Executive Information Systems Use in Organisational Contexts: An Exploratory Study

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ABSTRACT

Like any other type of information system, Executive Information Systems (EIS) appeared on the computing scene in the late 1970s with the promise of making businesses gain competitive advantage by their use to enhance managerial decision-making. At that time, these systems were mainly known as Executive Support Systems (ESS). As a departure from the mainstream information systems, EIS are designed and built primarily to support managerial functions of top-level managers in organisations. With advances in technologies such data warehousing, data mining, OLAP, ROLAP, MOLAP, Internet, Intranet, Extranet and the Web, indications are that more and more organisations are turning to implement EIS in one form or another. Currently they go by other names such as Enterprise-wide Information Systems, Enterprise Business Intelligence Systems, Everybody's Information System, and Balanced Scorecard or simply Scorecard. The recent hype about Knowledge Management has even made EIS more attractive to organisations. Despite the attractiveness of these systems, there are equally reports of their high failure rates. Some of these failures are due to the non-use of the systems.

This paper reports on a research in progress on the use of Executive Information Systems (EIS) in organisational contexts. The primary focus of the research is to investigate factors that explain users' behaviour towards using EIS in organisational settings. It is also aimed at identifying the relative importance of these factors that determine the use of EIS. Preliminary results suggest there is very high perceived usefulness of EIS in organisations. The results also suggest social factors are much considered by users in using EIS. They also suggest users consider satisfaction with information from EIS, support for the EIS system and the EIS system itself a little more over EIS development plan in using EIS. The preliminary results also suggest users consider management processes associated with EIS system more than EIS development processes and the organisational environment in using EIS.

INTRODUCTION

The success or failure of information systems (IS) has been a focus of studies by IS researchers in the past decades. Underutilisation of information sysems has generally been dentified in the IS literature as one of the sources of IS failures and system usage is even often used as a surrogate of IS success. As hardware and software capabilities continue to advance in an alarming rate, the problem of low system usage still remains (Moore, 1991; Norman, 1993; Weiner, 1993; Johansen and Swigart, 1996; Ventakesh and Morris, 2000).

The problem of low IS usage ironically appears more at the top levels of organisations where systems are used discretionarily by senior managers and executives. The irony here is that, it is the top management of organisations that approve and finance IS projects. One would therefore expect them to be concerned about the success of the systems and use the systems appropriately: if that is what it takes to make the systems succeed. Unfortunately that seems not to be the case.

In the past two decades, executive information systems have been designed and built primarily to support the managerial activities of top-level managers of organisations. Along with the success stories, however, there are many examples of EIS failures some of which are due to the non-use of the systems (Glover, Watson and Rainer, 1992; Schenk, 1992; McBride, 1997). Whereas these systems have attracted a growing number of research studies in recent times, a review of the EIS literature reveals that few studies have been done on the real use (that is, the active engagement) of the systems. The majority of the prior EIS research studies has focused on documenting the features, benefits, development, methodologies, and implementation of EIS by using case studies and interviews (e.g. Watson et al., 1992; Rainer and Watson, 1995; Nandhakumar, 1996; Nandhakumar and Jones 1997; McBride, 1997; Watson, Houdeshel and Rainer, 1997; Bajwa et al. 1998; Li and Jordan, 1998; Vandenbosch, 1999; Carte, 1999; Watson and Carte, 2000; Scholz, 2000). The research studies on this side are quite thorough and extensive than the use side. Of the limited research studies on the use side, very few used appropriate reference theories that address system use as a behaviour (Trice and Treacy, 1988). These studies are also mixed, with only a very small number addressing the problem of low EIS usage.

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

The growth in popularity and the marked lack of empirical research studies to address the problem of low EIS usage necessitate this research study. The primary aim of the study is to identify, examine and provide some understanding of the social, cultural and organisational factors that explain the behaviour of managers towards using EIS. The results of this study will be use to suggest those social, cultural and organisational factors that need to be considered in the development and implementation of EIS to improve their usage in organisations.

This paper reports some preliminary results for this research study. The paper begins by presenting the research questions followed by presenting the theoretical perspective of the study. Definitions of EIS and a brief overview of EIS are then presented followed by some previous research studies on EIS usage. The paper continues by presenting the nature of executives' work and how EIS fits in. The theoretical framework, the research model, the hypotheses, and the research methodology for the study are next presented. Finally, the paper concludes by presenting some preliminary results of the study and an outline of work-in-progress.

RESEARCH QUESTIONS

Information systems are social systems. Studies (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 successful IS lie in the social and organisational context. Studies of the Stock Exchange Taurus system (Currie, 1995), the London Ambulance system (Beynon-Davies, 1995), the Confirm system (Oz, 1994) and some others (Sauer, 1993; Mitev, 1996; McBride, 1997) have also indicated that the complex interaction of the social, cultural, political and organisational elements with the technical elements result in the failure of information systems.

