

IS User Behavior Testing Using Triandis' Theoretical Framework: An Explanatory Research Design

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ABSTRACT

The intent of this paper is to share a research design and a research methodological approach to an explanatory user behavior testing for an information system using Triandis' Theoretical framework. Research frameworks generally available to information systems (IS) researchers were reviewed and the justification for choosing Triandis' Theoretical Framework was presented. Research methodology and data collection method for the study were detailed. Some guidelines for questionnaire design were presented. The research model for the study was presented and lessons learnt from the study were shared to guide other IS researchers.

Keywords: *IS User behavior testing, Research paradigms, Explanatory IS Research design, Research methodology, Questionnaire design and administration, Triandis' Theoretical Framework.*

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INTRODUCTION

Research designs and methodologies vary in any research study, including information systems (IS) research. This is to be expected since research design and methodology should and must be appropriate to the research problem and questions under investigation. Research problems and questions typically vary as well. However, there are general research designs and methodologies that researchers adopt and tailor to suit their research problems and questions. The selection and use of a particular research design and methodology is essential, because it is critical to the validity of the results declared in any research study. Inappropriate selection and use of a research design and a methodology will invalidate the results declared in any study: no matter how eloquently the results have been presented. As a result of this, good researchers spend some time to think through the research design and methodology for their studies.

This paper presents a research design and a research method appropriate for explanatory IS user behavior testing (ISUBT). The particular IS used in the study is executive information systems (EIS). The study in question used Triandis' Theoretical Framework - a model from social psychology and organizational behavior - as its theoretical foundation. The study investigated factors that explain users' behavior towards using EIS in organizational settings.

The paper first briefly looks at research frameworks generally available to IS researchers. This is followed by an exposition of the common theoretical frameworks generally used in IS research and then Triandis' Theoretical Framework and a research model are presented. Next, the research design, research methodology, data collection method, questionnaire design are presented. The rationale for the selection of the specific procedures and methods are explained. This is followed by the pilot study, the administration of the main survey questionnaire and the

results. The paper finally concludes with the overall lessons learnt in the study and suggestions to other IS researchers.

RESEARCH FRAMEWORKS AVAILABLE TO IS RESEARCHERS

Information systems are social systems (e.g., Sauer, 1993; McBride, 1997), therefore, IS inquiries generally turned to be social science research in nature. The task of conducting an inquiry has been complicated by the fact that there is no overall consensus about how to conceptualize the doing of IS research. Generally there are two camps from which IS research is conducted – *qualitative* and *quantitative* – and there has been sporadic warfare between these two camps until recently.

Ontology, Epistemology and Human Nature

Generally four sets of assumptions are used to conceptualize social science research – *ontology*, *epistemology*, *human nature* and *methodology* (Burrell and Morgan, 1980). Ontological assumptions concern the very essence of the phenomena under investigation. A basic ontological question, for example, concerns whether the “reality” to be investigated is external to the individual; or whether “reality” is of an “objective” nature or the product of individual cognition; or whether “reality” is given “out there” in the world or the product of one’s mind (Burrell and Morgan, 1980). Epistemological assumptions are about the grounds of knowledge, about how one might begin to understand the world and to communicate this knowledge to fellow human beings. Assumptions relating to human nature concern the relationship between human beings and their environment. Ontological, epistemological and human nature assumptions for an investigation have direct implications for the methodological nature of the

investigation (Burrell and Morgan, 1980). There is a lot of debate about these assumptions, the discussion of which is beyond the intent of this paper.

Paradigms, Methodologies and Methods

A *paradigm* is “a set of beliefs, values and techniques which is shared by members of a scientific community, which acts as a guide or map, dictating the kinds of problems scientists should address and the types of explanations that are acceptable to them” (Kuhn, 1970, p. 175). A paradigm, in simple terms, is a set of prepositions that explain how the world is perceived. It contains a world view. It is a way of breaking down the complexity of the real world to tell researchers and social scientists what is important, legitimate and reasonable (Patton, 1990; Sarantakos, 2002).

