

Original Paper

The Research Design and Methodological Framework into the
Study of the Adoption of Decision Support Systems by
Knowledge Workers and Lesson Learned

Emmanuel M. Ikart^{1*}

¹ Corrective Services NSW, Department of Justice, Australia

* Emmanuel M. Ikart, Corrective Services NSW, Department of Justice, Australia

Received: July 16, 2020

Accepted: August 16, 2020

Online Published: August 18, 2020

doi:10.22158/ibes.v2n3p32

URL: <http://dx.doi.org/10.22158/ibes.v2n3p32>

Abstract

The method in which Information System (IS) research is conducted maybe considered in respect of the research philosophy undertaken, the research methodology utilized, and the research instruments employed in search of the research objective for a solution of the research problem. Depending on the objectives, research problems and research areas, IS research design and methodology vary considerably, yet basic approach towards IS research remains the same. Whereas the research design defines the structure and strategy for the study plus the tactical plan by which the study will be executed so as to bring empirical evidence to bear on the research problem, the methodology defines the scientific way of studying how the research is done scientifically. This paper presents the research design and methodology into the study of the adoption of Decision Support Systems (DSS) by Knowledge Workers. The paper also centered its discussion on the procedures through which the questionnaire was pilot tested and administered into a satisfactory response rate. Two extreme philosophies namely; positivism and interpretivism were employed as rationale choices of epistemology. The lessons learnt were remarkable. The pilot study ensured that appropriate language was used for scale items and the questionnaire was meaningful and comprehensive. The study underscores key factors influencing the response rate to mail surveys namely; incentives, survey design quality, use of reliable and valid instruments, addressing issues of instrument rigor, timing and administration of survey. The paper makes useful contributions to social sciences research.

Keywords

DSS, research design, methodology, methods, knowledge workers

1. Introduction

The method in which IS research is conducted maybe considered in respect of the research philosophy undertaken, the research methodology utilized and the research instruments employed in search of the research objective, and for a solution of the research problem (Goundar, 2013; Arnott & Pervan, 2005; Galliers, 1991; Isrobert, n.d). Depending on the objectives, research problems and research areas, IS research design and methodology vary considerably, yet basic approach towards IS research remains the same (Goundar, 2013; Ditsa, 2004; Avison & Fitzgerald, 2000). Whereas the research design defines the structure and strategy for the study plus the tactical plan by which the strategy will be executed so as to bring empirical evidence to bear on the research problem, the research methodology defines the scientific way of studying how the study is done scientifically (Kerlinger, 1986; Avison & Fitzgerald, 2000). The methodology sets out the principles of methods which in any particular situation have to be reduced to a method uniquely suited to that particular situation (Checkland, 1981). Methods on the other hand, are tools or instruments namely; experiments, surveys and other tests used in research to gather empirical evidence and/or to analyze data. Methods focus on the types of methods considered suitable to collect and analyze the evidence needed to implement the research plan. Methods are chosen on the basis of the criteria related to or even dictated by a key element (e.g., the purpose of research) of the research methodology in which it is embedded (Goundar, 2013; Avison & Fitzgerald, 2000; Galliers, 1991; Kerlinger, 1986; Checkland, 1981). The methodology provides the platform to map out and advance the research in the right direction and to explain, describe and predict research phenomena. Consequently, the choice of research design and methodology for IS research is critical to the validity of the results. Researchers need to be confident that their test actually measure what it is supposed to. Moreover, the data that is collected and analysed via a good research design and methodology should provide information that is factual or at least; accurate, reliable and valid. Considerably, objectivity and impartiality are a critical aspect of a good research design. Therefore, an IS research design requires a clear objective and an unbiased approach that is consistent with a good research process so as to obtain appropriate answer to the research question and establish a high level of confidence in business decisions (Anortt & Pervan, 2005; Sarantakos, 2002; Isrobert, n.d.). As a matter of fact, an inappropriate selection and use of research design and methodology might invalidate the results of the study and reduce the confidence in business decision making, no matter how logically the results have been presented (Ditsa, 2004). Certainly, the need is for IS researchers concerned with research to pay due attention in crafting appropriate methodology for improving the quality of research and business decisions (Goundar, 2013; Ditsa, 2004; Avison & Fitzgerald, 2000). As the first of its kind, this paper presents the research design and methodology into the study of the adoption of DSS by Knowledge Workers. DSS is the part of the IS discipline including Executive Information Systems (EIS) and business intelligence systems (BIS) that is focused on supporting and improving managerial decisions. The decision made using DSS can fundamentally change the nature of a business (Arnott & Pervan, 2005). The use of such systems is thus a necessary condition through which executive performance can be significantly affected (Begeron et al.,

1995). Beyond the research design and methodology, the scope of this paper covers the procedures through which the questionnaire for the study in question was pretested and administered into a satisfactory response rate. The remainder of this paper is organized as follows: first, we present the research design, methodology and methods in IS research; second, we look at the paradigm and the epistemology of the research study; third, we examine the nature of the study, type of investigation, unit of analysis and time horizon of the study; fourth, we present the research strategy, including the methodology adopted for the study; and fifth, we explore data collection methods used in IS studies in relation to the mail survey method we utilized in the pursuit of our research goal; sixth, we look at the questionnaire design for the study and the pilot study; seventh, we present a brief summary of the conceptual frameworks drawn on the work of Davis (1989) and Triandis (1979). This is followed by the administration and monitoring of the returns of the mail survey, follow-up mailings and the response rate. Finally, we conclude the paper with a discussion of the experiences, lessons learnt and implications for IS research.

2. Method

2.1 Research Design, Methodology and Methods

Generally, a research design is a structure and plan of inquiry strategically developed so as to obtain appropriate and accurate answers to research questions as economically as possible. The plan is the overall program of the research study. The plan is purposefully and specifically framed and implemented to bring empirical evidence to bear on the research problem (Kerlinger, 1986; Kothari, 2004; Goundar, 2013). As illustrated below in Table, and, also throughout this paper, the research design for our study in question incorporates the following aspects:

- A clear statement of the research problem;
- Show what will be the objective and how this will be accomplished;
- Procedures, techniques and tools to be used to gather relevant information;
- How the chosen methods will be applied to answer the research questions;
- Key aspects of research design including research methodology;
- Population samples to be studied and;
- Data collection method, research instruments and data analysis method.

The research problem that our study in question sought to provide a solution to is the question: Why knowledge workers choose or choose not to use DSS tools in their roles. Specifically, the study investigates the following two research questions:

- 1) What are the social, cultural and organizational factors that might influence knowledge workers to use DSS in an organization?
- 2) What is the relative importance of this factor in determining DSS usage by knowledge workers?

To answer these questions validly, objectively and accurately the study in question adopted a combination of positivist and interpretivist paradigms towards IS research. Whilst the positivist

paradigm was used almost for the entire study, the interpretive study was used mainly for interviewing and data analysis at the pilot study. Data for the study was collected by mail surveys of a representative sample of knowledge workers that used DSS in their roles in organizations in Australia. Table 1, illustrates the research design guidelines and methodology employed in this paper (Babbie, 2004; Sekaran, 1992). More specific detail of these guidelines is presented in the paper commencing with a research methodology.

Table 1. Research Design & Methodology for IS Research Studies

Research Paradigm & Research Epistemology	Positivism, Interpretivism
Nature of the study	Exploratory, Explanatory & Descriptive Studies
Unit of Analysis	Individuals
Types of Investigation	Casual, Correlation Investigations
Time Horizon	One-shot (Cross sectional)
Research Strategy & Data Collection Methods	Mail Survey

Source: adopted from Sekaran (1992) and Babbie Babbie (2004).

A *Methodology* is characterized as a science of studying how the research is done scientifically or, as a systematic method of solving the research problem (Avison & Fitzgerald, 2000). Within the methodology we are able to examine a range of steps undertaken by researchers in studying the research problem and the logic behind those steps in the context of the research study. At the general level, a *Methodology* can be described as a recommended series of steps and procedures undertaken in the course of conducting a research study. The *Methodology* aids researchers to explain, describe and predict the research phenomena (Goundar, 2013; Kothari, 2004). Clearly, the *Methodology* formed the internal research environment so conceived, for understanding and identifying the right types of research philosophy, research strategy, nature of study, time horizon, unit analysis and data collection method as well as the right techniques, procedures, and tools to process and analyzing information about the research project (Goundar, 2013; Avison & Fitzgerald, 2000). In IS research papers the methodology section allows the reader to critically evaluate the study overall validity and reliability. Nevertheless, the characterization of methodology raises the questions:

- Should the use of methodology produce same results each time?
- Does the methodology include specification of techniques?
- Does a collection of techniques and tools constitute a methodology?
- What is the difference between a methodology and method?