The success or failure of information systems is therefore inextricably linked with the dynamics of the organisation within which they exist. McBride (1997), who studied the rise and fall of an executive information system in a UK manufacturing company over nine years, concludes 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). Social, cultural and organisational factors are equally linked with system use (Bergeron, et al., 1995; Carlson & Davis, 1998; Venkatesh and Morris, 2000).

The main purpose of this research study, therefore, is to identify, examine and provide some understanding of the social, cultural and organisational factors that explain the behaviour of managers to use executive information systems, using a model from organisational behaviour as a theoretical foundation. The main research questions for the study are:

1. What are the major social, cultural, and organisational factors that explain the behaviour of managers towards using EIS in an organisational setting?
2. What is the relative importance of these factors in determining EIS use by managers?

THEORETICAL PERSPECTIVE FOR THIS 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 Diffusion of Innovations (e.g., Moore and Benbasat, 1991; Compeau and Meister, 1997); the Technology Acceptance Model (TAM) which is an adaptation of the Theory of Reason Action (TRA) (e.g., Davis, 1989; Davis, et al., 1989; Adams et al., 1992; Venkatesh and Davis, 1996; Kim, 1996; Venkatesh, 1999; Venkatesh and Morris, 2000; Elkordy, 2000); the Theory of Planned Behaviour (TPB) (e.g., Mathieson, 1991; Taylor and Todd, 1995); Social Cognitive Theory (SCT) (e.g., Compeau and Higgins, 1995a, 1995b; Hill et al, 1986, 1987) and Activity Theory (e.g., Engeström and Escalante, 1996; Nardi, 1996; Kuuti, 1996, 1999; Engeström, 1999; Blackler et al., 1999). This body of research has produced some useful insights into the cognitive, affective and behavioural reactions of individuals to technology, and into the factors which influence these reactions.

According to Compeau, et al. (1999 p.1), in each of the theories noted above, behaviour (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 behaviour. The beliefs are represented by the perceived characteristics of innovating in Innovation Diffusion research, by perceived usefulness and perceived ease of use in TAM, by behavioural beliefs and outcome evaluations in TPB, and by outcome expectations in SCT. Seddon (1997) refers to these as the net benefits (realised or expected) accruing from the use of a system. Affective responses are typically measured by attitudes towards use, an individual's evaluation of the behaviour as either positive or negative. These commonalities in the models reflect a belief in the cognitive basis of behaviour.

Compeau, et al. (1999, p.1) however suggest that, while TAM and the Diffusion of Innovations perspectives focus almost exclusively on beliefs about the technology and the outcomes of using it, SCT and the TPB include other beliefs that might influence behaviour, independent of perceived outcomes. The TPB model incorporates the notion of Perceived Behavioural Control (PBC) as an independent influence on behaviour, recognising that there are circumstances in which a behaviour 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 behaviour. PBC encompasses perceptions of resource and technology facilitating conditions, similar to those measured by Thompson, et al. (1991), as well as perceptions of ability, or self-efficacy (Taylor and Todd, 1995).

Regrettably, none of the above theoretical frameworks addresses explicitly some of the social and organisational factors that may influence/explain the user's behaviour to use IS.

A model developed by Triandis (1971, 1980) from organisational behaviour addresses, explicitly the net beliefs as well as the social, cultural and organisational factors that influence/explain behaviour. The Technology Acceptance Model (TAM), which is derived from Ajzen and Fishbein's Theory of Reason Action (TRA), is mostly used as a theoretical framework for IS use research studies. Triandis' model has some similarities with TRA and forms the theoretical foundation for this study. The model is described later in this paper.

DEFINITIONS OF EIS

There are various definitions for EIS by researchers, depending upon the perspective through which one sees the systems. What many EIS researchers think of an EIS can be summed up as:

Any information systems that can present critical information timely, clearly and accurately, and reveal the interrelationships and driving factors between key performance indicators (KPIs) to enable a faster and more accurate decision-making.

Typically, Kelly (1998) defines an EIS as "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" (p.3), whereas Thierauf (1991) defines an EIS as "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" (p.10), while Watson et al, (1991) define it as "a computerised system that provides executives with easy access to internal and external information that is relevant to their critical success factors" (p.14).

Bergeron et al (1991) present an EIS as "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" (p. 7). A similar definition of EIS was introduced by Elam and Leidner (1995) as "a computer-based information system designed to provide a senior manager access to information relevant to his or her management activities" (p.89), whereas Turban (1993) defines it as "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] designed to support the complex and multi-dimensional nature of top-level decision making" (p.404).

Pervan and Phua (1997) think of an EIS as "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" (p.64), whereas Bidgoli (1998) defines it as: "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".

Rightly or wrongly, a unique definition for these systems will seem to "box" the systems and limit the range of capabilities that the systems have as they evolve. Although EIS have spread and are spreading to other levels organisations and may be engaged by other users in other functional areas, in the context of this study, an EIS will be defined simply as:

A computer-based information system designed to aid managers in their managerial roles.

AN OVERVIEW OF EIS

EIS is most concerned with data and ways of interacting with the data. It is designed as structured reporting system which filters, extracts, and compresses a broad range of relevant current and historical information which are either internal or external to the organisation. It is used, in part, to monitor and highlight the critical success factors of the organisation as defined by the user.