The three dominant paradigms in social science are: *positivism*, *interpretivism* and *critical theory*. The other two new additions in order of dominance are *constructivism* and *participatory* (Lincoln and Guba, 2000; Sarantakos, 2002). There are perceptions of reality, of human beings, of the nature of science, and of the purpose of research distinctly held for each of these paradigms. For example, positivists’ perceptions of human beings are that human beings are rational individuals obeying external laws without free will. While interpretivists perception of human beings are that human beings are creators of their world and make sense of the world they live in with no restriction from external laws. And they create systems of meanings for themselves (see e.g. Sarantakos, 2002).

A *methodology* on the other hand is a model, which entails theoretical principles as well as a framework that provides guidelines about how research is done in the context of a particular paradigm (see e.g., Cook and Fonow, 1990; Lather, 1992). In simple terms, a methodology

translates the principles of a paradigm into a research language, and shows how the world can be explained, handled, approached and studied (Sarantakos, 2002). *Methods* however refer to the tools or instruments employed by researchers to gather empirical evidence or to analyze data. Methods are chosen on the basis of criteria related to or even dictated by the major elements of the methodology in which they are embedded – such as the perception of reality, definition of science, perception of human beings, purpose of research, type of research units, etc. In a sense, methods are a-theoretical and a-methodological approach to carrying out research (Sarantakos, 2002).

Despite these “frameworks” suggesting to some extent how one can go about conducting a research, it is sometimes unclear and difficult when it comes to details and choice of suitable frameworks to suit one’s research objectives. In the next section, theoretical frameworks generally used in IS research are presented.

THEORETICAL FRAMEWORKS GENERALLY USED 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 individuals' reactions to information technology. IS researchers generally have not drawn on other disciplines for their work and some IS researchers have argued that these shortcomings may explain the conflicting results obtained in IS research (Goodhue, 1988; Swanson, 1982).

A variety of theoretical perspectives are currently used by IS researchers in studying individuals' reactions to computing technology. Some of the theoretical frameworks used 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 TAM, by behavioral beliefs and outcome evaluations in the TPB, and by outcome expectations in the SCT. Seddon (1997) refers to these as the net benefits (realized or expected) accruing from the use of a system.

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 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.

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, Triandis' theory 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 and beliefs that link the act to future consequences.

Triandis' Theoretical Framework is used as a theoretical framework in the EIS user behavior testing study from which the experience gained from the study is being shared in this paper. The next section presents the theoretical framework and the derived IS user behavior testing research model.

TRIANDIS' THEORETICAL FRAMEWORK

Triandis' Theoretical Framework is a model from social psychology and organizational behavior. It has a larger number of relevant variables in a theoretical network of interrelated hypotheses around the constructs of attitude and behavior, which are placed in the broadest possible context. The major constructs and concepts of Triandis' (1980) Theoretical Framework and the relations among them are shown in Figure 1.

Concepts Underlying Triandis' Theoretical Framework

Triandis (1980) contends 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.