Whereas a methodology is a set of principles of method which in any particular situation has to be reduced to a method uniquely suited to that particular situation (Checkland, 1981), *Methods* on the

other hand are tools or instruments, e.g., surveys, experiments and/or other tests used in research to gather empirical evidence or to analyze data. *Methods* focus on the types of methods deemed suitable to collect and analyze the evidence needed to implement the research plan. *Methods* are chosen on the basis of criteria related to or even dictated by the key elements of the methodology in which they are embedded such as the purpose of research, perception of human beings, and types of research units (Goundar, 2013; Avison & Fitzgerald, 2000; Galliers, 1991; Kerlinger, 1986; Checkland, 1981). In line with this explanation, the research methodology presented in Table 1 (above) underscores the precise ideas and platform to mapping out and advancing the research in the right direction including the techniques and tools to achieve the research objectives. Correspondingly, the external environment of the research combines to form a part of the research through the methodology which guides the researcher to extract critical information for establishing the research objectives, reviewing relevant literature and obtaining other tools and instruments for research (Goundar, 2013; Galliers, 1991; Arnott & Pervan, 2005). Although IS research studies may differ in terms of the topic areas, research objectives and the flow of the information (including this study), by adopting an appropriate methodology their objectives are realizable (Ditsa, 2004; Goundar, 2013).

2.2 Research Paradigm and Research Epistemology

Paradigm refers to a specific technique of thinking about a problem scientifically, including a number of achievements that have been acknowledged as the foundation of further practice (Kuhn, 1970). To put it simply, a paradigm is a set of propositions that explain how the world is perceived, and it contains a world view, a way of breaking down the complexity of the real world, telling researchers and social scientists what is important, what is legitimate, and what is reasonable (Patton, 1990; Sarantakos, 2002). Thus, *Paradigms* allow researchers to identify the relationship between variables and to specify appropriate methods for conducting a particular research (Guba & Lincoln, 1994). Paradigm is also, a belief about the way in which data about a phenomenon should be gathered, analyzed and used. Thus, they focus on methods deemed suitable to collect and analyze the evidence. As suggested by Checkland (1981), the complexity of the variety of the real world can be reduced in an experiment whose results can be validated by its repeatability. Furthermore, social scientists can build knowledge through theory testing and by the refutation of hypotheses. Five types of paradigms such as *positivism*, *realism*, *post-positivism*, *critical theory* and *constructivism* have been identified for social sciences research. Accordingly, each of these paradigms holds a unique perception of reality, of the human beings, of the nature of science and of the purpose of research (Arnott & Pervan, 2005; Guba & Lincoln, 1994; Sarantakos, 2002). These philosophical assumptions, which relate to the underlying epistemology, guide the research (Myers, 2004). *Epistemology* refers to assumptions about knowledge and how knowledge can be obtained (Myers, 2004). *Epistemology* is the grounds of knowledge, and it is concerned with the method in which the world may be legitimately investigated, and what may be considered as knowledge and progress. *Epistemology* addresses the questions: What is knowledge? How is it acquired? What do people know? And how do we know what we know? Research in the field

of epistemology focuses on analyzing the nature of knowledge, and how knowledge is linked with the notions of truth, beliefs and means of the production of knowledge (Avison & Fitzgerald, 2000; Encyclopedia of Philosophy, 1967).

The *positivism* (sometimes called scientific) and *interpretivism* (also known as anti positivism) are the two extreme paradigms or philosophies that are frequently identified in Western tradition of sciences (Avison & Fitzgerald, 2000; Galliers, 1991). The *positivism paradigm* comprises of natural science and has influenced social scientists as a rational system. The positivism paradigm assumes that one reality is driven to a large extent by universal laws and truths and principles without free will. *Positivist studies* generally attempt to test theory, in an attempt to increase the predictive understanding of the phenomena (Myers, 2004). Researchers adopting this paradigm claim to be objective, neutral and independent. The problem solving process in the positivism paradigm commences with formulating hypotheses that are subject to empirical testing through quantitative method (Buttery & Buttery, 1991). The quantitative method provides objective value free and unambiguous interpretation of reality (Guba & Lincoln, 1994). Pursuant to this, as reported by Myers (2004), Orlikowski and Baroudi (1991) classified an IS research as positivist where there was evidence of formal propositions, quantifiable measures of variables, hypothesis testing and the drawing of inference about a phenomenon studied. *The interpretivism paradigm* on the other hand, assumed that there is no single truth that can be proven by positivism paradigm investigations. *Interpretivists* claim that it is merely by the subjective interpretation of and intervention in reality can reality be fully understood. The study of phenomena in their natural environment is the belief by *interpretivism paradigm*, along with the acknowledgement that scientists should involve in those phenomena they study or events be described from the participants' perspectives. Social processes cannot be captured by hypothetical deductions. However, they admit that there may be various interpretations of reality, but maintain that these interpretations are in themselves a type of scientific knowledge they are pursuing (Galliers, 1991). Our study in question can be classified as both positivism and interpretivist paradigms as discussed in the next subsection of the rationale for choice of epistemology.

2.2.1 Rationale for Choice of Epistemology for the Study

In their study, Orlikowski and Baroudi (1991) noted that about 96.8% of research in leading US IS Journals conformed to positivist tradition. Further, in a review of 259 articles in Personal DSS, Arnott and Pervan (2005) observed that about 3.1% of the studies could be described as interpretivist. This suggests that no single methodology is inherently better than the other methodology and that a research can use a mixed method. Moreover, as a justification, IS researchers have called for a pluralistic attitude towards IS research (e.g., Benbasat et al., 1987; Kuhn, 1970; Remenyi & Williams, 1996). Accordingly, we are of the view that an IS research can have a combination of positivist and interpretivist philosophies inasmuch as their views are deemed useful. Our study in question investigates the social, cultural and organizational factors that might influence knowledge workers to use the DSS tools in organizations. Hence, our overriding concern is that the research we undertake

should be both relevant to the research questions and rigorous in its operationalization (as presented in Table 6). Consequently, the study utilized a combination of positivist and interpretivist paradigms for its investigation. Principally, in line with Orlikowski and Baroudi (1991), the theoretical foundation for the study was drawn on the work of Davies (1989) and Triandis' (1979) to establish the research model, derive the research hypotheses, test the hypotheses and draw inferences of the phenomenon under investigation. Further, the data for the study was gathered by mail surveys of a sample of 500 knowledge workers that used the DSS systems from 255 organizations across Australian states and territories. A quantifiable measure of variables (positivist paradigm) was then used for the main study and for the development of key research instruments. But interpretivist philosophy was required for the pilot study because of the sample size (n=30) used and its usable response rate (19). Hence, a qualitative analysis or interpretive philosophy was utilized mainly for data analysis at the pilot study and for qualitative interviews with The Statistical Consultation Unit (TSCU) at the Institution where the study was conducted for a pre-pilot study of the draft questionnaire. As stated in the introductory section, a discussion of most of the project works of the study in question is beyond the scope of this paper. Table 2 summarizes the epistemology and philosophical elements of the study.

To summarize, this paper employed a combination of positivist and interpretivist paradigms. Whereas a positivist paradigm was used for almost the entire study, an interpretivist paradigm was utilized for qualitative interviews with TSCU on the draft questionnaire, and for qualitative data analysis of the pilot study. Besides, IS researchers have called for a pluralistic attitude towards IS research methods. Also, it has been emphasized that different views and interpretations are legitimate, particularly, in aiding researchers to gain a deeper insight and good understanding of research and for improving the quality of research (e.g., Kuhn, 1970; Remenyi & Williams, 1996; Avison & Fitzgerald, 2000; Benbasat, 1984). Next, we look at the nature of the study.

Table 2. Epistemology for the Research Study

Research Epistemology	Positivism Paradigm	Interpretivism Paradigm
	<ul style="list-style-type: none"> • Theory testing • Hypotheses testing • Quantitative methods • Predictions & control • Data collection by mail surveys • Researcher neutrality • Quantifiable measure of variables • Drawing of inference of research phenomenon 	<ul style="list-style-type: none"> • Interviewing DSS users at TSCU • Qualitative data analysis of the pilot study

Source: Adopted from Orlikowski and Baroudi (1991).

