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**Locus of Control and Going-Concern Judgements:
The Mediating Effect of Nondiagnostic Information
and Decision Aid Availability**

Anamitra Shome

A Thesis

in

The Faculty

of

Commerce and Administration

**Presented in Partial Fulfilment of the Requirements
for the Degree of Doctor of Philosophy at
Concordia University
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Abstract

Locus of Control and Going-Concern Judgements: The Mediating Effect of Nondiagnostic Information and Decision Aid Availability

Anamitra Shome
Concordia University, 1998

The primary purpose of this dissertation is to investigate the influence of the auditor's locus of control on auditor judgement in the context of a complex auditing task, going concern evaluation. Other objectives involve examining the influence of information type and decision aid availability (and their interaction with each other and with locus of control) on this task. In examining the influence of locus of control on going concern assessment, the study makes a significant original contribution to the extant literature in audit judgement.

Despite the exploratory nature of the study, the findings indicate differences in the decision making behaviour of individuals with an internal locus of control (internals) versus those with an external locus of control (externals), particularly with respect to perceived information relevance. Decision aids were found to influence perceptions of information relevance or task complexity on controlling for locus of control. Internals did not display greater decision accuracy than externals. Evidence of the dilution effect was found on controlling for locus of control. Information type, decision aid availability, and locus of control interacted to influence decision accuracy. Overall, the results indicate that internals achieve better decision performance than externals if they are unaided, or if they have access to a decision aid in mixed information environments. The results also suggest that auditors' professional judgement is an important factor influencing decision performance.

Dedication

**This work is dedicated to the loving memory
of my father, Jyoti Prakash, and my mother, Meena.**

Your sacrifices shall not go in vain.

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Chapter I

Introduction

1.1 Motivation and purpose

The purpose of this dissertation is to investigate the influence of an individual personality variable, locus of control, on auditor judgement in the context of a complex auditing task, going concern evaluation. The role of nondiagnostic information and a decision aid is also examined. Previous research on the influence of nondiagnostic information on auditor judgement has met with somewhat inconsistent results. A probable reason for this is the emphasis of these studies on task and environment related variables only, to the exclusion of variables intrinsic to the decision maker. This may have been partly responsible for the inconsistent results observed so far. This study develops a framework for differences in auditor judgement and decision making based on the individual's locus of control (which is posited to influence the choice of a cognitive information processing strategy). The objective of this study is to empirically evaluate this framework.

The study is motivated primarily by the objective of making a significant original contribution to the extant literature. It does so through an investigation of the influence of a personality factor (locus of control), and two environmental factors (nondiagnostic information and decision aid availability) on auditor judgement. These factors are examined in the context of a complex auditing function, going concern assessment. The study is also motivated by considerations of relevance and timeliness in view of the proposed changes to Canadian auditing regulation in respect of going concern assessment.

1.2 Going concern evaluation

Auditing has been defined as "a systematic process of objectively obtaining and evaluating evidence regarding assertions about economic actions and events to ascertain the degree of correspondence between those assertions and established criteria and communicating the results to interested users" (American Accounting Association, 1973). The ultimate output of the audit process is the auditor's report, which presents the auditor's opinion on the fairness of the client's financial statements. In forming this opinion, the auditor engages in a variety of tasks that range on a continuum from "structured" (Keen and Scott-Morton, 1978) to "unstructured".

The auditor's professional judgement plays an important role in the formulation of the audit opinion. However, the degree to which it is crucial for the successful performance of a given audit task depends on the nature of the task. While the problem and its solution are clearly defined for structured tasks, unstructured tasks are characterized by ill-defined problems lacking clear-cut solutions. The latter require the decision maker to use his or her professional judgement to a considerably greater degree than the former (Abdolmohammadi, 1987). Thus, professional judgement assumes critical importance in complex audit task situations relative to simple ones (Jiambalvo and Pratt, 1982).

An example of a complex decision task in auditing is going-concern evaluation, typically carried out near the completion of the audit (Anderson, Koonce and Marchant, 1992). The going-concern concept assumes that an entity will continue in operation for the foreseeable future and will be able to realize assets and discharge obligations in the

normal course of operations (Boritz, 1991). Financial statements prepared in accordance with Generally Accepted Accounting Principles (GAAP) are based on the validity of this assumption with respect to a given entity. If the entity's circumstances do not warrant the continued validity of the going concern assumption, another (more appropriate) basis for financial statement preparation must be adopted.