New technologies such as data warehousing and data mining, enterprise resource planning (ERP) and the Web have recently increased the popularity of EIS rather than replace them (Carte, 1999; Bashein and Markus, 2000). These technologies gave the impetus for the widening use of EIS by managers whose decision must be timely in an increasingly competitive and uncertain environment (Bergeron et al., 1995). Data warehousing, for example, is generally regarded as the prerequisite for effective decision support or data mining systems and ROLAP and MOLAP (relational and multidimensional operations for online analytical processing) have given rise to such concepts as "slicing" and "dicing" of data which have added more flexibility and ease-to-use EIS (Bashein and Markus, 2000).

Executive Information Systems differ from traditional information systems in the following ways:
- specifically tailored to executive's information needs and decision-making style
- able to access data about specific issues and problems as well as aggregate reports
- provide on-line status access, trend analysis, exception reporting and "drill-down" capabilities
- access a broad range of internal and external data
- are particularly easy-to-use (typically mouse or touchscreen driven)
- are used directly by executives without assistance
- able to extract, filter, compress, and track critical data
- 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
- provide instant access to supporting details of any summary displayed on an EIS screen.

Recent studies (Wheeler et al., 1993; Frolick & Robichaux, 1995; Bergeron et al., 1995; Bashein and Markus, 2000) show EIS are spreading to other levels in some organisations. Subsequently they are referred to in some organisations as "enterprise-wide information systems" or "everyone's information systems" which still befit the acronym EIS, whereas in other organisations they are known by vendor product names such Enterprise Business Intelligence Systems, Balanced Scorecard or simply Scorecard.

THE NATURE OF EXECUTIVES' WORK AND HOW EIS FITS IN

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

An executive's role in an organisation 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 to playing other leadership roles expected of them from their subordinates. Much of the work of executives evolve around developing agendas, goals, priorities, strategies and plans that may not be documented, establishing networks, developing corporate relationships between people inside and outside the organisation 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 the work functions of executives as follows:

- Reviewing reports from their subordinates on the activities of many areas of the organisation;
- Monitoring news of the outside world;
- Meeting with managers in the organisation to discuss operations and strategy;
- Identifying problems and opportunities, and formulate plans to capitalise on them; and
- Leading the people who work with them to carry on their goals.

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

Strategic planning: The process of deciding on objectives of the organisation, 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 organisation'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 organisation. They 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 variety of the information are quite large. The information requirements for management control fall between the other 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 the controlling of those plans. However, all executives do planning and controlling in proportion to the different levels of the organisation.

Perhaps, Mintzberg's (1973) model is probably the best known characterisation of the activities of executives. He categorises executives' 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 EIS can assist an executive in all these roles.

EIS are designed with the capabilities to assist the executive to quickly search and scan the organisation's environment for any threats and opportunities for 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 organisation. In addition, because executives devote significant amount of time to acquire and analyse information through their interactions with people and processing of documents, EIS are also designed to save considerable amount 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 judgement is to help the executive in arriving at decisions quickly and more accurately.

PREVIOUS RESEARCH STUDIES ON EIS USAGE

The focus of 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 of studies focuses on EIS usage (see Table 1). The research studies on the development and implementation side are more thorough and extensive and form the bulk of the EIS literature than the studies on the usage side.

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 too, only very few use appropriate reference theories to address system usage. The focus of these research studies seems to be in line with the four suggested frameworks by Carisson and Widmeyer (1990) for researching EIS usage based on executives management activities, that is, 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. This seems to be adhered to with almost a complete neglect of research studies into the real use of the systems. These managerial activities should rather filter into determining the real use of the systems by the target users.

The focus of the few research studies on EIS usage can be broken into six areas (see Table 1). Of the six areas, only the focus on factors that influence/explain EIS use deals with the actual engagement of the systems; without which the other five cannot be realised. The research studies on the actual engagement are quite few, and of the few only a small number used appropriate reference theories to address system use as a behaviour (e.g., Bergeron, et al., 1995; Kim, 1996; Elkordy, 2000).

As can be seen from Table 1, whereas some of the research studies on EIS usage are looking at the impact of using the systems on managerial activities in general and decision-making process in particular, 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. While some other studies are looking at the use of the systems to respond to major business problems being intensified by global recessionary and competitive forces such as, adaptability to customer requirements, quality improvement and cost-containment, some others are looking at the mode of use of the systems, such as searching and scanning and improving executives mental model of the organisations. And while some of the studies are looking at the patterns of EIS use by executives, others are simply seeking answers to how frequently EIS is used by executives.

As mentioned above, it is only the sixth of the area of research studies on EIS usage in Table 1 – factors that influence/explain EIS use – that deals with the real use of the systems. And since system use is a behaviour (Trice and Treacy, 1988), appropriate reference theories are necessary to study it. The following sections outline the theoretical framework that forms the basis of this study.