2.3 Nature of the Study

The three common nature of research used in social sciences research studies are *exploratory*, *explanatory* and *descriptive* studies (Sekaran, 1992; Datsa, 2004; Babbie, 2004). While *exploratory* research is undertaken at the start of the research project to have a preliminary and better understanding of the problem under investigation, *explanatory* research is used for problem discovery and it focuses on explaining the different aspects of the problem under investigation in a detailed manner. However, once the problem is defined and better understood, *descriptive study* can be undertaken to describe or explain the characteristics of the population or phenomena that is under investigation. *Descriptive research* seeks to find answer to the questions about who is doing what, why, when and how (Ikart, 2018). Even though there is a general understanding of the problem, answers to some specific questions are necessary in order to define the precise problem. The study we undertake investigates the social, cultural and organizational factors that might influence knowledge workers to use the DSS tools in their roles in organizations. Overall, we are of the view that *exploratory*, *explanatory* and *descriptive studies* are relevant for this research project. Consequently, the research involves an initial literature search of secondary data, where publications or journals are searched to gather preliminary knowledge of topic. We also conducted preliminary interviews with executives who actually use the DSS tools in their roles (Ikart, 2018). The purpose of the *exploratory research* was to enable us to clearly define the social-cultural and organizational factors that might influence the executive to use the DSS tools in the roles. Additionally, we carried-out *explanatory research* to identify the extent and the nature of cause-and-effect relationships between the study variables as presented in Table 6. Questions that enable us to have good understanding of knowledge workers attitudes, opinions, beliefs and needs towards their use of DSS were an important aspect of the *descriptive research*. We employed the mail survey method to gather the primary data from the sample population of knowledge workers who actually use the DSS systems tools in their roles in their organizations. One of the important ideas in a research project is the unit of analysis; this we examine as a subsection next.

2.4 Unit of Analysis

The unit of analysis is the objects of study within the research. The unit of analysis must be well described and explained the differences among them for the conceptual and operationalization of the variables. An unsuitable unit of analysis may influence the researcher to choose erroneous tools, distorting the results and confounding the conclusions of the study (Babbie, 2004). The units of analysis studied in social sciences research include individuals, groups, social interactions, organizations, and social artifacts (Sekaran, 1992; Babbie, 2004). Furthermore, in studying human behaviour, three aspects of human behaviour, namely the actor or actors engaging, behaviour-towards-an-object and a setting or context are considered because actors, behaviour and objects exist in contexts (Ditsa, 2004). Our study in question investigates the factors within social, cultural and organizational that might influence knowledge workers to use the DSS tools in their organizations. In that case, knowledge workers were individuals, organizations were contexts and DSS

tools were objects (Ditsa, 2004; Khalil & Ekordy, 2005). Behavior is influenced by socio-cultural variables defined in Table 6. Thus, the results to be derived from the study would have potential significant implications to organizations besides enriching the IS literature.

2.5 Type of Investigation

Two types of investigations namely; causal and correlation are used in social research studies to provide answers to the research questions (Sekaran, 1992). Causal investigation aids in the identification of the actual cause of the problem and a prediction of what will happen if a change is made. Once a problem has been established, clarified and defined, its cause and effect relationships can be research. Again, once the problem has been established and the causes are explained, *Correlation investigation (Prediction)* can be made about an event occurring based on some known factors or important variables associated with the problem. Attempts are often made to establish cause—and-effect relationships in correlation studies through the application of regression analyses and justifications of results (Sekaran, 1992). The research problem that the study in question sought to provide a solution to is the question: *why knowledge workers choose or choose not to use DSS*. Specifically the study investigates these two research questions.

- 1) *What are the socio-cultural and organizational factors that can explain knowledge workers' behavior towards using DSS in organization?; and*
- 2) *What is the relative importance of these factors in determining DSS usage by knowledge workers of organizations?*

To summarize, our study in question utilized *causal* and *correlation investigations*. Whilst *causal investigation* was used to establish cause—and—effect relationship of the problem, *correlation investigation* was used to identify important variables associated with the problem. Further, time is a critical factor in a research project and as a result; this paper looks at time horizon for the study question next subsection.

2.6 Time Horizon

Researchers have options of two horizons in research projects namely, *cross sectional* or *longitudinal studies* to choose from (Sekaran, 1992; Babbie, 2004). In a *cross-sectional study*, the unit of analysis (same constant variables) is observed at one point in time. Put differently, researchers might collect cross sectional data just once, over a period of days or weeks or months in order to provide answers to the research questions (Khalil & Elkordy, 2005). A *cross-sectional study* is also referred to as *one-shot studies* (Sekaran, 1992). But in a *longitudinal study*, a researcher observes different variables over time and collect data based on those studies (Sekaran, 1992; Babbie, 2004). A *longitudinal study* is not cost-effective because it can run for a longtime. Also, an extended period may lead to longitudinal survey responds dropping out during the study. Hence a considerable burden in terms of time and money precludes researchers from conducting *longitudinal studies* (Babbie, 2004). Concerning our study in question, the unit of analysis was observed just once. Therefore, a *cross-sectional* or *one-shot study* was most feasible and appropriate. The study sought to explain the socio-cultural and

organizational factors that might influence knowledge workers to use the DSS tools in their roles, but would not predict it. A *longitudinal study* was not feasible and therefore was disregarded.

2.7 Research Strategy and Data Collection Methods

Four research methodologies have been identified for empirical IS studies namely: *case studies*, *field studies*, *laboratory studies* and *field tests* (Sekaran, 1992). In *case studies*, researchers systematically gather in-depth data on a single entity using multiple information gathering sources, e.g., personal interviews (structured or unstructured), direct observations of phenomena, archive records and psychometric tests whose results hopefully converge, in order to establish construct validity. Depending on the approach, data collection and analytical techniques utilized by researchers; case studies may be positivist, interpretivist or critical in nature (Goundar, 2013; Sekaran, 1992). Reality can be captured in greater details by researchers with the analysis of more variables than patterns occurring in artificial setting of a lab and it is a comprehensive data collection method in social sciences research. On the contrary, case studies are more costly and time-consuming as compare to other methods of data collection. Case Study Critics have criticized case studies for lacking scientific rigor and providing limited basis for generalization of results. Whereas case studies can produce rich qualitative data, they do not create quantitative data, and as a result, mathematical analysis is limited (Galliers, 1991). *Field studies* are research experiments conducted in a natural environment or context of the subjects of studies. *Field studies* endeavor to determine a causal relationship between two variables in a controlled setting. The independent variables can be altered and changes in the dependent variables are then observed. The influence of the independent variables resulting in a change in the dependent variables is known as causality (Goundar, 2013). Besides, subjects are often carefully chosen by the researcher to respond to certain manipulated stimuli (Isrobert, n.d.; Galliers, 1991). Experiments conducted in a laboratory (or *Laboratory Experiments*) setting use the laboratory as an environment to identify the precise relationships between variables. This is because researchers have more control over how they manipulate or influence the variables in the relationships using quantitative analytical techniques. However, in both approaches it is essential for researchers to determine the independent and dependent variables and establish a control group and measure the change before and after the situation (Goundar, 2013; Sekaran, 1992). The major strength of field experiments is that behavior is more likely to reflect real life because of their natural settings and there is less likelihood of demand characteristics affecting the results as participants may not know they are being studied (Goundar, 2013; Galliers, 1991). On the contrary, there is limited control over extraneous variables which might bias the results, and this makes it difficult for another researcher to replicate the study in exactly the same way. For laboratory studies, it is easier to replicate an experiment because of the standardized procedure utilized. They also allow researchers to have precise control of extraneous and independent variables for intensive study, this result into a cause and effect relationship. Nevertheless, the artificiality of the setting may produce unnatural behavior that does not reflect real life. In other words, it would be difficult to generalize the findings to a real life setting. More so, much of the study using this method utilized students as

surrogates for “real” decision makers, thus adding to the sanitized nature of the laboratory situation (Galliers, 1981). Last but certainly not the least, *Field study* or *Survey questionnaire* can be conducted by focus group survey, telephone survey and mail survey methods. The use of survey questionnaire tools enables the researcher to obtain data about practices, situations or views at one point in time through questionnaires or interviews. A quantitative analytical technique is then used to draw inferences from this data regarding existing relationships. The use of surveys permits a researcher to study more variables at one time than is possible in other studies, while data can be collected about real world experiments. As discussed in next subsection, the mail survey method is probably the most economical method to examine complex phenomena compared to face-to-face and phone interviews (Ditsa, 2004; Sekaram, 1992; Galliers, 1991). Table 3, summarizes the taxonomy of methodologies for IS research studies.