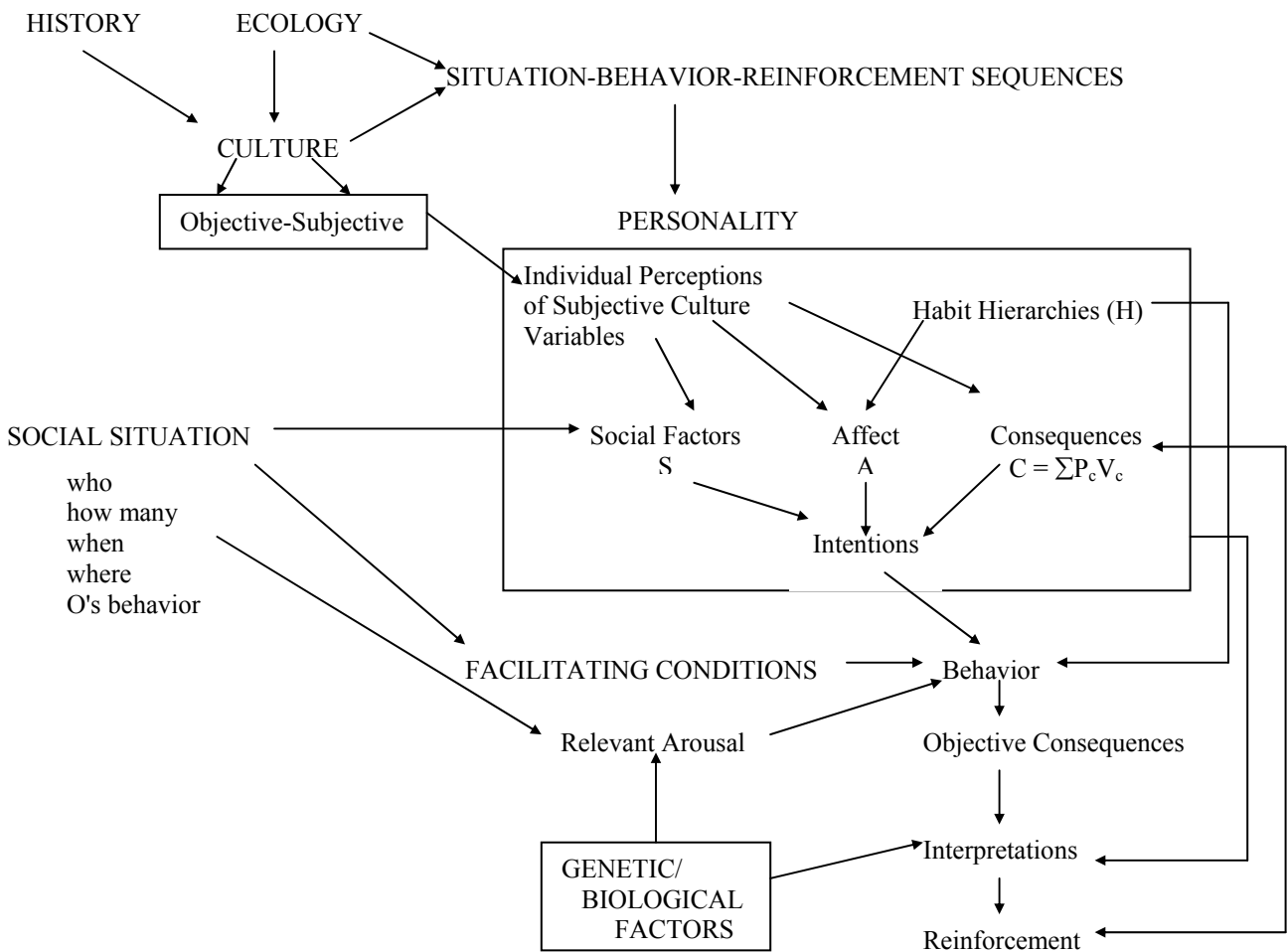


Figure 1: Triandis' Theoretical Framework - showing Relations among the major variables
Source: Triandis (1980)

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 (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). Detail definitions of constructs in the framework can be found in Triandis (1980).

IS User Behavior Testing Research Model

Based on Triandis’ Theoretical Framework presented above, a research model for IS user behavior testing (ISUBT) is presented in Figure 2. Figure 2 shows the constructs that are necessary to test a user behavior of using an information system, including IT. Suitable variables for each construct can be determined based on the literature. The model was tested using the research model with variables presented in Figure 3. The next section presents the research design for EIS user behavior testing in which ISUBT model was used.