The importance of the going concern assessment task has been underscored in recent times. Auditors have been severely criticized by investors subsequent to the bankruptcies of some high-profile public companies (Cormier, Magnan and Morard, 1995). Changes to auditing regulation are being envisaged as a result of such pressures. Currently, auditing regulations in Canada require auditors to assess the validity of the going concern assumption for a client firm only in the event that they "become aware of conditions that cast doubt on the ability of the enterprise to continue as a going concern" (CICA Handbook, Paragraphs 5510.51-53). However, a recent CICA Exposure Draft (September 1995) titled "*Auditors' Responsibility to Evaluate the Going Concern Assumption*"¹ proposes to make it mandatory for auditors to explicitly assess the validity of the client firm's going concern status on every audit engagement. As a result, going concern assessment has assumed considerably added significance as an important

¹ As of April 1998, the Exposure Draft has not been incorporated within the CICA Handbook. According to the status report on the Exposure Draft posted to the CICA website, it is presently under consideration by a joint task force comprising members from the Auditing Standards Board and the Accounting Standards Board. The latter has issued another exposure draft titled "*Going Concern*" in March 1996. The objective of the combined task force is to remove inconsistencies between the two exposure drafts and harmonize them with international and U.S. positions.

decision task in auditing.

1.3 Auditor decision-making

Several studies have investigated auditor judgement and decision performance relating to going concern assessment. Altman and McGough (1974) found, on comparing audit opinions issued for a sample of 34 bankrupt companies with the predictions of a discriminant model, that the model performed with 82 percent accuracy relative to 44 percent for auditors. Levitan and Knoblett (1985) also found that their model outperformed auditors, although auditors did achieve relatively high accuracy (90 percent and 84 percent success rates for the model and auditors respectively). Koh and Killough (1990) and Koh (1991) also observed similar results.

These studies seem to indicate that auditors do not perform as well as statistical models in bankruptcy prediction. However, Hopwood, McKeown and Mutchler (1994: 410) felt that their conclusions may be questioned because of their failure to adequately incorporate the decision environment in which auditors normally function. An important part of this environment consists of information. Auditors typically have to evaluate rich information sets in order to arrive at their going concern estimates. While diagnostic information does exist in these information sets, they are also characterized by the presence of nondiagnostic information. Rapid advances in information technology have resulted in increasingly larger quantities of information available to the decision maker, and auditors too have to contend with this proliferation as an integral part of the audit environment. Libby and Libby (1989: 729) pointed out that research in judgement and decision making has consistently found that humans have difficulty drawing inferences

from multiple sources of information. Nisbett, Zukier and Lemley (1981) observed the "dilution effect"— whereby subjects given mixed information containing both diagnostic and nondiagnostic information tended to make less extreme judgements than those given only diagnostic information— indicating that the nondiagnostic information, although *a priori* irrelevant to the decision task at hand, did have an effect on the decision-maker's judgement. The dilution effect is explained in terms of the decision-maker's use of the "representativeness" heuristic (Tversky and Kahneman, 1982b), whereby nondiagnostic information about a target entity has the capacity to render it less "similar" to a hypothetical entity which might be most likely to exhibit extreme and atypical behaviour.

1.4 Decision making behaviour

The use of a heuristic strategy such as representativeness to arrive at a decision raises the question of why intuitive strategies would be preferred to normative ones that would lead to greater decision accuracy. The Newell and Simon (1972) theory of information processing represents decision making in terms of problem solving.

According to this framework, problem solving involves the interaction of a) the problem solver's representation of the problem in terms of a problem space; b) the human information processing system; and c) the external task environment. The components of the problem are encoded by the problem solver within the problem space. It is the structure of the problem space that determines the choice of the information processing strategy employed to solve the problem.

An explanation for why the decision maker would make a choice from among different decision strategies (as opposed to following the same strategy consistently) is

suggested in the literature in terms of the effort-accuracy framework (Beach and Mitchell, 1978; Payne, 1982). Decision-makers are assumed to be motivated by the twin objectives of maximizing decision accuracy and minimizing decision effort (in terms of the use of cognitive resources for information processing). This motivation guides the choice of decision strategy (i.e., either normative or intuitive). Normative (or compensatory) strategies assume consistent information processing across alternatives and the utilization of all available information for every alternative and attribute. Intuitive strategies (also termed heuristics or non-compensatory strategies) use only part of the information available. Consequently, although normative strategies result in superior decision performance, they demand higher costs in terms of cognitive effort than intuitive ones which, however, may not achieve the same level of decision performance.