Table 3. Taxonomy of Methodologies for IS Research Studies

<i>Case Studies</i>	Data collection based on a single entity by direct observations, personal interviews, archive records & psychometric tests. Case studies may be positivist, interpretivist & critical in nature.
<i>Laboratory Experiments</i>	Entailed experiments where subjects are carefully chosen to respond to manipulated stimuli in labs using quantitative analytical techniques
<i>Field Studies</i>	Are extensions of laboratory experiments into real world of an entity; Experiments conducted in a more realistic environment than is possible in artificial sanitized lab situations.
<i>Field Study or Surveys</i>	Data collection from sample respondents via surveys, interviews, and focus group surveys etc., may requires follow-ups of non-respondents. Quantitative analytical technique used to draw inferences of the data of existing relationships.

Source: Adopted from Kothari (2004) and Galliers (1991).

2.8 Data Collection Methods-Mail Survey

Survey questionnaires can be administered by focus group, face-to-face, home delivery, self-administered questionnaires and telephone survey. Each of these methods is briefly summarized as:

- Focus group survey—The questionnaire is administered to a group of 7-to-8 respondents at the same place and at the same time.

- Face-to-face—The questionnaire is administered to the respondents in a face –to-face encountered interview.
- Home delivery questionnaire—The questionnaire is delivered to the home of the respondent and the study explained to the respondent.
- Self-administered questionnaires—The respondents are asked to complete the questionnaires and return them to the researcher. Mail survey is the common form of self-administered questionnaires. This method includes questionnaires been mailed to respondents who then complete them and post them back to research. Mail survey can also be carried-out by electronic mail, web and Interactive Voice Response (IVR).
- Telephone survey—The questionnaires are read to the respondents over the phone for their verbal responses to the questionnaires (Babbie, 2004; Dillman, 2000).

The data collection method used for the study in question was the mail survey. The mail survey method was chosen because of a number of reasons. First, compared with focus group, face-to-face interviews and telephone surveys, the cost of conducting a mail survey was relatively cheaper in terms of money, man power and reach to the population sample of knowledge workers across Australian states and territories (Kerlinger, 1986; Dillman, 2000; Babbie, 2004). Second, we believed that mail surveys would be more convenient for knowledge workers because they can answer the questionnaires at their own pace, which will result into a comprehensive and thorough response. Considering their busy schedules, executives can answer the questionnaire at their own homes, at work locations, while commuting or anywhere they want to, as long as they can access the survey instrument. This provides them with anonymity (Babbie, 2004; Ditsa, 2004). Third, the method did not require us to gain too much experience to supervise and administer the survey. Also, we were in position and capable to curtail sampling errors than would be possible with interviews or phone surveys (Zikmund, 2003). Fourth, mail survey was by far the most feasible method compared with face-to-face or phone surveys to collect the primary data from the population sample too large to observe directly, and to be able to provide a broader picture of individuals' behaviors towards DSS adoption in organizational settings (Ditsa, 2004; Sarantakos, 2002; Babbie, 2004). Fifth, we were of the view that we would improve the response rate to a mail survey through follow-up mailed-out which would result in collecting more data on particular characteristics of interest (Ivancevich & Matthew, 1990). Past research also suggests that the respondents to mail surveys are more comfortable in giving their honest opinions in writing than being interviewed by someone in person or over the phone (Zikmund, 2003). On the contrary however, mail surveys often accompanied a low response rate. Consequently, to request executives to complete mail surveys, we expected the response rate to be much poorer than usual (Kerlinger, 1986, Babbie, 2004). More so, experience suggests that it is difficult to have any control over mail survey regardless of whether the questionnaire has been completely answered or what will happen to the survey questionnaire following the mailed-out. Also, one does not know whether the intended respondent is the actual respondent to the mail survey. Finally, we were of the view that given that, we did not write

down the names of the intended respondents anywhere in the distributed questionnaires, some respondents may have found the process too impersonal (Dillman, 2000; Babbie, 2004)

Table 4. A Summary of Strengths & Weaknesses of Mail Survey

<ul style="list-style-type: none"> • More economical and efficient method to collect original data from a large population sample 	<ul style="list-style-type: none"> • Low response rate, and response rate can be even poorer when top-officers are surveyed
<ul style="list-style-type: none"> • Inexpensive and effective method to cover a large population that is geographically dispersed rather than face-to-face survey or phone survey 	<ul style="list-style-type: none"> • Researchers are limited from collecting detailed information from respondents for in-depth analysis
<ul style="list-style-type: none"> • Compared with other methods participants can give more honest answers 	<ul style="list-style-type: none"> • Difficult to know whether the intended respondent is the actual respondent
<ul style="list-style-type: none"> • Mail survey suits executives' busy corporate schedules 	<ul style="list-style-type: none"> • The process can be too impersonal to respondents
<ul style="list-style-type: none"> • Easy to administer data for a large population sample and to provide anonymity for frank responses 	<ul style="list-style-type: none"> • Possible bias in respondents due to the self-selecting nature of survey respondents
<ul style="list-style-type: none"> • It is convenient because respondents can complete the survey at their own pace 	<ul style="list-style-type: none"> • Biased results and outdated information may be used to cover errors
<ul style="list-style-type: none"> • Ensured confidentiality and anonymity 	

Sources: adopted from Babbie, 2004, Dillman, 2000 and Kerlinger, 1986.

To summarize, it is believed that the benefits of the mail survey far out-weigh the drawbacks. Consequently, the mail survey method was utilized as the primary method of data collection. Table 4 summarizes the strengths and weaknesses of mail surveys. The subsections that follow examine questionnaire design and questionnaire design for the study.

2.8.1 Questionnaire Design

A questionnaire is a research instrument consisting of a series of written questions with a choice of answers devised for the purposes of gathering information by a survey from the respondents (Babbie, 2004; Sekaran, 1992). Questionnaires are useful data-collection mechanisms, and have standardized answers that make it easy for researchers to compile data (Sekaran, 1992; Dillman, 1978). Two main forms of questions are used in IS research to pose questions in survey questionnaires namely; open-ended versus closed ended questions (Babbie, 2004). *Open-ended questions* are probing questions that are designed to maximize the input from the person answering, and minimize the input from the person asking. For example, the respondent may be asked to state five things that are challenging in

his/her job. Or, what obstacles did you face in preparing the presentation? But in *Closed-ended questions*, the respondent is asked to make a choice from a set of alternatives. For instance, the researcher might list ten to fifteen characteristics that might seem interesting or challenging at work and ask the respondents to rank the first five among these items. Also, the researcher might simply ask the respondent to make a choice between a “yes” or “no” response to a question (Babbie, 2004; Sekaran, 1992). There are a number of benefits associated with closed-ended questions over open-ended questions as: (i) respondents can make a quick choice among alternatives, (ii) responses can be easily coded for subsequent data analysis, (iii) answers from different respondents can be compared, (iv) closed-ended questions provide greater uniformity of responses that can be easily processed on analytical tool and, (v) responses to closed-ended questions can be transferred directly into computer format for analysis. Unlike closed-ended questions, open-ended questions cause researchers to gather infinite range of answers which must be edited and categorized for successive data analysis. Responses to open-ended questions must be interpreted before coding; and this can lead to misunderstanding and research biases. Also, an open-ended question is not a good option to ascertain quantitative statistics, and there is likelihood that researchers might find most responses irrelevant to research intent (Babbie, 2004; Sekaran, 1992).

To conclude, although closed-ended questions may require incentives to encourage the respondents to respond to the survey questionnaire and/or may compel the respondents to make quick choices they would not otherwise make, the benefits of closed-ended questions far outweigh that of open-ended questions. Therefore, we employed closed-ended questions to design the mail survey questionnaires of the study in question. The design of the questionnaire was steered by some structural requirements. First, we included all possible responses that should be expected and added a category such as, “Other (Please specify: __).” Second, we ensured that the answer categories provided were mutually exhaustive so that the respondents do not feel compelled to select more than a choice. We also added an instruction to the questionnaire requiring the respondents to choose the one best answer to each question (Babbie, 2004; Dillman, 1978). Third, we ensured that all the questions in the questionnaire can be interpreted in the same manner by all respondents and that the entire survey is simple, direct and coherent. We do this to motivate the respondents to respond to the questions. Finally, we make certain that no aspect of the questionnaire suggests any bias by the researcher (Ikart, 2018).