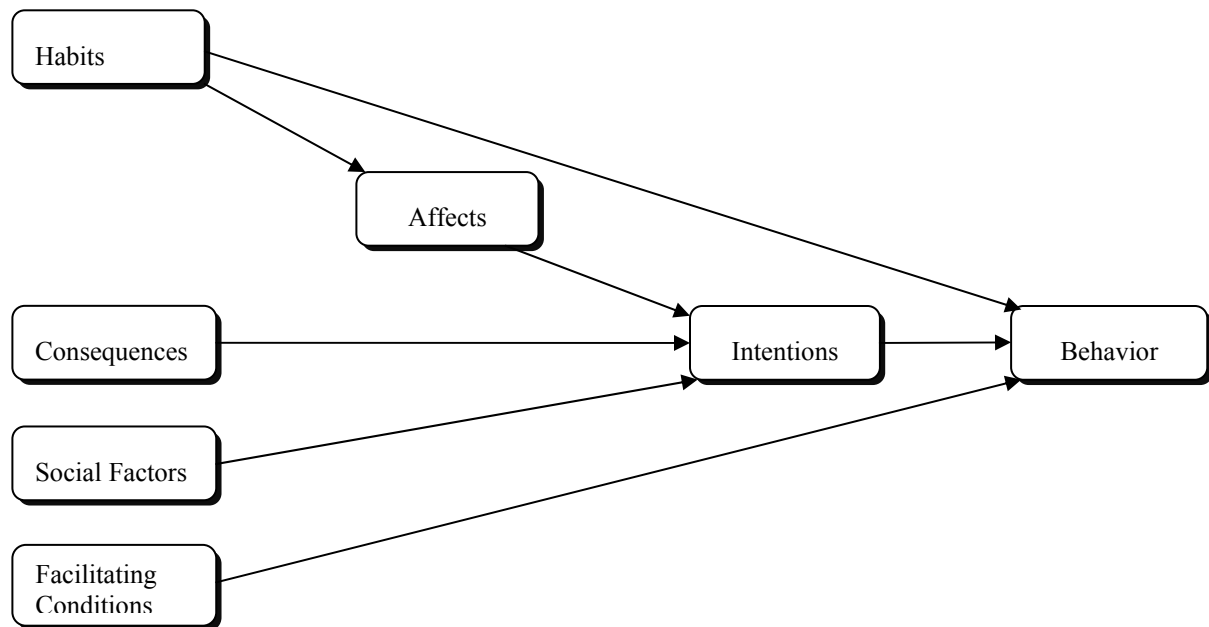


Figure 2: IS User Behavior Testing Model

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 problem that the study in question in this paper sought to provide solutions to is: *the failure of executive information systems (EIS) in organizations due to underutilization or non-usage of these systems*. The 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?*

The paradigm chosen for ISUBT study is *positivism*. The research design used the design guidelines provided by Babbie (2001). Table 1 describes the important research design and

methodology aspects employed in the study. More specific details are discussed below.

Table 1: Summary of Research Design and Methodology

Attribute	Characteristics
Nature of Research	Exploratory and Explanatory
Unit of Analysis	Individuals
Time Dimension	Cross-sectional
Research Methodology	Field Study
Data Collection Method	Mail Questionnaire Survey

Nature of Research

There are three common natures 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 to report 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.

The nature of research for EIS user behavior testing is both *exploratory* and *explanatory* since, the purpose of the research is primarily to identify the important social, cultural, political and organizational factors that explain the behavior of executives towards using EIS in organizational settings.

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 mostly 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 the study examines factors that may influence an individual's behavior to use EIS, the unit of analysis therefore is an *individual* (actor). In the 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.

Time Dimension

Time plays an important role in the design and execution of research (Babbie, 2001). Researchers basically have 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. In a *longitudinal* study, on the other hand, 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.

Cross-sectional approach was considered most appropriate and feasible for the study. The study seeks to explain behavior towards the use of EIS but not to predict it, therefore, a

longitudinal study is not necessary (Bergeron et al., 1995). The next sections look at research methodology, data collection methods in IS user behavior testing.

RESEARCH MODEL FOR EIS USER BEHAVIOR TESTING

Using the IS user behavior testing model derived above, a research model was adapted for EIS user behavior testing as shown in Figure 3. The research model and it is similar to that used by Bergeron et al. (1995), which was based on Triandis' Theoretical Framework.

