relation to EIS use. Please circle your response to each of these statements.

(SA – Strongly Agree  A – Agree  U – Uncertain  D – Disagree  SD – Strongly Disagree)

1 The social working relationships between me and the following make it easier for me to use an EIS:

- My colleagues
- My superiors
- The IS director
- My subordinates

2 The following aspects of my organization encourage me to use an EIS:

- The organizational culture
- The pace of changing business environment
- The interactions among the business units
- The power and politics of the organization
- The commitment of the organization to EIS
### F. EIS Development and Management Processes

Some aspects of a system's **development processes** and the **management processes** associated with the system may encourage people in organizations to use the system. Below are some statements about aspects of development processes and management processes in relation to EIS use. Please circle your response to each of these statements.

(SA – Strongly Agree  A – Agree  U – Uncertain  D – Disagree  SD – Strongly Disagree)

1. The following aspects of the EIS development processes in my organization encourage me to use an EIS:

   - Executive sponsorship  
     - SA  A  U  D  SD
   - My involvement and participation in the development  
     - SA  A  U  D  SD
   - The availability of technical and other resources  
     - SA  A  U  D  SD
   - The use of a development plan  
     - SA  A  U  D  SD
   - Follow-ups made after the implementation of an EIS  
     - SA  A  U  D  SD

2. The following aspects of the EIS management processes in my organization encourage me to use an EIS:

   - Management policies and rules  
     - SA  A  U  D  SD
   - Data management  
     - SA  A  U  D  SD
   - Availability of support  
     - SA  A  U  D  SD
   - The availability and accessibility of the system  
     - SA  A  U  D  SD
G. Personal Information

We are requesting the following personal information about you that will help us in our analysis of the data we are collecting. No participant will be identified with any information provided. Please tick the appropriate box for your response.

1. Sex:  □ Female  □ Male


3. Highest educational level attained:  □ School Cert.  □ Higher School Cert.  □ TAFE Qualification  □ Bachelor Degree  □ Postgraduate Degree  □ Other (please specify)

4. Current position in organization:  □ Top-level Manager  □ Middle-level Manager  □ Lower-level Manager  □ Other (please specify)
Thank you once again for your time and effort in responding to this questionnaire. We appreciate very much your valuable contribution to this study. We will also appreciate it very much if you could provide us with any further comments about your use of information systems for managerial work and about this survey. Please provide your comments below or e-mail us on george_ditsa@uow.edu.au. Thank you.
APPENDIX C: Template of Follow-up Cover letter to Questionnaire
27th February, 2002

Dear «Title» «LastName»,

Project Title: Executive Information Systems Use in Organizational Context
Researchers: Mr George Ditsa and Professor Graham Winley

About two and half months ago, you received a questionnaire designed to investigate "Executive Information Systems use in Organizational Context" as part of a PhD degree by Mr George Ditsa.

From the responses received to date, our records show that we have not received your completed questionnaire. In case your letter and questionnaire were misplaced or lost, we have enclosed a new questionnaire with a copy of the original letter for your completion. Your responses will be kept confidential.

Please return the completed questionnaire in the enclosed self-addressed stamped envelope to us by 18th March, 2002.

Your consideration and prompt return will be appreciated. Thank you for your valuable contribution. If you would like any further information, please contact us on (02) 4221 4034 or email george_ditsa@uow.edu.au.