Table 1: Classification of EIS research studies by research focus

Focus of Research Study	Researchers (for example)
Development and implementation	Wetherbe, 1991; Glover et al., 1992; Watson et al., 1992; Rainer & Watson, 1995; Frolick & Robichaux, 1995; McBride, 1997; Nandhakumar, 1996; Nandhakumar & Jones 1997; Watson, Houdeshel and Rainer, 1997; Bajwa et al., 1998; Li and Jordan, 1998; Vandenbosch, 1999; Carte, 1999; Watson and Carte, 2000; Scholz, 2000
Usage: i. Impact of use on - managerial activities - decision-making	Rockart & DeLong, 1992; Leidner & Elam, 1994a Schenk, 1992; Leidner & Elam, 1994; Elam & Leidner, 1995; Hoven, 1996; Handzic, 1997
ii. Overall benefits from use	Wallis, 1992; Nord and Nord, 1995
iii. Use to respond to competitive advantage and other business problems	Volonino, et al., 1995
iv. Mode of use (e.g. searching and scanning)	Frolick et al. 1997; Vandenbosch and Huff, 1997; Vandenbosch, 1999
v. Pattern of use (including frequency of use)	Seeley and Targett, 1999; Thodenius, 1995
vi. Factors that influence/explain use	Young and Watson, 1995; Bergeron, et al., 1995; Kim, 1996; Elkordy, 2000

THEORETICAL FRAMEWORK, RESEARCH MODEL AND HYPOTHESES

Trice and Treacy (1988) asserted that, system use is a behaviour whose determinants are not well understood in IS research, and that system use can 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), with Fishbein and Ajzen's (1975) theory of reasoned action (TRA) as the conceptual framework of choice employed to link user beliefs and attitudes to behaviour. Some researchers (Thompson et al., 1991; Bergeron et al., 1995) have 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).

This research study employs Triandis' framework as theoretical foundation. The research model for this study is derived from this theoretical framework, which takes into consideration the social, cultural and organisational factors that explain the behaviour of top-managers to use EIS. The research model is used to test empirically the hypothesised relationships among the factors.

In the following section, an overview of Triandis' theoretical framework is presented. This is followed by the research model and the hypotheses.

TRIANDIS' THEORETICAL FRAMEWORK

Some 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) relied on Fishbein and Ajzen's (1975) TRA, in their attempts to explain user behaviours. While TRA is very useful, it is somewhat incomplete in that it leaves aside factors which could also have an influence on behaviour intentions, and on behaviour itself. 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 behaviour, placing them in the broadest possible context.

Triandis (1980) states that *behaviour* has "*objective consequences,* (that occur 'out there' in the real world) which are *interpreted* (occur inside the person)" (p.198). He argues that as result of these interpretations, the person feels *reinforced*. Reinforcement, he states, "affects the *perceived consequences* of the behaviour in two ways: it changes the *perceived probabilities* that the behaviour will have particular consequences and it changes the *value of these consequences*" (p.198). These probabilities and values, Triandis argues, in turn, constitute one of the determinants of *behavioural intentions* to behave, which are one of the determinants of behaviour. Triandis further argues that *habits* and *relevant arousal* are also determinants of behaviour. But even when the intentions are high, the habits well established, and the arousal optimal, there may be no behaviour if the geography of the situation makes the behaviour impossible; thus *facilitating conditions* are seen as important determinants of behaviour. The interpretation of the objective consequences, Triandis argues, may differ because of genetic/biological influences or because of the previous situation-behaviour-reinforcement sequences that the individual has encountered in his/her history, that is, the individual's *personality*. Personality, Triandis states, internalises the *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 also concerned with behaviours 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 – what make a group or a category of people to distinguish between, for example, good and evil; clean and dirty; beautiful and