2.8.2 Questionnaire Design for the Study

In designing the questionnaire for the study, the procedures and strategies suggested by Dillman (1978), Sekaran (1992), Babbie (2004) and Kerlinger (1986) were carefully considered. All the questions were adapted from previous studies (e.g., Bergeron et al., 1995; Davis, 1989; Thompson et al., 1991; Fishbein & Ajzen, 1975; Ditsa, 2004; Ajzen & Fishbein, 1980) although, with appropriate modifications and adjustments. Each question in the questionnaire represented a component of the research model. The questions were selected based on their theoretical importance and potential relevance to practice. The design of the questionnaires was subjected to a three-stage pre-pilot. A pilot

survey for the draft questionnaires was considered relevant for the purposes of establishing content validity and minimizing bias in responses due to misinterpretation of the instrument as well as ensuring that the instrument used is reliable and valid and that the issue of instrument rigor is systematically addressed (Sekaran, 1992; Babbie, 2004). To make the questionnaire more eye-catching to the respondents, we used coloured paper to print out the questionnaires to be mailed-out, because an eye-catching questionnaire can help ensure a significant response rate (Dillman, 1978; Sekaran 1992; Babbie, 2004). Furthermore, we coded the questions in the questionnaire with one being the negative end and five being the positive end. The codes for Strongly Disagree, Disagree, Uncertain, Agree and Strongly Agree were used throughout the questionnaire where the statement requires the respondents to make a choice from the options provided. Our aim was to make it simple for the respondents to circle their choice of response following the statement and to minimize confusion regarding the meaning of the code (Sekaran, 1992; Babbie, 2004). To enable the respondents to proceed to answering the questions immediately after reading through the cover letter, we placed the section of the questionnaire requiring the respondents' personal information at the end of the questionnaire. On the very last page of the questionnaire, we thanked the respondents and provided them with a blank page to make any comments of the questionnaire (Sekaran, 1992; Dillman, 1978; Babbie, 2004). To ensure the questions in the questionnaire meet ethical standards of Australia, we made an application to the Human Research Ethics Committee (HREC) of the Institution where the research was conducted for approval. Following the HREC review and approval for the study, we included a statement in the cover letter of how the questionnaire has been reviewed by the HREC, and a statement guaranteeing the confidentiality of the respondents. We added another statement in the cover letter advising the respondent to refer any complaints that they may have about the study to the Complaints-handling Officer of the HREC. We provided a telephone number on the cover letter to that effect. We design the cover letter based on the suggestions provided by Sekaran (1992), Dillman (1978) and Babbie (2004). Throughout the process of data collection, there was no complaint made to the HREC, because the process we employed attended to the HREC requirements.

2.9 Pre-Pilot Surveys versus Pilot Survey for the Study

Two initial pre-pilot surveys were utilized in designing the questionnaire for the study. The pre-pilot surveys were conducted with The Statistical Consultation Unit (TSCU), academics and PhD students from the Institution where the research was conducted. The procedure used was as follows: A six-page questionnaire drafted for the study was initially given to TSCU for a review. During the meeting with the TSCU Unit representative, the TSCU representative was interviewed and asked to comment on the questionnaire in terms of its ease of use, comprehensibility, meaningfulness, effectiveness and content validity (i.e., whether the scale items appear to measure what they intend to measure) and overall suitability. Based on the feedback we received from the representative, we modified the individual questions and instructions for the respondents. The feedbacks we received included suggestions to number the questions in the questionnaire and to include the email address of the researchers for

contact and to use five-point Likert scales throughout the questionnaire for all statements requiring scaling except for questions on attitude towards using DSS where semantic differential scale was utilized. Next, we subjected the revised questionnaire to the next phase of pre-pilot with ten academics and four doctorate degree students. This was done because those academics and doctorate students were well versed with the design of questionnaires. We also asked the Panel members to comment on the validity, consistency and clarity of the questionnaire. All the comments and suggestions provided by them as feedback, regarding the validity, consistency and clarity of the questions were carefully considered and incorporated into the survey questionnaire. The feedbacks we received included suggestion to swap some questions in the questionnaires for logical flows and to provide a blank space in the questionnaire for comments by the respondents. Based on these two pre-pilot surveys and expert assessment, we came to the conclusion that the measurement scales in the draft questionnaire had an acceptable level of content or face validity. Next, we subjected the pre-pilot results to the pilot survey in the field with executives that actually used DSS within the Illawarra region of the Institution where the study was conducted in Australia. We conducted the pilot survey with the aim to pre-test the survey with executives who use the DSS systems in the field. The main concern we had to pre-test the questionnaire in the field was to detect any problems with its validity and reliability. The pilot seeks to determine whether: the words we used in each question were properly understood, each question measures what it is intended to measure, each question can be interpreted similarly by the respondents and whether each question contain an adequate range of response categories. In addition, we designed a cover letter explaining the purpose of the survey. We mailed it out in a slim package with prepaid self-addressed envelopes to the participants in the pilot study. Again we added a statement in the cover letter guaranteeing the confidentiality of the respondents and a statement of how the research had been reviewed by the HREC in Australia. The cover letter and envelope had the name of the Institution where the study was conducted. The respondent was specifically asked to complete the enclosed questionnaire in the mail and return it by mail in the enclosed self-addressed prepaid envelope (Babbie, 2004; Sekaran, 1992). We estimated about twenty minutes as an average time for the respondents to complete the questionnaire and indicated this in the cover letter. Because we were interested in the comments and suggestions by the respondents for improvements of the questionnaire for the main survey as well as their use of DSS, we provided an additional blank space in the questionnaire for comments. Further, we provided an email address for those who wished to comment via such medium (Babbie, 2004; Dillman, 1978). To achieve a good response rate, we administered the pilot survey exactly as if it was the main survey but on a small sample of knowledge workers who actually use the DSS systems in their organizations. Although there is no widely agreed sample size for a pilot survey, Hunt et al. (1982) suggested that between 12 and 30 subjects is recommended. We carried-out the pilot survey on a representative sample of thirty knowledge workers from medium size organizations within the Illawarra region that actually used DSS. After 3 follow-ups by telephone calls we received 19 completed questionnaires, giving a response rate of 63%. We examined carefully the returned

questionnaires for signs of respondents having difficulty in understanding the questions or interpreting ambiguous questions differently. None of these problems were noticed. All the 19 questionnaires returned were acceptable for analysis. However, there were suggestions and comments from respondents, which were taken for improving the main study. The feedback includes suggestion to define the term DSS in a plain language in the questionnaire such that it can be understood by all potential respondents. Another suggestion led to our inclusion of executive's experience in computer-based information systems prior to using the DSS systems. Table 5 presents the data on participant characteristics for the pilot study. Columns 1 and 2 highlight demographic factors and valid items; column 3 presents data on participant characteristics; and columns 4 and 5 in the right hand panel present data on feedback, comments and suggestions for improving the questionnaire for the main study. As can be seen in Table 5, the feedback and suggestions were provided by both male (14) and female (5), participants from diverse management skills (top management, 9; middle management, 5; and other, 5) and experiences and education qualifications (10 postgraduate degree holders, 7 undergraduate degree holders and 2 others) and age group of between 26-55 years.

Table 5. Participant Characteristics for Pilot Study & Suggestions for Improvement

Demographic Factors	Valid Items	Frequency	Comments and Feedback Suggested by Participants in the Pilot for Improving the Questionnaire Irrespective of their Demographic Variables
Gender	Male	14	
	Female	5	
Age Range	26 -35	6	
	36 – 45	10	
Education	46- 55	5	
	Undergraduate	7	
	Post Graduate	10	
Job Positions	Others	2	
	Top management	9	
	Middle management	5	

- Suggestion to define a DSS in a plain English language for clarity to every respondent
- Suggestion to include a question on executives' experience in CBIS prior to their experience in DDS as a variable for Habits
- Suggestion to swap questions in the questionnaire for logical flows of ideas in the questionnaire

To summarize, regardless of the participant characteristics, their comments, feedbacks and suggestions which were taken for improving the questionnaire include:

- A suggestion to define DSS in a plain English language for clarity to all the respondents;
- A suggestion to include a question on knowledge workers experience in CBIS prior to their experience in DSS as a variable for habit;
- A suggestion to swap questions in the questionnaire for logical flows of ideas.

Our overarching concern was that the research we undertook should be both relevant to the research questions as stated previously, and rigorous in its operationalization, thus, we present a brief summary of the conceptual and operationalization of construct variables of the study in question in the next subsection.