Yours sincerely,

Professor Graham Winley

encl.
APPENDIX D: Industry Codes and Industry Groups in Database
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Industry Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>IT Supplier</td>
<td>IT Supplier</td>
</tr>
<tr>
<td>01</td>
<td>Agriculture</td>
<td>Agriculture &amp; Mining</td>
</tr>
<tr>
<td>02</td>
<td>Services to Agriculture; Hunting and Trapping</td>
<td>Agriculture &amp; Mining</td>
</tr>
<tr>
<td>03</td>
<td>Forestry and Logging</td>
<td>Agriculture &amp; Mining</td>
</tr>
<tr>
<td>04</td>
<td>Commercial Fishing</td>
<td>Agriculture &amp; Mining</td>
</tr>
<tr>
<td>11</td>
<td>Coal Mining</td>
<td>Agriculture &amp; Mining</td>
</tr>
<tr>
<td>12</td>
<td>Oil and Gas Extraction</td>
<td>Agriculture &amp; Mining</td>
</tr>
<tr>
<td>13</td>
<td>Metal Ore Mining</td>
<td>Agriculture &amp; Mining</td>
</tr>
<tr>
<td>14</td>
<td>Other Mining</td>
<td>Agriculture &amp; Mining</td>
</tr>
<tr>
<td>15</td>
<td>Services to Mining</td>
<td>Agriculture &amp; Mining</td>
</tr>
<tr>
<td>21</td>
<td>Mfg: Food, Beverage &amp; Tobacco</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>22</td>
<td>Mfg: Textiles, Clothing, Footware and Leather</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>23</td>
<td>Mfg: Wood and Paper Products</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>24</td>
<td>Mfg: Printing, Publishing and Recorded Media</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>25</td>
<td>Mfg: Petrol, Coal and Chemical Products</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>26</td>
<td>Mfg: Non-Metallic Mineral Products</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>27</td>
<td>Mfg: Metal Products</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>28</td>
<td>Mfg: Machinery and Equipment</td>
<td>Manufacturing</td>
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<td>Other Manufacturing</td>
<td>Manufacturing</td>
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<tr>
<td>36</td>
<td>Electricity and Gas</td>
<td>Utilities &amp; Construction</td>
</tr>
<tr>
<td>37</td>
<td>Water, Sewerage and Drainage</td>
<td>Utilities &amp; Construction</td>
</tr>
<tr>
<td>41</td>
<td>General Construction</td>
<td>Utilities &amp; Construction</td>
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<tr>
<td>42</td>
<td>Construction and Engineering Services</td>
<td>Wholesale &amp; Retail</td>
</tr>
<tr>
<td>45</td>
<td>Wholesale Trade: Basic Materials</td>
<td>Wholesale &amp; Retail</td>
</tr>
<tr>
<td>46</td>
<td>Wholesale Trade: Machinery and Motor Vehicles</td>
<td>Wholesale &amp; Retail</td>
</tr>
<tr>
<td>47</td>
<td>Wholesale Trade: Personal and Household Goods</td>
<td>Wholesale &amp; Retail</td>
</tr>
<tr>
<td>51</td>
<td>Retail Trade: Food</td>
<td>Wholesale &amp; Retail</td>
</tr>
<tr>
<td>52</td>
<td>Retail Trade: Personal and Household Goods</td>
<td>Wholesale &amp; Retail</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Industry</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>53</td>
<td>Retail Trade: Motor Vehicles</td>
<td>Wholesale &amp; Retail</td>
</tr>
<tr>
<td>57</td>
<td>Accommodation and Restaurant Trade</td>
<td>Wholesale &amp; Retail</td>
</tr>
<tr>
<td>61</td>
<td>Road Transport</td>
<td>Transport &amp; Storage</td>
</tr>
<tr>
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<td>Rail Transport</td>
<td>Transport &amp; Storage</td>
</tr>
<tr>
<td>63</td>
<td>Water Transport and Port Authority</td>
<td>Transport &amp; Storage</td>
</tr>
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<td>Air and Space Transport</td>
<td>Transport &amp; Storage</td>
</tr>
<tr>
<td>65</td>
<td>Other Transport</td>
<td>Transport &amp; Storage</td>
</tr>
<tr>
<td>66</td>
<td>Services to Transport</td>
<td>Transport &amp; Storage</td>
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<td>Storage and Marketing Boards</td>
<td>Transport &amp; Storage</td>
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<td>71</td>
<td>Communications</td>
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<td>73</td>
<td>Banking and Finance</td>
<td>Finance &amp; Business</td>
</tr>
<tr>
<td>74</td>
<td>Insurance</td>
<td>Finance &amp; Business</td>
</tr>
<tr>
<td>75</td>
<td>Services to Finance and Insurance</td>
<td>Finance &amp; Business</td>
</tr>
<tr>
<td>77</td>
<td>Property Services</td>
<td>Finance &amp; Business</td>
</tr>
<tr>
<td>78</td>
<td>Marketing &amp; Business Management Services</td>
<td>Finance &amp; Business</td>
</tr>
<tr>
<td>80</td>
<td>Federal Government</td>
<td>Govt &amp; Defence</td>
</tr>
<tr>
<td>81</td>
<td>State Government</td>
<td>Govt &amp; Defence</td>
</tr>
<tr>
<td>82</td>
<td>Defence</td>
<td>Govt &amp; Defence</td>
</tr>
<tr>
<td>83</td>
<td>Local Government</td>
<td>Govt &amp; Defence</td>
</tr>
<tr>
<td>84</td>
<td>Education and Research</td>
<td>Community Services</td>
</tr>
<tr>
<td>86</td>
<td>Health Services</td>
<td>Community Services</td>
</tr>
<tr>
<td>87</td>
<td>Community Services and Welfare</td>
<td>Community Services</td>
</tr>
<tr>
<td>91</td>
<td>Film, Radio and TV</td>
<td>Personal &amp; Other Services</td>
</tr>
<tr>
<td>92</td>
<td>Libraries, Museums and Arts</td>
<td>Personal &amp; Other Services</td>
</tr>
<tr>
<td>93</td>
<td>Sport and Recreation</td>
<td>Personal &amp; Other Services</td>
</tr>
<tr>
<td>95</td>
<td>Personal Services, Tourism and Entertainment</td>
<td>Personal &amp; Other Services</td>
</tr>
<tr>
<td>96</td>
<td>Other Services</td>
<td>Personal &amp; Other Services</td>
</tr>
</tbody>
</table>
APPENDIX E: Table 5.4.1 to Table 5.4.15
Table 5.4.1: Correlations Matrix Among Perceived Usefulness Sub-Variables (Beliefs)  
(n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. EIS increases org performance</td>
<td>1.000</td>
<td>.621**</td>
<td>.481**</td>
<td>.307**</td>
<td>.447**</td>
<td>.427**</td>
</tr>
<tr>
<td>2. EIS provides competitive advantage</td>
<td>.621**</td>
<td>1.000</td>
<td>.453**</td>
<td>.290**</td>
<td>.467**</td>
<td>.487**</td>
</tr>
<tr>
<td>3. EIS provides better control of activities</td>
<td>.481**</td>
<td>.453**</td>
<td>1.000</td>
<td>.312**</td>
<td>.390**</td>
<td>.349**</td>
</tr>
<tr>
<td>4. EIS helps detect problems</td>
<td>.307**</td>
<td>.290**</td>
<td>.312**</td>
<td>1.000</td>
<td>.567**</td>
<td>.460**</td>
</tr>
<tr>
<td>5. EIS improves decision quality</td>
<td>.447**</td>
<td>.467**</td>
<td>.390**</td>
<td>.567**</td>
<td>1.000</td>
<td>.583**</td>
</tr>
<tr>
<td>6. EIS increases decision making speed</td>
<td>.427**</td>
<td>.487**</td>
<td>.349**</td>
<td>.460**</td>
<td>.583**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.01 level (2-tailed). (Listwise, n = 143)