The accuracy-effort framework suggests that decision makers, being highly adaptive, switch from normative to intuitive strategies depending on the task requirements. For simple decision tasks, decision makers may use normative strategies to achieve greater accuracy at relatively low cost (in terms of the expenditure of cognitive resources). However, as task complexity increases, the use of normative strategies entails corresponding increases in cognitive effort, leading the decision maker to switch to a lower effort strategy such as a heuristic.

Basing itself on the two decision theories outlined above, this study posits that decision makers, faced with a complex decision task (such as going concern evaluation, made additionally complex by the introduction of both diagnostic and nondiagnostic information), may elect to switch to a non-compensatory (intuitive) decision strategy to

solve the task problem. The use of a heuristic will simplify the decision process, leading to perceptions of low task complexity. In addition, where the task is not nearly as complex (due to the lack of the nondiagnostic component), decision makers may use a compensatory (normative) decision strategy to attain optimal decision performance. Although this will have the effect of engendering a perception of task complexity in the mind of the decision maker, it will also lead to better decision performance. This study also posits, therefore, that going concern decisions made in the context of a relatively lower volume of information (containing primarily diagnostic information) will lead to better decision performance.

1.5 Decision aids and going concern assessment

Decision aids are an important constituent of the audit environment (Messier, 1995). The literature on the use of decision aids in auditing suggests that decision aids generally contribute to the improvement of audit judgement, although evidence of decision aids hampering decision performance has also been found (e.g., Ashton, 1990). Like the aid employed in this study, most of the decision aids examined in audit judgement research have been simple types that follow a decomposition strategy (Messier, 1995) — although recent research suggests that mechanical aggregation aids can lead to superior decision performance relative to decomposition aids (Bonner, Libby and Nelson, 1996). The benefit from a decision aid is seen to arise from its ability to divide the decision task into separate phases that the decision maker can then focus upon. In a complex task situation (such as going concern assessment) made more complex as a result of the existence of both diagnostic and nondiagnostic information, a decision aid

may encourage the use of a compensatory strategy rather than an intuitive one by simplifying the decision task in this manner. Consequently, this study posits that decision aids will enable the decision maker in such a situation achieve better decision performance.

1.6 Strategy selection and locus of control

The Newell and Simon (1972) theory of information processing posits that the gross characteristics of the human information processing system are invariant over task and problem solver. However, these characteristics do not determine the behaviour of the decision maker in detail. Thus, individual differences in personality may manifest themselves in decision-making. For instance, in situations of increasing task complexity, individuals with low thresholds for cognitive effort may choose to switch to an intuitive strategy (from a normative one) earlier than those with high effort thresholds.

An important personality trait that could have a bearing on decision behaviour is the decision maker's locus of control, which refers to "the beliefs that individuals hold regarding the relationship between actions and outcomes" (Lefcourt, 1991: 414). Individuals with an external locus of control (henceforth, externals) believe in luck or chance, experience a sense of powerlessness concerning the external environment, and believe that outcomes cannot be influenced by one's efforts. Individuals with an internal locus of control (henceforth, internals), on the other hand, believe in their ability to influence outcomes through their actions.

An important difference between externals and internals relates to their behaviour with respect to seeking and processing information. Internals have been found to be

superior to externals in the acquisition and utilization of information (Phares, 1968), are more likely to pay more attention to potentially relevant cues than externals (Lefcourt and Wine, 1969), and are more willing to adopt a long-term perspective than externals (Lefcourt, 1982). Differences between internals and externals become more evident in "ambiguous" task situations (Phares, 1968), suggesting that, particularly in complex task situations, externals tend to exhibit decision behaviour that is different from that of internals. This study proposes that in the context of a complex task such as going concern assessment on the basis of mixed information sets, these differences between internals and externals may manifest themselves in decision makers' going concern estimates, as well as perceptions of information relevance and task complexity. The nature of these differences is explained in the hypotheses presented in Chapter II.

1.7 Contribution to original knowledge

This study makes a contribution to the extant literature by providing an explanation for individual differences in decision strategy selection. Specifically, it presents a framework for differential individual decision performance in a complex audit task depending upon the decision maker's orientation with respect to a personality trait, perceived locus of control. Decision performance has traditionally been proxied in audit judgement studies by judgement confidence and inter-judge consensus. This study uses decision accuracy as a measure of decision performance. The Newell and Simon (1972) theory of information processing, as well as the effort- accuracy theory of decision strategy selection of Beach and Mitchell (1978) are used to achieve the objectives of the study. Consequently, the findings constitute a significant contribution to the extant

literature on audit judgement and decision making.