2.10 Conceptualization And Operationalization Of Construct Variables

Drawn on the work of Triandis (1979) and Davis (1989), the conceptual framework of the study consisted of seven constructs including; Habits (**H**), Facilitating Conditions (**FC**), Social Factors (**SF**), Perceived Usefulness (**PU**), Perceived Ease of Use (**PEOU**), Attitude Toward Using (**ATU**) and Actual Use (**AU**); To operationalize these constructs, we referenced various past studies (e.g., Triandis, 1979; Davis, 1989; Bergeron et al., 1995; Thompson et al., 1991; Ditsa, 2004; Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). Triandis says that habits are closely related to individuals' past experience with an act and ability to perform a given act. Hence, we measured Habits based on the number of years of experience that executives have had in DSS and CBIS (e.g., Ditsa, 2004; Bergeron et al., 1995). Triandis defines facilitating conditions as "objective factors, 'out there' in the environment, that several judges can agree make an act easy to do" (p. 205). Following the work of Nanhakumar (1996), Nanhakumar and Jones (1997) and Ditsa (2004), we measured **FC** based on three variables. That is, the degree to which DSS: (i) development processes, (ii) management processes, and (iii) organization environment of DSS facilitate their use by knowledge workers. More so, Triandis suggests that the reference group's subjective culture (norms, roles, values and social situations) of the social factors influences the individual notion of desirable behavior. In IS context, this refers to the influence of the executive work group such as, peers, superiors, subordinates and IS directors. Accordingly, **SF** was measured on norms, roles, values and social situations, and was operationalized based on four questions which asked the respondent the extent to which the work group members: (i) Think, (ii) Want, (iii) Expect and (iv), Encourage the respondent to use the DSS tools (Ditsa, 2004; Thompson et al. 1991; Bergeron et al. 1995). The scales were reliable with a Cronbach's alpha of 0.81, 0.9 and 0.86 (Bergeron et al., 1995; Ditsa, 2004). The PU and PEOU were operationalized by obtaining users' assessment of their Perceived Usefulness and Perceived Ease of Use of DSS based on twelve similar items, six items for each developed by Davis (1989) with 7-point Likert scales. The scales for all statements were adjusted to a 5-point Likert Scale based on the advice by TSCU. **ATU** is the affective evaluation of the behavior (Fishbein & Ajzen, 1975) and was measured using five standard 5-point semantic differential scales for operational attitude. Finally, **AU** was measured in terms of frequency of

use (“how often”). It was considered as valid and reliable construct (Davis, 1989; Davis et al., 1989). To summarize, the instruction to the respondents for these items were: “In this section we wish to determine how useful you believe a decision support systems could be for your current roles. Please tell us how much you agree or disagree with each of the following statements (1= Strongly Disagree; 2 = Disagree; 3 = Uncertain; 4 = Agree; and 5 = Strongly Agree).” A five-point Likert Scale was used throughout the questionnaire for all the statements requiring scaling with anchors strongly disagree to strongly agree, except questions on attitude towards DSS where semantic differential scale was used. These modifications as advised by TSCU at the pre-pilot study were to ensure that the questionnaire was both meaningful and comprehensive. Table 6 list, in abbreviated format all of the measurement scale items that were ultimately selected for the study

Table 6. Operationalization of Constructs

Measure	Construct
Habits	
H1	The number of years of my experience in DSS as: <i>(Please tick one from the list)</i>
H2	The number of years of my experience in CBIS as: <i>(Please tick one from the list)</i>
H3	My ability to use DSS can be categorized as: intermittent user, novice frequent user, expert casual user or expert frequent user
Facilitating Conditions	
FC1	Guidance, resources and documentations are available to me as the DSS development needs
FC2	Access to support team, timely information and strategic data & policies are available to me
FC3	Organizational culture, dynamic changes, powers and politics and the interaction of the DSS with subsystems encourage me to use the DSS tools
Social Factors	
SF1	My colleagues, superior, IS director & subordinates think I should use the DSS tools
SF2	Generally, I want to do what my colleagues, IS director, superior & subordinates want me to
SF3	By virtue of my role, my colleagues, superior, IS director and my subordinates expect that I use the DSS tools
SF4	The social working relationship between me and my colleagues, superior, subordinates, IS director & DSS support team encourage me to use the DSS
Perceived Usefulness	
PU1	I believe my using of DSS will increase my performance in the organization

PU2	I believe my using of DSS will provide my organization with competitive edge
PU3	I believe my using of DSS will provide me with greater level of control over our activities
PU4	I believe my using of DSS will increase the quality of my decision-making
PU5	I believe my using of DSS will provide me with information to detect problems
PU6	I believe my using of DSS will increase the speed of my decision-making
Perceived Ease of Use	
PEOU1	Based on my knowledge of DSS learning to operate the DSS is easy for me
PEOU2	Based on my knowledge of DSS I find the DSS flexible to interact with
PEOU3	Based on my knowledge of DSS I find it easy to get the DSS to do what I want it to do
PEOU4	Based on my knowledge of DSS it is easy for me to become skillful at using the DSS
PEOU5	Based on my knowledge of DSS I find the DSS easy to use
PEOU6	Based on my knowledge of DSS my interactions with the DSS are clear and understandable
Attitudes towards Using	
ATU1	All things being equal my using DSS in my job is: Bad 1 2 3 4 5 Good
ATU2	All things being equal my using DSS in my job is : Foolish 1 2 3 4 5 wise
ATU3	All things being equal my using DSS in my job is: Unfavorable 1 2 3 4 5 Favorable
ATU4	All things being equal my using DSS in my job is: Harmful 1 2 3 4 5 Beneficial
ATU5	All things being equal my using DSS in my job is: Negative 1 2 3 4 5 Positive
Actual Usage	
A	On average, how many times do you use DSS in a week? <i>(Please tick one from the list)</i>

2.11 Administration and Monitoring of Returns of Mail Surveys

The methods we utilized to administer the mail surveys comprised of: the distribution of the questionnaires to the sample respondents and monitoring of the returns and then the follow-up. Babbie (2004) suggests that the best method to collect data by mail is to send a questionnaire along with a cover letter and a self-addressed stamped envelope for the return of the questionnaire. In that respect, the respondent is likely to complete the questionnaire and return it in the self addressed envelope. Guided by Babbie's assertion, we employed this simple approach for the respondents to complete the questionnaires and return them in the self-addressed prepaid envelopes supplied without their effort in folding the questionnaires. We included a cover letter explaining the completion of the questionnaire and return procedures in the package. To improve the administration of the mail survey and minimize its workload, we mailed-out five hundred questionnaire packages in 5 batches through ordinary mail to the sample respondents from 255 medium size organizations in Australia using DSS/EIS/BIS. We mailed-out the questionnaire package in pre-paid envelopes that had the name of the Institution, emblem and address of the Institution where the study was conducted on the left hand corner of the

envelope. Within each package we included the cover letter, questionnaire and pre-paid self-addressed envelope. To expedite the records of returns and the follow-up mailing to the non-respondents, we pre-numbered each mailed out questionnaire and added a statement to that effect on the cover letter. We explained the purpose of the study in the cover letter along with how we obtained the respondent's name, what the respondent needed to do, an estimated time for the respondent to complete the questionnaire, a guarantee of the confidentiality of the respondent, and the expected date for the respondent to return the completed questionnaire. We thanked the respondents for their time and effort in participating in the study. We printed the cover letter on the Institution letterhead and signed it. Next, we created a table for each batch of the mailed-out questionnaires with columns for respondent's title, name, job title, and company's address. We pre-numbered the uniqueness of each questionnaire mailed-out to the respondent with dispatch date, received date, follow-up date and comments. We created another table to note down the number of completed questionnaires usable for analysis, number of uncompleted questionnaires unusable for analysis, the number of questionnaires marked, "return to senders", and the number of telephone calls and email received from the respondents. To simplify the follow-up process, as each questionnaire was returned, we marked the received date in the appropriate column against the sample respondent using the pre-numbered identifier on the questionnaire. However, there were some deficiencies in the returns of the mail survey. For instance, there were cases where respondents phoned us to advise that they do not participate in surveys. Hence, we respected their policy and omitted their names from the follow-up mail-out. There were also cases where the returned questionnaires were incompletely filled out. Consequently, we omitted them from the analysis. Further, some survey packages were returned with marks: "return to sender", "the addressee has left the company". On that point, we phoned the organizations to ask whether the current incumbent would like to participate in the study and complete the questionnaire. If they complied, we wrote down the incumbent details and resent the survey package to. But if they declined to do so, we respected their decisions. In other cases, some sample respondents' emailed to advise us to remove their names from the study because they do not use DSS/EIS, and as a consequent; we removed their names from the follow-up mail-out. Overall, a significant number of respondents expressed their interest in the findings of the study and also provided useful comments.