Table 5.4.2: Correlations Matrix Among Perceived Usefulness Sub-Variables  
(Value Attached) (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. EIS has potential to increase organization performance</td>
<td>1.000</td>
<td>.592**</td>
<td>.368**</td>
<td>.429**</td>
<td>.473**</td>
<td>.407**</td>
</tr>
<tr>
<td>2. EIS has potential to provide competitive advantage</td>
<td>.592**</td>
<td>1.000</td>
<td>.428**</td>
<td>.392**</td>
<td>.463**</td>
<td>.424**</td>
</tr>
<tr>
<td>3. EIS has potential to provide better control of activities</td>
<td>.368**</td>
<td>.428**</td>
<td>1.000</td>
<td>.376**</td>
<td>.438**</td>
<td>.360**</td>
</tr>
<tr>
<td>4. EIS has potential to help detect problems</td>
<td>.429**</td>
<td>.392**</td>
<td>.376**</td>
<td>1.000</td>
<td>.498**</td>
<td>.449**</td>
</tr>
<tr>
<td>5. EIS has potential to improve decision quality</td>
<td>.473**</td>
<td>.463**</td>
<td>.438**</td>
<td>.498**</td>
<td>1.000</td>
<td>.618**</td>
</tr>
<tr>
<td>6. EIS has potential to increase decision making speed</td>
<td>.407**</td>
<td>.424**</td>
<td>.360**</td>
<td>.449**</td>
<td>.618**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.01 level (2-tailed). (Listwise, n = 143)