1.8 Organization of the dissertation

The remainder of the dissertation is organized as follows. The relevant literature is reviewed in Chapter II, which also incorporates the development of the research hypotheses. Chapter III presents the literature on which the development of the decision aid used in the study is based. Chapter IV describes the research method employed in the study. Chapter V incorporates the results of the data analysis, as well as a discussion of the results. Chapter VI presents the conclusions, including a discussion of the limitations of the study, and implications for future research.

Chapter II

Literature Review and Hypothesis Development

2.0 Overview

Recent developments in Canadian auditing regulation suggest that auditors will, in all likelihood, be called upon to exercise their judgement on every audit engagement to assess the client's ability to continue as a going concern. Prior research on audit judgement related to going concern assessment has focussed mainly on variables related to the auditing environment. However, the results of this line of research have not been consistent. One reason for this could be the relative lack of emphasis on studying the effect of individual personality factors on decision making. This study investigates the effect of one such personality variable, the decision maker's locus of control, on going concern assessment. This chapter begins by providing the background relating to auditing judgement in going concern evaluation. This is followed by a discussion of the literature relating to decision making in contexts characterized by the presence of relevant as well as irrelevant information. The literature pertaining to the effect of decision aids, an important constituent of the audit environment, is then presented.

The literature on locus of control (e.g., Lefcourt, 1991; Phares, 1976) suggests that there are significant differences relating to information processing behaviour between individuals with an internal locus of control and those with an external locus of control. The reasons for such differences, however, are not readily apparent. This study draws upon the problem-solving theory of Newell and Simon (1972) and the effort-accuracy theory of Beach and Mitchell (1978) to form an integrated framework that presents the

probable reasons for the divergence between internals and externals in their information processing behaviour. This framework is then used to develop the research hypotheses, which posit that auditors will differ significantly in their going concern decisions depending on whether they are internals or externals. This divergence in information processing between internals and externals is hypothesized to be moderated by the presence of irrelevant information and the use of a decision aid. The study examines audit judgement and decision making through the effect of three independent variables (locus of control, irrelevant information, and decision aid availability) on three dependent variables (decision accuracy; and the decision maker's perceptions of information relevance and task complexity).

2.1 Judgement and decision making in auditing

Ever since Ashton's (1974) seminal study on auditor judgement, several papers have contributed to the burgeoning literature in the area. Despite this progress, several gaps still exist in the current state of understanding of the exercising of professional judgement in different auditing contexts. The CICA Research Report (1995: 22-23) on professional judgement in auditing summarizes these gaps as relating to the audit task environment, auditor characteristics, audit evidence, and the qualitative attributes of audit judgement. The objective of this study is to narrow this gap through a contribution to the extant literature.

2.1.1 The nature of auditing

The Statement of Basic Auditing Concepts (American Accounting Association, 1973: 2) defines auditing as "a systematic process of objectively obtaining and evaluating

evidence regarding assertions about economic actions and events to ascertain the degree of correspondence between those assertions and established criteria and communicating the results to interested users". Judgement and decision making play a crucial role in the performance of this function, being "inherent in every phase of the audit process" (Solomon and Shields, 1995: 139). Decisions typically have to be made in areas relating to (1) evaluations or judgements of current information; (2) predictions of future outcomes; (3) assessments of the probability that particular outcomes will occur (and revisions of such probabilities); and (4) choices among alternate courses of action (Ashton, 1982: 71).

These decisions are made in the course of various audit-related tasks of varying degrees of complexity, ranging from the highly "structured" (Keen and Scott-Morton, 1978) to the highly unstructured. Judgement and decision making are brought to play on these tasks at varying levels of intensity (Abdolmohammadi, 1987: 174). Structured tasks (such as computing depreciation expense) require little judgement and decision making skills. Semi-structured and unstructured tasks, on the other hand (such as performing analytical procedures), require "a wide spectrum of cognitive activities including forming mental representations, generating and testing hypotheses, external and internal (i.e., in memory) information search, and information evaluation and combination" (Solomon and Shields, 1995: 147). An example of a complex, unstructured audit task requiring a high level of audit judgement is going concern evaluation.

2.1.2 Going concern evaluation

Assessing an entity's going concern status is a crucial auditing task. The going

concern concept assumes that an entity will continue in operation for the foreseeable future, realizing assets and discharging liabilities in the normal course of operations. The use of this assumption underlies the preparation of financial statements in accordance with the accrual method of accounting within the framework of generally accepted accounting principles (GAAP). Thus, the deferred recognition of revenues to specific time periods and the systematic expiration of costs over future time periods are a function of the continued validity of this underlying assumption. However, when circumstances call into doubt the validity of the going concern assumption for a given entity, the appropriateness of any recorded values in financial statements prepared by the entity in accordance with GAAP is also subject to doubt (Boritz, 1991: 2).