Figure 2: Triandis's theoretical framework–showing relations among the major variables
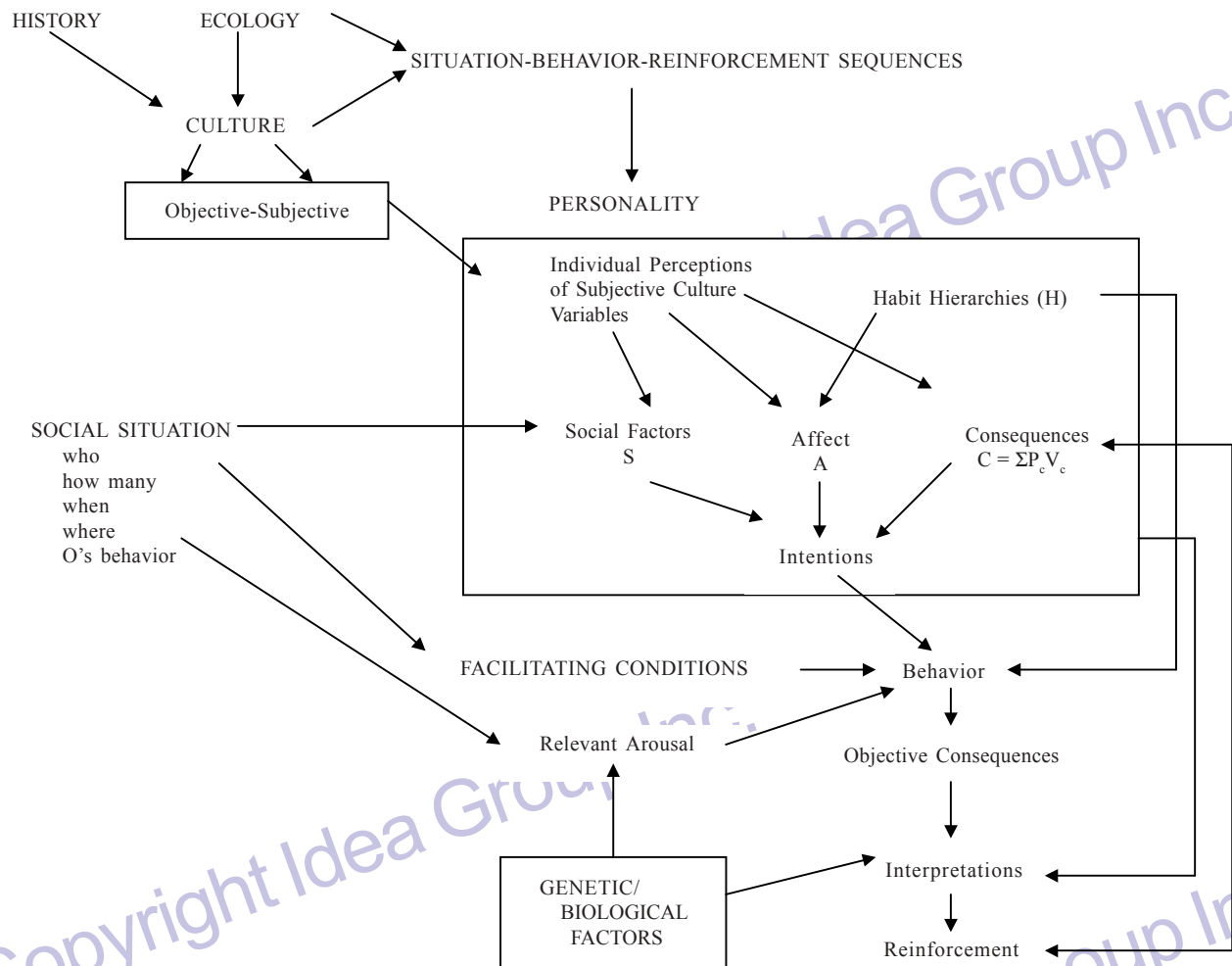
ugly; natural and unnatural; normal and abnormal; logical and para-doxical; and rational and irrational). These internalisations, according to Triandis, correspond with, but not identical to, the group's subjec-tive culture, and form the *social factors* that influence the intention to behave. In addition, Triandis argues, previous experiences of the individual with particular behaviours result in *affect* towards the behaviour, which in turn are among the determinants of intentions. Triandis adds that, personality is an outcome of *situation-behaviour-reinforcement* sequences and the *subjective culture* to which the indi-vidual is exposed. This subjective culture, Triandis explains, reflects the human-made part of the environment, which is shaped by *histori-cal* and *ecological* forces. In turn, personality has an impact on the way people will interpret the objective consequences of the behaviour.

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

Triandis notes that the arrows in the model show the directions of probable causality. Though he admits there are several bidirectional relationships which are not shown in order to keep the diagram simple.

Triandis defines *habits* as "situation-behaviour sequences that are or have become automatic, so that they occur without self-instruc-tion" (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 behaviour, 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 behaviours. Thompson et al (1991) who ignored habits in their studies acknowledged that habits "are clearly an important determinant of behaviour" (p. 130).

Triandis on the other hand defines *behaviour* 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 specific acts of hitting someone. Such acts he said have no meaning in themselves but acquire meaning from the social context, particu-larly 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, behaviour consists of the frequency, duration and/or in-tensity of the reactions by an organism to stimuli. *Behavioural inten-tions* which trigger behaviour, is defined 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 behaviour's conse-quences (p. 203).

The clear distinction that can be drawn between *habits* and *behaviours* from Triandis' framework is that, whereas habits are auto-

matic and occurring in the individual without self-instruction and with the individual usually not conscious of the reactions, behaviours are not. It can be deduced from the framework that *habits* are *behaviours* that have become automatic and acquired through the individual's past experience and ability to perform an act.

Relevant arousal is a physiological factor. Triandis states that "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 influence behaviour and is influenced by genetic and biological factors, as well as by the social situation, that is, the behaviour 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 to be performed. Consequently, the level of *facilitating conditions* is an important factor in explaining an individual's behaviour, and must be taken into account. In turn, facilitating conditions are dependent on the social situation.

Triandis (1971) argued that behaviour 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) expanded this term and called it s*ocial factors* which he describes as "the individual's in internalisation the reference groups' 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.