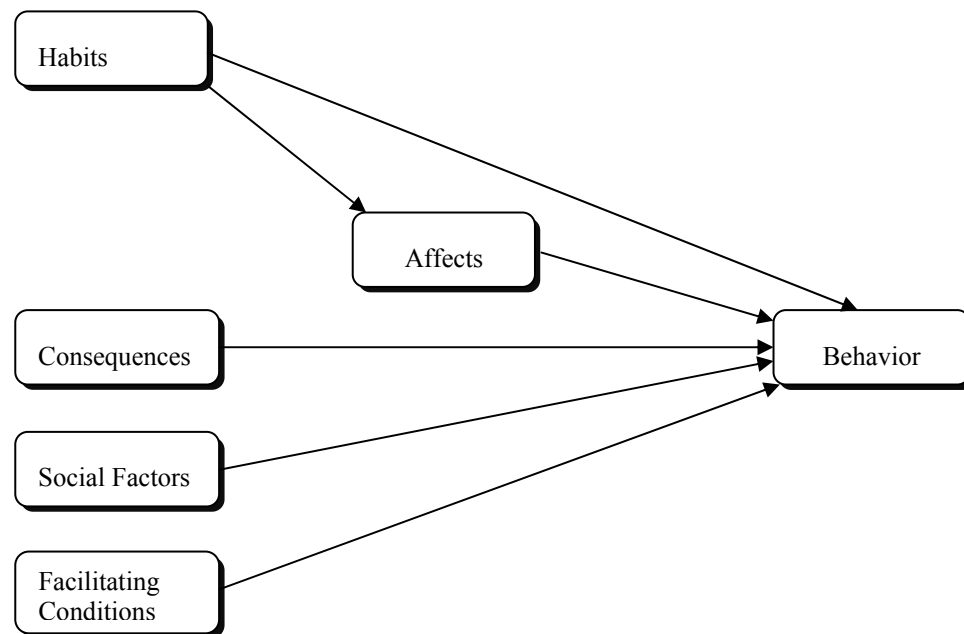


Figure 3: Research Model for EIS User Behavior Testing

The variables for the **habits** construct are *EIS experience* and *ability to use EIS*. The variables for the **affect** construct in the study consist of *satisfaction with EIS information*, *satisfaction with EIS system*, *satisfaction with EIS support*, and *satisfaction with EIS development plans*. Consistent with the Triandis' Theoretical Framework, the variable for the **consequences** construct is *perceived usefulness* (consequences) of EIS use. 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 **facilitating conditions** construct are *EIS development processes*, *EIS management processes*, and *organizational environment*. 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 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).

The *intentions* construct was not included in the research model because survey questions for the constructs leading into it were framed to include questions that determined the user's intentions.

(For the sake of publication space allowed, the operationalization of constructs and measurement instruments are available on request to the corresponding author).

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). EIS user behavior testing employed *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).

DATA COLLECTION METHOD

There are mainly four data collection methods in real world inquiries: *Interview*; *Questionnaire survey*; *Observations*; and *Document inspection*. Each of these methods has their advantages and disadvantages. The data collection method used for EIS user behavior testing was questionnaire survey.

There are three main methods of administering questionnaire surveys (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).

Reasons for choosing Mail Questionnaire Survey for the Study

The mail survey method using ordinary mail was chosen for the study for three main reasons. First, because there has been no study on user behavior towards the use of EIS in Australia where the study was conducted and 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 makes scheduling face-to-face or telephone survey very time consuming and economically infeasible.

Things to consider when using Questionnaire Survey Method

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 usual. 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, & 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 so as 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 viewed to be appropriate in designing the questionnaire and the administration of the survey for the EIS user behavior testing study. The following section presents the questionnaire design for the study.

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.

THE QUESTIONNAIRE DESIGN FOR THE STUDY

In designing the survey questionnaire for the study in question, the procedures and guidelines provided by Sarantakos (2002), Babbie (2001), Dillman (1978, 2000), Wiersma (1986, 2000) and Robson (1996) were used as a guide. Some questions in the questionnaire were also adopted from other studies. The questionnaire was designed in two stages.

In stage 1, the questionnaire was pre-tested in full three times on six colleagues at their workplaces. 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. In addition, brief descriptions and definitions were provided at the beginning of each section of the questionnaire so that 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 respondents were thanked for their valuable contributions and asked to make any further comments they wished to contribute.