Table 5.4.3: Correlations Matrix Among Internalization Sub-Variables (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. EIS helps in usual tasks</td>
<td>1.000</td>
<td>.485**</td>
<td>.430**</td>
<td>.566**</td>
</tr>
<tr>
<td>2. EIS helps to identify trend</td>
<td>.485**</td>
<td>1.000</td>
<td>.532**</td>
<td>.595**</td>
</tr>
<tr>
<td>3. EIS helps in strategic decisions</td>
<td>.430**</td>
<td>.532**</td>
<td>1.000</td>
<td>.500**</td>
</tr>
<tr>
<td>4. Not using EIS disadvantages</td>
<td>.566**</td>
<td>.595**</td>
<td>.500**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.01 level (2-tailed). (Listwise, n = 142)
Table 5.4.4: Correlations Matrix Among EIS System Satisfaction Sub-Variables (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Always available</td>
<td>1.00</td>
<td>.744**</td>
<td>.530**</td>
<td>.392**</td>
<td>.414**</td>
<td>.433**</td>
<td>.583**</td>
</tr>
<tr>
<td>2. Always reliable</td>
<td>.744**</td>
<td>1.00</td>
<td>.629**</td>
<td>.448**</td>
<td>.436**</td>
<td>.385**</td>
<td>.612**</td>
</tr>
<tr>
<td>3. Always effective</td>
<td>.530**</td>
<td>.629**</td>
<td>1.00</td>
<td>.483**</td>
<td>.408**</td>
<td>.459**</td>
<td>.671**</td>
</tr>
<tr>
<td>4. Always flexible</td>
<td>.392**</td>
<td>.448**</td>
<td>.483**</td>
<td>1.00</td>
<td>.547**</td>
<td>.406**</td>
<td>.602**</td>
</tr>
<tr>
<td>5. Always easy to use</td>
<td>.414**</td>
<td>.436**</td>
<td>.408**</td>
<td>.547**</td>
<td>1.00</td>
<td>.569**</td>
<td>.514**</td>
</tr>
<tr>
<td>6. Always fast</td>
<td>.433**</td>
<td>.385**</td>
<td>.459**</td>
<td>.406**</td>
<td>.569**</td>
<td>1.00</td>
<td>.562**</td>
</tr>
<tr>
<td>7. Overall satisfactory</td>
<td>.583**</td>
<td>.612**</td>
<td>.671**</td>
<td>.602**</td>
<td>.514**</td>
<td>.562**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.01 level (2-tailed). (Listwise, n = 142)

Table 5.4.5: Correlations Matrix Among EIS Information Satisfaction Sub-Variables (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Always available</td>
<td>1.00</td>
<td>.425**</td>
<td>.353**</td>
<td>.534**</td>
<td>.395**</td>
<td>.483**</td>
<td>.392**</td>
<td>.529**</td>
</tr>
<tr>
<td>2. Always reliable</td>
<td>.425**</td>
<td>1.00</td>
<td>.863**</td>
<td>.574**</td>
<td>.584**</td>
<td>.498**</td>
<td>.503**</td>
<td>.645**</td>
</tr>
<tr>
<td>3. Always accurate</td>
<td>.353**</td>
<td>.863**</td>
<td>1.00</td>
<td>.535**</td>
<td>.651**</td>
<td>.419**</td>
<td>.482**</td>
<td>.618**</td>
</tr>
<tr>
<td>4. Always timely</td>
<td>.534**</td>
<td>.574**</td>
<td>.535**</td>
<td>1.00</td>
<td>.494**</td>
<td>.583**</td>
<td>.537**</td>
<td>.704**</td>
</tr>
<tr>
<td>5. Always precise</td>
<td>.395**</td>
<td>.584**</td>
<td>.651**</td>
<td>.494**</td>
<td>1.00</td>
<td>.401**</td>
<td>.454**</td>
<td>.499**</td>
</tr>
<tr>
<td>6. Always adequate</td>
<td>.483**</td>
<td>.498**</td>
<td>.419**</td>
<td>.583**</td>
<td>.401**</td>
<td>1.00</td>
<td>.655**</td>
<td>.721**</td>
</tr>
<tr>
<td>7. Always meaningful</td>
<td>.392**</td>
<td>.503**</td>
<td>.482**</td>
<td>.537**</td>
<td>.454**</td>
<td>.655**</td>
<td>1.00</td>
<td>.732**</td>
</tr>
<tr>
<td>8. Overall satisfactory</td>
<td>.529**</td>
<td>.645**</td>
<td>.618**</td>
<td>.704**</td>
<td>.499**</td>
<td>.721**</td>
<td>.732**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.01 level (2-tailed). (Listwise, n = 142)