3. Results

3.1 Follow-up Mailings of Mail Survey & Result

We carried-out follow-up mailings after three weeks and three days to non-respondents for each batch of survey questionnaires that we distributed. We allowed additional three days to three weeks to allow the survey packages to get to the non-respondents of the survey questionnaire. We carried-out the follow-up process to ensure proper timing (Babbie, 2004). Also, we ensure that each questionnaire package in the follow-up was exactly the same as the initially distributed questionnaire plus a reminder letter mailed to the non-respondents. The construction of the reminder letter was business-like and we

placed emphasis on the importance of completing the survey. This was meant to encourage non-respondents to respond to the questionnaire by filling-out the questionnaire and returning it to us. We conducted the follow-up mailings in order to increase the return rate of the mail survey (Babbie, 2004). Of a total of 116 questionnaires that were returned in the initial survey, 71 were usable for analysis and 45 were not. Also, of a total of 85 questionnaires that were returned in the follow-up, 50 were useful for analysis but 35 were not. On the whole, we received a total of 201 responses from both the initial and follow-up mailings, 121 were useful for analysis but 80 were not useful for analysis. The industry distribution of the organizations surveyed captures the main segments with DSS activities namely; manufacturing, (20%), finance & business, (17%) and community services, (10%) and communication, (10%). The firm size was well distributed in terms of small to medium sized (less than 1200 employees plus IT staff) and large firms (more than 1200 employees plus IT staff), and each with the turnover in millions US\$.

Furthermore, to determine the influence of non-response bias in the study, we carried-out Mann-Whitney test between the early (also regarded as non-stimulated responses) and late (also regarded as stimulated responses) respondents in the mail survey in terms of the demographic variables namely; experience in DSS, experience in CBIS, education qualifications and job positions. The result indicated no significant difference between the two groups. Hence, the response bias was negligible. We present a summary of the initial and follow-up responses to the survey in Table 7.

Table 7. A Summary of Initial Survey & Follow-Up Responses

	Initial Survey (%)	Follow-up (%)	Total (%)
Useable Returns	71 (35.3)	50 (24.9)	121(60)
Unusable Returns	45 (22.4)	35(17.4)	80 (39.8)
Total Returns	116 (57.7)	85 (42.3)	201 (100)

3.2 Response Rate of the Study

To summarize, the overall response rate to the mail survey was: 201(116 + 85). The gross response rate was 40.2% (201/500), of which, 121 (71+50) returns, i.e., 24.2% (121/500) were suitable for analysis. The gross response rate and useable response rate as illustrated in Table 8 was reasonably high compared with previous similar studies. For instance, in the US, Kim (1996) mailed out 400 surveys to mainly EIS users and received a total 112 returns, giving it a response rate of 28%. In the UK, Elkordy and Khalil (2005) obtained a response rate of 22.5% from 960 questionnaires mailed out to EIS users. In Australia, Pervan (1992) obtained 22% response rate from the questionnaires mailed out to IS managers identified in the Business Review Weekly as having EIS. Also, Ditsa (2003) obtained a response rate of 20.57% from 700 mailed out questionnaires to EIS users. On the basis of these response rates of prior studies, as well as the comparative size of commerce in Australia, the response

rate for this study was satisfactory.

Table 8. Summary of Responses to Mail Survey Questionnaire

Total Number of Questionnaire Mailed Out	500
Total Number of Questionnaire Returned	201
Total Number of Returns Useful for Analysis	121
Total number of Returns Unsuitable for Analysis	80
Gross Response Rate	40.2%
Usable Response Rate	24.2%

4. Discussion

This paper presents the research design and the methodology into the study of the adoption of DSS by Knowledge Workers. Generally, it is noted that the research design and methodology are a vital tool for planning the research structure and explaining how major parts of the research project work together to address the central research questions validly, objectively and economically. Specifically, the lessons we learned from the interplay of the two extreme views (i.e., positivism and interpretivism) of the IS research epistemology, the pilot study, the conceptual and operationalization of constructs into a satisfactory response rate of the study in question plus their implications for research have been remarkable.

First, whereas the positivist and the interpretivist paradigms are considered as two extreme views in social sciences research (Galliers, 1991; Avison & Fitzgerald, 2000), more recently they have moved closer to a compromise, recognizing the virtues and faults of each other (e.g., Kuhn, 1970; Remenyi & Williams, 1996; Avison & Fitzgerald, 2000; Benbasat, 1984). Consequently, a combination of positivist and interpretivist paradigms was employed in the study in question. A positivist paradigm was used for almost the entire study, but an interpretivist paradigm was used mainly for pre-pilot interviews with TSCU and for qualitative data analysis at the pilot study due to the sample size (n=30) used and its usable responses received (19). Equally, it is noted that different views and interpretations drawn on these paradigms are legitimate, particularly, in guiding researchers to gain a deeper insight and good understanding of research (e.g., Kuhn, 1970; Remenyi & Williams, 1996; Avison & Fitzgerald, 2000; Benbasat, 1984). IS researchers should therefore embrace more diversity in epistemology and methodology in order to promote the professional relevance of the field through high quality research outcomes (Arnott & Pervan, 2005).

Second, the key methodological thesis throughout social sciences research studies has been the need for researchers to give more attention to instrumentation. This refers to how measurement instruments are developed and validated. In IS research, questionnaire design is often driven by pragmatism and expediency, and so issues of instrument validation tend to receive limited attention. This also applied to

the pilot test of survey questionnaires, which is often done in a hurried and in a non-systematic manner (Hunt et al., 1980). While researchers can employ previously used scales with confidence that these may have been assessed over a number of independent studies as reliable and valid, this may not be sufficient due to variations in language and sense-making across culture within populations (Ikart, 2018). Consequently, we have centered our discussion on the procedures through which the draft questionnaire was pilot tested, which had been constructed by appropriating and modifying previously used scales. Three main benefits have been derived from a more rigorous pilot of the instrument: (i), the two-stage process ensured that appropriate language was used for scale items and that the questionnaire was meaningful and comprehensive (e.g., swapping of questions in questionnaire for logical flow of ideas and defining DSS in a plain language) to members of the population of interest. As a result, the possibility of obtaining “noise” in the data collection was reduced and we have been more confident that the responses to the question were valid; (ii), the pilot test ensured that the measuring instruments used were, after some modifications, internally consistent, reliable and had an acceptable level of content or face validity; and (iii), based on the results and findings of prior studies from which the measurement scales were derived (e.g., Fishbein & Ajzen, 1989; Begeon et al., 1995), the pilot study enabled us to conclude that the multi-item scales were indeed likely to be valid measures of the constructs in the conceptual framework of Table 6.

Third, perhaps, the question that many readers possibly will ask is: Was the response rate for the study in question satisfactory? Is it high enough? What is a typical response rate? Concerns about response rates have solid theoretical grounding, because one cannot make an inference about a larger group if potential respondents did not participate in the survey. Regarding this study, we believe that the response rate of 24.2% received was high enough compared with previous similar studies in the US (e.g., North & North, 1995) 32.4%; Canada (e.g., Bergeron et al., 1995) utilized 38 EIS users in a field study of nine organizations; UK (e.g., Elkordy & Khalil, 2005, 22.5%); and Australia (e.g., Pervan, 1992) 22%. On the basis of the response rates of these past studies, as well as the comparative size of commerce in Australia, the response rate for the study in question was satisfactory. Nonetheless, the reality for most research is that response rates are not high, yet their findings are accurate. There is evidence that sometimes lower response rates provide more accurate findings. What matter most is not the number of people that have responded to the survey instead, it is how representative they are of the groups to which they belong? Moreover, any rigorous and costly effort to double the response rate may make no difference in the statistical result. For example a study conducted by Visser et al. (1996) in the US found that a mail survey with a lower response rate was more accurate than a telephone survey with a higher response rate. Put differently, higher response rate does not necessarily improve accuracy. Nevertheless, understanding and monitoring response rates is an important consideration of the survey fielding process. But a lower than industry benchmark response rate can be a potential indication of issues that could negatively affect data quality. Consequently, it is vital to consider key factors that may well influence the response rate to a survey namely, respondent population sample, survey incentives,

survey design quality, questionnaire pre-testing, use of reliable and valid instrument, timing and administration of surveys for adequate response rate and more reliable and representative data.

Fourth, the conceptual framework used in the study to address the research problem as a behavior using the TAM and Traindis' variables is believed to be highly robust following pretesting of the instruments and refinement of measurement scales. The framework emphasizes the importance of socia-cultural and an organizational factor relevant for a successful adoption of IS including DSS. The framework offers a significant prospect for researchers studying human behavior. Hopefully, the model of the operationalization of constructs illustrated in Table 6 provides a useful contribution to social sciences research. The model suggests a set of hypotheses that could be tested empirically. Although the model is consistent with the results of past studies, its specific predictions can be investigated in such areas as E-Commerce, E-marketing, internet banking for user behavior testing and other IS research.