Affect relates to the individual's feelings of joy, elation, or pleasure, or depression, disgust, displeasure, or hate towards a given behaviour. Positive feelings will increase the intention toward a given behaviour, while negative feelings will decrease them. Affect is influence by the individual's habits and by his/her perceptions of subjective culture variables.

Consequences factor is considered as function of the *perceived consequence* of the behaviour 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 behaviour. The value of the consequence is the "affect attached to the consequence" (Triandis, 1980, p. 203). The model hypothesises that the higher the expected value of the behaviour, the more likely the person will intend to perform it. Consequences are influenced by an individual's perception of subjective culture variables as they do to social factors and affect variables. According to the model, consequences, in addition to influencing behaviour, through intentions, they are influenced by behaviour. That is, the objective consequences of a behaviour is interpreted by the individual, and "as a result of these interpretations, the person feels reinforced" (p.198).

THE RESEARCH MODEL

Bergeron et al (1995) who based their research model on Triandis' 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 is based on Triandis' framework, as shown in Figure 3. The model is in line with that used by Bergeron et al (1995) in a similar study. While, however, Bergeron et al ignored culture and social situation factors in their model, subjective-objective culture and social situation factors are taken into account in the operationalisation of the social factors construct in this study.

The affect construct consists of satisfaction with information similar to that of Bergeron et al. This model however takes into account satisfaction with the EIS system and satisfaction with the EIS support instead of satisfaction with access and satisfaction with assistance respectively as in Bergeron et al's model. In addition, satisfaction with the EIS system plan is included in this construct in this study.

The facilitating conditions construct consists of EIS development processes, EIS management processes, and organisational environment. In line with Triandis framework, the consequences construct consists of perceived usefulness (consequences) of EIS use. The behaviour construct consists of the frequency of EIS use and the internalisation of EIS use, similar to that of Bergeron et al (1995).

Similar to Bergeron et al (1995) and Thompson et al (1991)'s studies, genetic/biological factors are not included in this research model. Similarly, behavioural intentions are not included in line with the suggestions of Bergeron et al, Thompson et al, Moore and Benbasat (1992), and Ajzen and Fishbein (1980). This study seeks to explain behaviour towards the use of EIS but not to predict it, as did by Bergeron et al (1995), and therefore a longitudinal study is not also necessary.

Habits are operationalised by assessing the number of years of a top-manager's experience in using EIS and his/her ability to use the systems. Consequences are operationalised by assessing top-managers' perceived consequences (usefulness) of using EIS in his/her work and assessing the impact of using EIS on his/her performance. Social factors are operationalised by measuring the subjective norms, roles and values and the social situations on top-managers in using EIS. Affect is operationalised by measuring the top-manager's satisfaction with the information provided by the EIS, with the EIS itself, with the support provided in using the system, and with the system plan now and into the future. Facilitating conditions are operationalised by measuring what the EIS development processes, the EIS management processes and the organisational environment have on the top-manager's behaviour in using the EIS. Finally, behaviour is operationalised by measuring the frequency and the internalisation of EIS use. (Detail operationalisation available on request).

RESEARCH HYPOTHESES

The hypotheses to be tested based on the research model are as follows.

According to Triandis' framework, habits have a major contribution to the explanation of behaviour. This is supported by a previous study (Sugar, 1967, cited in Thompson, et al., 1991) which shows that habits are a strong predictor of behaviour. Sugar (1967) 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 behaviour was found to be habit, followed by norms and attitudes the least. According to Triandis, habits are closely related to an individual's past experience and ability to perform a given act and in his earlier work in 1972 (in association with Vassiliou, Vassiliou, Tanaka, and Shanmugam and with the assistance of Davis, Kilty, McGuire, Saral and Yang) he also acknowledged experiences as habits. Previous IS studies also identified computer experience as determinants of user attitude towards information systems.

According to the framework, habits lead to the derivation of some satisfaction or dissatisfaction (affect) which in turn explains behaviour, while habits themselves directly explain behaviour. The framework asserts that the frequency of doing or using something constitutes a behaviour and the internalisation of the probabilities and values of an act constitutes one of the determinants of behavioural intentions to behave, which are one of the determinants of behaviour. Accordingly, it is hypothesised that:

H1a: EIS experience positively correlates with the frequency of EIS use.
H1b: EIS experience positively correlates with the internalisation of EIS use.
H2a: Ability to use EIS positively correlates with the frequency of EIS use.
H2b: Ability to use EIS positively correlates with the internalisation of EIS use.