Table 5.4.6: Correlations Matrix Among EIS Support Services Satisfaction Sub-Variables (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Always adequate</td>
<td>1.00</td>
<td>.764**</td>
<td>.704**</td>
<td>.604**</td>
<td>.771**</td>
</tr>
<tr>
<td>2. Always relevant</td>
<td>.764**</td>
<td>1.00</td>
<td>.701**</td>
<td>.640**</td>
<td>.739**</td>
</tr>
<tr>
<td>3. Always timely</td>
<td>.704**</td>
<td>.701**</td>
<td>1.00</td>
<td>.730**</td>
<td>.760**</td>
</tr>
<tr>
<td>4. Always provided with positive attitude</td>
<td>.604**</td>
<td>.640**</td>
<td>.730**</td>
<td>1.00</td>
<td>.727**</td>
</tr>
<tr>
<td>5. Overall satisfactory</td>
<td>.771**</td>
<td>.739**</td>
<td>.760**</td>
<td>.727**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.01 level (2-tailed). (Listwise, n = 142)
### Table 5.4.7: Correlations Matrix Among EIS Development Plan Satisfaction Sub-Variables (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Always available</td>
<td>1.000</td>
<td>.795**</td>
<td>.612**</td>
<td>.522**</td>
<td>.617**</td>
<td>.515**</td>
<td>.761**</td>
</tr>
<tr>
<td>2. Always reliable</td>
<td>.795**</td>
<td>1.000</td>
<td>.751**</td>
<td>.541**</td>
<td>.582**</td>
<td>.551**</td>
<td>.784**</td>
</tr>
<tr>
<td>3. Always complete</td>
<td>.612**</td>
<td>.751**</td>
<td>1.000</td>
<td>.504**</td>
<td>.584**</td>
<td>.445**</td>
<td>.682**</td>
</tr>
<tr>
<td>4. Always flexible</td>
<td>.522**</td>
<td>.541**</td>
<td>.504**</td>
<td>1.000</td>
<td>.565**</td>
<td>.564**</td>
<td>.635**</td>
</tr>
<tr>
<td>5. Always attainable</td>
<td>.617**</td>
<td>.582**</td>
<td>.584**</td>
<td>1.000</td>
<td>.656**</td>
<td>.706**</td>
<td>.656**</td>
</tr>
<tr>
<td>6. Always futuristic</td>
<td>.515**</td>
<td>.551**</td>
<td>.445**</td>
<td>.564**</td>
<td>1.000</td>
<td>.656**</td>
<td>.656**</td>
</tr>
<tr>
<td>7. Overall satisfactory</td>
<td>.761**</td>
<td>.784**</td>
<td>.682**</td>
<td>.635**</td>
<td>.706**</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.01 level (2-tailed). (Listwise, n = 143)

### Table 5.4.8: Correlations Matrix Among Executive’s Subjective Norms Sub-Variables (Assessment of Work Group Influence) (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Colleagues think I should use</td>
<td>1.000</td>
<td>.601**</td>
<td>.400**</td>
<td>.577**</td>
</tr>
<tr>
<td>2. Superior think I should use</td>
<td>.601**</td>
<td>1.000</td>
<td>.373**</td>
<td>.390**</td>
</tr>
<tr>
<td>3. IS director thinks I should use</td>
<td>.400**</td>
<td>.373**</td>
<td>1.000</td>
<td>.464**</td>
</tr>
<tr>
<td>4. Subordinates think I should use</td>
<td>.577**</td>
<td>.390**</td>
<td>.464**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.01 level (2-tailed). (Listwise, n = 142)