Finally, we have written this paper with a clear objective in mind viz., (a) to guide researchers irrespective of their disciplines to develop the most suitable research design and methodology for research studies; (b), to aid researchers to familiarize themselves with the art of using different methods, techniques and tools in research studies; and (c), to serve as an outlet for new ideas and insights for research students in crafting a high quality research thesis and to attaining a high position in the social hierarchy.

In summary, we hope this paper will encourage roundtable discussions in academia and management practice.

Acknowledgements

This paper has benefitted from thoughtful comments of unanimous reviewers. I thank you all for your insightful comments and support. This research study received no specific grant from any funding organization in the public, commercial or not-for-profit sector. The views expressed in this study are those of the authors though supported by the views from previous publications.

References

- Ajzen, I., & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behaviour*. Prentice Hall, Eagle Cliffs NJ.
- Arnort, D., & Pervan, G. (2005). The Methodological and Theoretical Foundations of Decision Support Systems Research. In *Information Systems Foundations* (pp. 246-261), ANU Press.
- Avison, A. E., & Fitzgerald, G. (2000). *Information Systems Development: Methodologies Techniques and Tools* (2nd ed.). The McGraw-Hill Companies, New York.
- Babbie, E. (2004). *The Practice of Social Research* (10th ed.). Thomson Wadsworth Australia.
- Benbasat, I. (1984). Analysis of Research Methodology. In F. N. McFarland (Ed.), *1984 The Information Systems Research Challenges, Boston* (pp. 47-88). MA: Harvard Business School Press.

- Benbasat, I., Goldstein, D., & Mead, M. (1987). The Case Research Strategy in Studies of Information Systems Case Research. *MIS Quarterly*, 3(11), 369-386. <https://doi.org/10.2307/248684>
- Bergeron, F., Raymond, L., Rivard, S., & Gara, M. (1995). Determinants of EIS Use: Testing a Behavioural Model. *Decision Support Systems*, 14, 131-146. [https://doi.org/10.1016/0167-9236\(94\)00007-F](https://doi.org/10.1016/0167-9236(94)00007-F)
- Buttery, E. A., & Buttery, E. M. (1991). Design of a Marketing Information System Useful Paradigms. *European Journal of Marketing*, 1(25), 26-39. <https://doi.org/10.1108/03090569110136303>
- Casebeer, A. L., & Verhoef, M. J. (1997). Combining Quantitative and Qualitative Research Methods: Considering the Possibilities for Enhancing the Study of Chronic diseases, *Chronic Dis Can*, 3(18), 5-13.
- Chapter Three: Research Methodology*. (2020). Retrieved 27 February, 2020, <http://www.is.cityu.edu.hk/staff/isrobert/phd/ch3>
- Checkland, P. (1981). *Systems Thinking, Systems Practice*. Wiley, Chichester.
- Davis, F. D. (1986). A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results. In *MIT Sloan School of Management, Cambridge, MA: Mit Sloan School of Management*.
- Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319-333. <https://doi.org/10.2307/249008>
- Dillman, D. A. (1978). *Mail and Telephone Surveys-The Total Design Method*. John Wiley and Sons, New York.
- Dillman, D. A. (2000). *Mail and Internet Surveys The Tailored Design Method* (2nd ed.). John Wiley & Sons.
- Ditsa, G. (2004). A Research Design and a Methodological Approach to an Exploratory User Behaviour Testing: Lessons Learnt. *Information Resources Management*.
- Elkordy, M. M., & Khalil, O. E. M. (2005). EIS Information: Use and Quality Determinants. *Information Resources Management Journal*, 18(2), 68-93. <https://doi.org/10.4018/irmj.2005040104>
- Emory, C. W., & Cooper, D. R. (1991). *Business Research Methods* (ed.). Irwin, Homewood.
- Encyclopedia of Philosophy*. (1967). Retrieved February 23, 2011, <http://www.ikipedia.org/wiki/Epistemology>
- Galliers, R. D. (1991). *Choosing Appropriate Systems Approaches: A Revised Taxonomy*. Elsevier Science Publishers B.V. Amsterdam, North Holland.
- Galliers, R. D., & Sunderland, A. R. (1991). Information systems management & strategy formulation: The “stage of growth” model revisited. *Journal of Information systems*, 1(2). <https://doi.org/10.1111/j.1365-2575.1991.tb00030.x>
- Goundar, S. (2013). Chapter 3—*Research Methodology and Research Method*. Victoria University of Wellington.

- Guba, E. G., & Lincoln, Y. S. (1994). Competing Paradigms in Qualitative Research. In *Handbook of Qualitative Research*. Sage Publication.
- Hirschein, R. (1985). *Information systems epistemology: An historical perspective*.
- Hunt, S. D., Sparkman, R. D., & Wilcox, J. B. (1982). The pretest in survey research: Issues and preliminary findings. *Journal of Marketing Research*, 19(May), 269-273.
<https://doi.org/10.1177/002224378201900211>
- Ikart, E. (2018). Questionnaire Pretesting Methods: A Comparison of Cognitive Interviewing & Respondent Debriefing Vis—A-vis the Study of the Adoption of Decision Support Systems by Knowledge Workers. *International Journal of Business & Information, IJBI*, 2(13), 119-154.
- Kerlinger, F. N. (1986). *Foundations of Behavioral Research* (3rd ed.). Rinehart and Winston, Holt New York.
- Khalil, O. E., & Elkordy, M. M. (2005). EIS Information: Use and Quality Determinants, Idea Group Publishing. In *Information Resources Management Journal*, 18(2), 68-93.
<https://doi.org/10.4018/irmj.2005040104>
- Kim, J. (1996). *An Empirical Investigation of Factors Influencing the Utilization of Executive Information Systems, Dissertation*. University of Nebraska.
- Kothari, C. R. (2004). *Research Methodology, Methods & Techniques* (2nd ed.). New Age International Publishers.
- Kuhn, T. S. (1970). *The Structure of Scientific Revolutios* (2nd ed.). The University of Chicago Press.
- Mcbride, N. (1997). The rise and fall of executive information systems: A case study. *Information Systems Journal*, 7, 277-287. <https://doi.org/10.1046/j.1365-2575.1997.00021.x>
- Myers, M. C. (2004). *Qualitative Research in Information Systems*. Retrieved June, 2004, from <http://www.qual.auckland.acnz/accessed>
- Nandhakumar, J. (1996). Design for success?: Critical success factors in executive information systems development. *European Journal of Information Systems*, 5, 62-72.
<https://doi.org/10.1057/ejis.1996.12>
- Nandhakumar, J., & Jones, M. (1997). Design in the dark: The changing user—Development relationship in information systems development. In *Proceeding of the Eighteenth International conference on Information systems* (pp. 15-17, pp. 75-87). Atlanta Georgia USA.
- Neuman, W. L. (2003). *Social Research methods: Qualitative and Quantitative Approach*. Pearson Education, Inc. Sydney.
- Nord, J., & Nord, G. (1995) Executive Information System: A study and Comparative Analysis. In *Information & Management* (Vol. 29, pp. 95-106). Elsevier B.V.
[https://doi.org/10.1016/0378-7206\(95\)00013-M](https://doi.org/10.1016/0378-7206(95)00013-M)
- Orlikowski, W. J., & Baroudi, J. J. (1991). Studying Information Technology in Organizations: Research Approaches and Assumptions. *Information Research*, 2, 1-28.
<https://doi.org/10.1287/isre.2.1.1>

- Patton, M. (1990). *Qualitative Evaluation and Research Methods*. Sage.
- Pervan, G. P. (1992). Issues in EIS: An Australian Perspective. *Journal of Computer Information Systems*, 32(4), 6-10.
- Remenyi, D., & Williams, B. (1996). The nature of research: qualitative or quantitative, narrative or paradigmatic? *Info System Journal*, 1996(6), 131-146. <https://doi.org/10.1111/j.1365-2575.1996.tb00009.x>
- Sarantakos, S. (2002). *Social Research* (2nd ed). MacMillan Publishers Australia Pty Ltd.
- Sekaran, U. (1992). *Research Methods for Business: A skill-Building Approach* (2nd ed.). John Wiley & Sons Inc.
- Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). *Personal computing towards a Conceptual Model of Utilization MIS Quarterly*, 15(1), 125-143. <https://doi.org/10.2307/249443>
- Triandis, H. C. (1979). In *Values, Attitudes, and Interpersonal behaviour. Nebraska Symposium on Motivation: Beliefs, Attitude, and Values* (pp. 195-259). University of Nabraska Press, lection Forecast ? An Evaluation of Columbus Dispatch Poll.
- Westen, D. (1996). *Psychology Mind, Brain, & Culture*. John Weiley & Son, Inc. New York USA.
- Zikmund, W.G. (2003). *Business Research Methods*. Australia, South Western.