Previous research studies indicate that executives who had been using computer systems for a greater length of time were seen to have better attitudes in terms of user comprehension and participation

Figure 3: Research model for EIS use
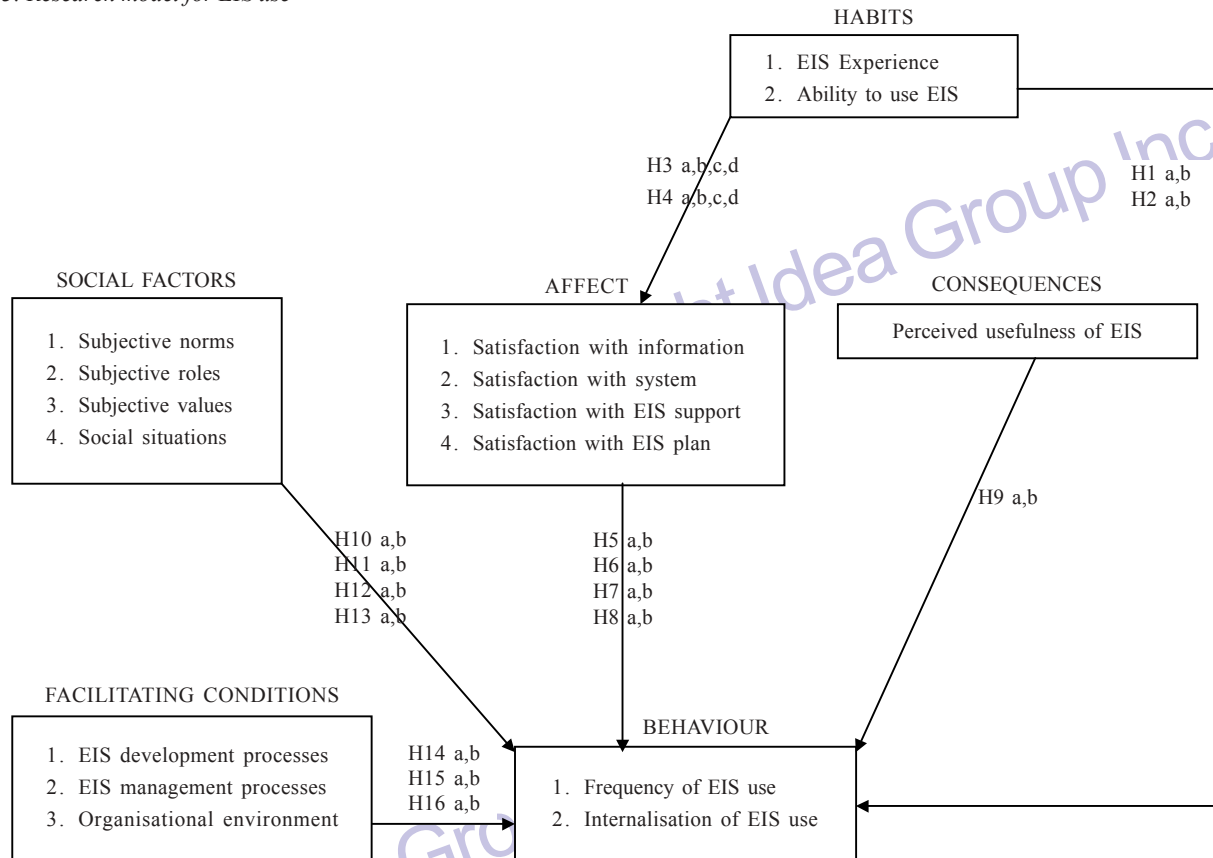
(Raymond, 1988). Similarly, Sanders & Courtney (1985) found the length of DSS use to be positively related to user satisfaction.

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 – information satisfaction. Previous studies have shown that users' satisfaction with the quality of information provided by a system, with the features of the system, and with the support provided by the support group or information centre are correlated with user satisfaction of information systems. Tafti (1992) synthesised the research in this area into information satisfaction, system satisfaction, and support group satisfaction, each of which consists of unique attributes (see the attributes of each in Appendix A), which correlate with user satisfaction of information systems. Previous studies (Amoako-Gyampah and White, 1993) also show that system plan correlates with user satisfaction of information systems. Accordingly, it is hypothesised that:

H3a: The longer the manager's experience with EIS, the higher the satisfaction with the EIS information attributes

H3b: The longer the manager's experience with EIS, the higher the satisfaction with the EIS features

H3c: The longer the manager's experience with the EIS, the higher the satisfaction with the EIS support group

H3d: The longer the manager's experience with the EIS, the higher the satisfaction with the EIS plan

H4a: The more the manager's ability to use EIS, the higher the satisfaction with the EIS information attributes

H4b: The more the manager's ability to use EIS, the higher the satisfaction with the EIS features

H4c: The more the manager's ability to use EIS, the higher the satisfaction with the EIS support group

H4d: The more the top-manager's ability to use EIS, the higher the satisfaction with the EIS plan

H5a: Satisfaction with EIS attributes positively correlates with the frequency of EIS use

H5b: Satisfaction with EIS attributes positively correlates with the internalisation of EIS use

H6a: Satisfaction with EIS features positively correlates with the frequency of EIS use

H6b: Satisfaction with EIS features positively correlates with internalisation of EIS use

H7a: Satisfaction with EIS support positively correlates with the frequency of EIS use

H7b: Satisfaction with EIS support positively correlates with the internalisation of EIS use

H8a: Satisfaction with EIS system plan positively correlates with the frequency of EIS use

H8b: Satisfaction with EIS system plan positively correlates with the internalisation of EIS use