### Table 5.4.9: Correlations Matrix Among Executive’s Subjective Norms Sub-Variables (Evaluation of Probability of Work Group Influence) (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I want because Colleagues think I should use</td>
<td>1.000</td>
<td>.643**</td>
<td>.514**</td>
<td>.708**</td>
</tr>
<tr>
<td>2. I want because Superior think I should use</td>
<td>.643**</td>
<td>1.000</td>
<td>.376**</td>
<td>.522**</td>
</tr>
<tr>
<td>3. I want because IS director thinks I should use</td>
<td>.514**</td>
<td>.376**</td>
<td>1.000</td>
<td>.518**</td>
</tr>
<tr>
<td>4. I want because Subordinates think I should use</td>
<td>.708**</td>
<td>.522**</td>
<td>.518**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.01 level (2-tailed). (Listwise, n = 139)
Table 5.4.10: Correlations Matrix Among Executive's Subjective Roles Sub-Variables (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Because of my role, Colleagues think I should use</td>
<td>1.00</td>
<td>.652**</td>
<td>.588**</td>
<td>.635**</td>
</tr>
<tr>
<td>2. Because of my role, Superior think I should use</td>
<td>.652**</td>
<td>1.00</td>
<td>.513**</td>
<td>.368**</td>
</tr>
<tr>
<td>3. Because of my role, IS director thinks I should use</td>
<td>.588**</td>
<td>.513**</td>
<td>1.00</td>
<td>.465**</td>
</tr>
<tr>
<td>4. Because of my role, Subordinates think I should use</td>
<td>.635**</td>
<td>.368**</td>
<td>.465**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.01 level (2-tailed). (Listwise, n = 141)

Table 5.4.11: Correlations Matrix Among Subjective Values of EIS Sub-Variables (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General opinion is EIS productive</td>
<td>1.00</td>
<td>.699**</td>
<td>.666**</td>
<td>.740**</td>
</tr>
<tr>
<td>2. General opinion is EIS rational</td>
<td>.699**</td>
<td>1.00</td>
<td>.694**</td>
<td>.716**</td>
</tr>
<tr>
<td>3. General opinion is EIS efficient</td>
<td>.666**</td>
<td>.694**</td>
<td>1.00</td>
<td>.794**</td>
</tr>
<tr>
<td>4. General opinion is EIS effective</td>
<td>.740**</td>
<td>.716**</td>
<td>.794**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.01 level (2-tailed). (Listwise, n = 144)

Table 5.4.12: Correlations Matrix Among Social Situations Sub-Variables (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Relationship with Colleagues make EIS use easy</td>
<td>1.00</td>
<td>.694**</td>
<td>.562**</td>
<td>.605**</td>
</tr>
<tr>
<td>2. Relationship with Superior make EIS use easy</td>
<td>.694**</td>
<td>1.00</td>
<td>.623**</td>
<td>.545**</td>
</tr>
<tr>
<td>3. Relationship with IS director make EIS use easy</td>
<td>.562**</td>
<td>.623**</td>
<td>1.00</td>
<td>.607**</td>
</tr>
<tr>
<td>4. Relationship with Subordinates make EIS use easy</td>
<td>.605**</td>
<td>.545**</td>
<td>.607**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed). (Listwise, n = 140)
Table 5.4.13: Correlations Matrix Among Facilitating Conditions (Organizational Environment) Sub-Variables (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Organizational culture encourages EIS use</td>
<td>1.000</td>
<td>.559**</td>
<td>.383**</td>
<td>.447**</td>
<td>.501**</td>
</tr>
<tr>
<td>2. Pace of change of business environment</td>
<td>.559**</td>
<td>1.000</td>
<td>.547**</td>
<td>.286**</td>
<td>.225**</td>
</tr>
<tr>
<td>3. Interaction among business units</td>
<td>.383**</td>
<td>.547**</td>
<td>1.000</td>
<td>.373**</td>
<td>.319**</td>
</tr>
<tr>
<td>4. Organizational Power and Politics</td>
<td>.447**</td>
<td>.286**</td>
<td>.373**</td>
<td>1.000</td>
<td>.212*</td>
</tr>
<tr>
<td>5. Organization commitment encourages EIS use</td>
<td>.501**</td>
<td>.225**</td>
<td>.319**</td>
<td>.212*</td>
<td>1.000</td>
</tr>
</tbody>
</table>