An application was initially made to the Human Research Ethics Committee (HREC) of the University where the research was conducted 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. The design of the cover letter

followed the suggestions and guidelines provided by Sarantakos (2002), Babbie (2001), Wiersma (2000) and Robson (1996).

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 HREC 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 valid 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.

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 a variable which turned out to be one of the important variables that explained the behavior of users in using the systems.

The lesson learnt here was that, pilot surveys can contribute to remarkable improvement of main survey questionnaires. (For the sake of publication space allowed, the resultant main survey questionnaire is available on request to the corresponding author).

MAIN SURVEY

In this section the administration of the main survey questionnaires, the organizations surveyed, the survey results and the lessons learnt from the study are presented.

Administration of the Survey Questionnaires

The administration of the survey questionnaires for the study involved the process undertaken in distributing the questionnaire packages to the respondents, monitoring of returned questionnaires, and the follow-ups 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 completed 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.

The 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. The second and the third batches were mailed out on November 12 and 14 respectively. The fourth, fifth and the sixth batches were mailed out on November 19, and the last batch was mailed out on November 23. A total of 700 questionnaire packages were mailed.

The survey questionnaire package was contained in a pre-paid A-4 size envelope with the University where the research was conducted'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 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 chief investigator.

Monitoring the Questionnaire Returns

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 questionnaire packages were returned for various reasons. Some respondents emailed, telephoned or wrote to inform us of their company policies not to participate in surveys. Some other respondents emailed and/or telephoned to discuss the research and offered additional valuable comments.

Follow-up Mailings to Non-respondents

The follow-up mailings to non-respondents were delayed until February the following year. This was done for the obvious reason that the months of December and January were 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. 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 460 follow-ups to non-respondents were made.

Main 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 from the first mailed outs, out of which 95 were usable for analysis. A total of 115 responses were received from the follow-up mailings, which was higher than expected. Out of the 115 responses received 49 were usable for analysis. This brings the

overall response total to 260 (145 + 115) giving a gross response rate of 37.14% ($260 \div 700$), of which 144 (95 + 49) responses, that is, 20.57% ($144 \div 700$), were suitable for analysis.

A total of number of 116 responses were not usable either 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. Table 2 shows the summary of the responses to the questionnaires.

Table 2: Summary Responses to Questionnaires

Total Number of Questionnaires Distributed	700
Total Number of Questionnaires Returned	260
Total Number of Unusable Questionnaires	116
Total Number of Usable Questionnaires for Analysis	144
Gross Response Rate	37.14%

The total number of responses and usable questionnaires received in the study is good compared with similar EIS studies in the US, the UK and Canada. In a 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 the study was considered satisfactory.

The lessons learnt here were that: 1. The timing of a survey is important if good response rate is to be achieved; 2. The cover letter for the follow-up to non-respondents should be worded in a manner to let the non-respondent feel the importance of the study and a prompt to respond urgently; and 3. The follow-up mailings should also be timed to warrant a good response rate.

CONCLUSION

This paper presented a research design and a methodology for a study an explanatory user behavior testing for users of EIS. The research design and methodology have been chosen to suit positivists' perceptions. 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. The data collection method has been elaborated and justified. 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.

The lessons learnt from the study were that a significant amount of time needs to be devoted in understanding research "frameworks" available to IS researchers and selection of the appropriate one(s) that suit one's investigation. A lesson was also learnt that the appropriate approach to the design of a research, especially the questionnaire, is vital for the success of the research. It was also learnt that pilot surveys contribute remarkably to the improvement of the main research. A conclusion was drawn that the timing of the administration of a survey is essential to ensure good response rate. Although the total of responses received from the follow-

up mailings was higher than expected, but the number usable for analysis was relatively small.

Further research is required to investigate why.

The lessons learnt from this study would be helpful to other IS researchers. The emphasis is that information systems are social systems and IS research mostly falls in the domain of social science. Attempts should therefore be made to understand the research frameworks in social science that are appropriate to IS research studies.

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