The perceived consequences construct is consistent with the expectancy theory of motivation proposed by Vroom (1964). The basic premises of expectancy theory is that individuals evaluate the consequences of their behaviour in terms of potential rewards and base their choice of behaviour on the desirability of the rewards. Perceived consequences are also what Davis (1989) refers to as perceived usefulness in the technology acceptance model. Davis (1989) defines *perceived usefulness* as the extent to which a person believes that using a particular technology will enhance his/her job performance. 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 behaviour (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). Accordingly, it is hypothesised that:

H9a: Perceived usefulness positively correlates with the frequency of EIS use

H9b: Perceived usefulness positively correlates with the internalisation of EIS use

As described earlier, subjective culture consists of norms, roles, and values. Subjective norms is 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 behaviour 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 and Davis, 1996; Venkatesh, 1999; Venkatesh and Morris, 2000; Elkordy, 2000). It follows that subjective roles and values which are also social factors will as well have superior, peers, and subordinate as determinants. Subjective culture constitutes the work group influences on the individual at the workplace. Bergeron et al (1995)'s studies show that social factors determine EIS users behaviour. And according to Triandis (1980), subjective culture is the subjective aspect of the social environment.

According to Triandis framework, any behaviour occurs in a particular social situation which triggers specific levels of social factors. Adamopoulos (1976, cited in Triandis 1980)'s 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 behaviours that can appropriately occur in the situation). According to Triandis, social situations include behaviour settings. A behaviour setting has place-time coordinates, it consists of physical entities and process, and it evokes particular behaviours. Triandis cites a classroom as a behaviour 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, e.g., talk, listen, take notes, and so on.

Following the above, it is hypothesised that:

H10a: Subjective norms positively correlate with the frequency of EIS use

H10b: Subjective norms positively correlate with the internalisation of EIS use

H11a: Subjective roles positively correlate with the frequency of EIS use

H11b: Subjective roles positively correlate with the internalisation of EIS use

H12a: Subjective values positively correlate with the frequency of EIS use

H12b: Subjective values positively correlate with the internalisation of EIS use

H13a: Social situations positively correlate with the frequency of EIS use

H13b: Social situations positively correlate with the internalisation of EIS use

EIS development, as revealed by the literature review, 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 the systems. Critical factors for successful EIS development have been linked to executive sponsorship, user involvement and participation, technical and other resources, plan for development and spread, management of data problems and resistance. 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 (1996)'s in-depth case study of EIS in an organisation suggests that, in addition to these development success factors, developers need to the understanding of the social and organisational contexts 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 regards to information systems use in organisations will create facilitating conditions for their use. Policies regarding EIS can be say, making the systems accessible to top-managers anywhere, anytime. This may require the provision of laptops and connectivity facilities which will allow top-managers to dial into the systems at home, on business trips, even if they are overseas. McBride (1997)'s nine years case study of the rise and fall of an EIS in the UK manufacturing company also suggests the importance of the interactions between the business environment, the organisational 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 explain EIS users behaviour to use the systems. Accordingly, it is hypothesised that:

H14a: EIS development processes positively correlate with the frequency of EIS use

H14b: EIS development processes positively correlate with the internalisation of EIS use

H15a: EIS management processes positively correlate with the frequency of EIS use

H15b: EIS management processes positively correlate with the internalisation of EIS use

H16a: Organisational environment positively correlate with the frequency of EIS use

H16b: Organisational environment positively correlate with the internalisation of EIS use

RESEARCH METHODOLOGY

Data Collection Methods

Data for the pilot study was collected from two large organisations in Australia identified using EIS by mailed-out questionnaire. The questionnaire was pre-tested on six colleagues, refined with feedback received and pre-tested again. Each time a consultation was made with the Statistical Consulting Service at the university to verify the statistical validity of the questionnaire as well. The cover letter to the questionnaire mailed out had a statement guaranteeing the confidentiality the respondent and a statement of how the research has 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.

Ten questionnaires were mailed out and eight were returned, all of which were good.

Data Analysis

The analysis of the data at this stage was qualitative. The analysis of the main survey will be similar to Bergeron et al (1995) by calculating product-moment correlation coefficients (Pearson's r). Further analysis will be conducted by using stepwise regression to determine the relative importance of the independent variables in explaining EIS use.

PRELIMINARY RESULTS

Preliminary results suggest there is very high perceived usefulness of EIS in organisations. The results suggest social factors are much considered by users in using EIS. The results also suggest users consider satisfaction with information from EIS, support for the EIS system

and the EIS system itself a little more over EIS development plans in using EIS. The preliminary results also suggest users consider management processes associated with the EIS system more than the EIS development processes and the organisational environment in using EIS.

WORK-IN-PROGRESS

At the time of submitting this paper, the refinement of the questionnaire, using feedback from the pilot study, has been completed. About 600 questionnaires were mailed out for the main survey to mainly CEOs, CFOs and one other executive in about 200 organisations using EIS in Australia. About 130 responses have been received as at the date of submitting this paper.

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