** Correlation significant at 0.01 * significant at 0.05 (2-tailed). (Listwise, n = 144)

Table 5.4.14: Correlations Matrix Among Facilitating Conditions (System Development Processes) Sub-Variables (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Executive sponsorship encourages EIS use</td>
<td>1.000</td>
<td>.220**</td>
<td>.213*</td>
<td>.260**</td>
<td>.189*</td>
</tr>
<tr>
<td>2. My involvement encourages EIS use</td>
<td>.220**</td>
<td>1.000</td>
<td>.483**</td>
<td>.484**</td>
<td>.477**</td>
</tr>
<tr>
<td>3. Technical availability encourages EIS use</td>
<td>.213*</td>
<td>.483**</td>
<td>1.000</td>
<td>.460**</td>
<td>.415**</td>
</tr>
<tr>
<td>4. Development plan encourages EIS use</td>
<td>.260**</td>
<td>.484**</td>
<td>.460**</td>
<td>1.000</td>
<td>.471**</td>
</tr>
<tr>
<td>5. Follow ups encourages EIS use</td>
<td>.189*</td>
<td>.477**</td>
<td>.415**</td>
<td>.471**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

** Correlation significant at 0.01 * significant at 0.05 (2-tailed). (Listwise, n = 143)

Table 5.4.15: Correlations Matrix Among Facilitating Conditions (Management Processes) Sub-Variables (n = 144)

<table>
<thead>
<tr>
<th>Sub-Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Management policies encourages EIS use</td>
<td>1.000</td>
<td>.388**</td>
<td>.343**</td>
<td>.261**</td>
</tr>
<tr>
<td>2. Data management encourages EIS use</td>
<td>.388**</td>
<td>1.000</td>
<td>.369**</td>
<td>.384**</td>
</tr>
<tr>
<td>3. Support availability encourages EIS use</td>
<td>.343**</td>
<td>.369**</td>
<td>1.000</td>
<td>.494**</td>
</tr>
<tr>
<td>4. Accessibility encourages EIS use</td>
<td>.261**</td>
<td>.384**</td>
<td>.494**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.01 level (2-tailed). (Listwise, n = 143)
APPENDIX F: Multiple Regression Assumption Checks
Multiple Regression Assumption Checks

Multiple regression analysis techniques are very sensitive to assumptions and have been described as among one of the fussiest statistical techniques (Pallant, 2001). Multiple regression analysis techniques make a number of assumptions about the data for analysis and any violation of these assumptions may impair the results of the analysis. A number of the assumptions relate to the residuals, that is, the differences between the observed and the predicted dependent variables calculated by the regression method. Consequently, the regression analysis must be carried out before all the assumptions could be checked.

Hair et al. (1995) listed four assumptions underlying multiple regression analysis techniques, which are important to check for any violation when using multiple regression techniques. The assumptions are: normality, linearity, constant variance (homoscedasticity) and independence of residuals. The assumptions can be checked from residuals plots which are generated as part of the multiple regression procedure in most statistical packages, including SPSS.

The analyses below focus on normality and heteroscedasticity. The nature of the data indicates no reason to assume dependency among residuals. Assessing normality requires comparison of residuals with individual predictors.
In Normal Probability Plots of standardized residuals, the residual points lying in “a reasonably straight diagonal line from bottom left to top right” would suggest that there were no major deviations from normality.

Figures 5.1 and 5.2 are the Normality Plots and Figures 5.3 and 5.4 are the Histogram Plots generated in this analysis. An examination of these plots suggested that there were no major violations of the assumptions for normality for both Frequency of EIS use and Internalization of EIS use.

In the scatterplots of the standardized residuals, a pattern showing no trend up or down, an no non-linearity, with most of the scores concentrated in the center around the 0 point would suggest there were no major deviations from normality and the other assumptions. Figures 5.5 and 5.6 are copies of the scatterplots generated in this study. An examination of these plots also suggested that there were no major violations of assumptions for normality and the other assumptions. These residual scatterplots are also useful in assessing heterostedasticity.

Note that the linear “subpatterns” in Figures 5.5 and 5.6 are due to the discrete (integer values only) nature of the response variables. Although, obviously, this is evidence of non-normality, it is not important issue in this context.
Figure 5.1
Normal P-P Plot of Regression Standardized
Dependent Variable: Frequency of EIS use

Figure 5.2
Normal P-P Plot of Regression Standardized
Dependent Variable: Total internalisation
Figure 5.3

Histogram

Dependent Variable: Frequency of EIS use

Regression Standardized Residual

Figure 5.4

Histogram

Dependent Variable: Total internalisation

Regression Standardized Residual
Figure 5.5

Scatterplot

Dependent Variable: Frequency of EIS use

Figure 5.6

Scatterplot

Dependent Variable: Total internalisation

Regression Standardized Predicted Value

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