In order to perform the task of going concern assessment, the auditor is required to judge whether the going concern assumption is unwarranted by the overall state of health of the entity. Stated differently, the auditor is required to assess whether events have occurred, or will occur in the foreseeable future, that indicate that the “going concern assumption is not an appropriate basis for preparing the current financial statements” (Boritz, 1991: 2) The importance of this judgement has been highlighted in recent times with the severe criticism levelled at auditors whose reports did not indicate that their clients (prominent publicly traded firms that subsequently failed) were at risk of losing their going concern status (Cormier, Magnan and Morard, 1995: 201).

Studies that have examined auditors’ judgement and decision making with respect to going concern evaluation have found that auditors are generally outperformed by statistical models. Altman and McGough (1974) used a bankruptcy prediction model

based on discriminant analysis, comparing its performance with the audit opinions issued in the year prior to bankruptcy for 34 bankrupt companies. The model accurately predicted bankruptcy for 82 percent of the cases a year prior to failure, and 58 percent of the cases two years prior to failure. In contrast, auditors had issued qualified audit opinions in only 45 percent of the cases in the reporting year prior to bankruptcy.

Similar results were observed when Altman (1983) extended the study to include three samples of firms from 1970 to 1982. The study examined a total of one hundred and nine failed companies. The model correctly identified 86.2 percent of the bankrupt firms one year prior to failure, but only 48.1 percent of them had received going concern qualifications from their auditors.

Levitan and Knoblett (1985) examined the correspondence of the variables and weighing schemes used in going concern evaluation by auditors to those used by two discriminant bankruptcy prediction models. The first model was constructed using 32 firms from the Compustat industrial file that had filed for bankruptcy protection under Chapter 11 of the U.S. National Bankruptcy Act, using ratios described in Statement on Auditing Standards (SAS) no. 34. The second was constructed using a sample of 32 firms that had received a going concern report. The two discriminant functions were then contrasted. Although an overlap was observed in the ratios used by auditors and the bankruptcy prediction models, their weighing schemes were quite different. Interestingly enough, 66 percent of the Compustat firms had received going concern opinions a year prior to bankruptcy.

More recent studies have observed similar results. Koh and Killough (1990) used

a discriminant model based on twenty-one financial ratios derived from the accounting and finance literature to predict bankruptcy for a sample of failed and non-failed firms during the period 1980 to 1985. The model correctly classified both the non-failed and failed firms correctly with 91.1 percent and 94.1 percent accuracy respectively. The model was then applied to a random sample of 400 Compustat companies (of which 14 were failed firms) for the period 1980 to 1985. Auditors' opinions for this sample were obtained from each firm's financial statements. While the model as well as auditors had equal accuracy rates for non-failed firms (88.6 percent and 88.8 percent respectively), the model strongly outperformed the auditors (78.5 percent to 21.4 percent) for failed firms.

In a subsequent study, Koh (1991) compared the predictions of a bankruptcy prediction model based on six financial ratios with the going concern assessments of auditors, for a sample of 165 bankrupt companies and 165 non-bankrupt companies relating to the period 1978 to 1985. The study used probit analysis to estimate the model parameters. Again, accuracy rates for the model and the auditors were similar for non-bankrupt firms (100 percent for both). For bankrupt firms, however, the model accurately predicted bankruptcy for 85.4 percent of the cases, while auditors did so for only 54.3 percent of the firms in the sample.

Several studies have investigated factors affecting auditors' decision making processes in order to understand the reason for inconsistent decision performance. Kida (1984) examined whether auditors' search for evidence is affected by hypothesis framing. After being randomly assigned to either a failure or a viability hypotheses condition, auditors were presented with a set of 20 cues, half of which suggested continued viability

while the other half indicated failure. Results showed the use of a confirmatory decision strategy—auditors in the viability group found more evidence supporting continued existence than those in the failure group. However, failure items were listed more than viability items by both groups. Interestingly enough, both groups listed the same number of failure items.

Asare (1989) hypothesized that auditors put more weight on disconfirmatory evidence than confirmatory evidence. Thus, for auditors framing their hypotheses in terms of viability, belief revisions after processing contrary information would be larger than for those receiving mitigating evidence after framing their hypotheses in terms of failure. Using an experimental design, he randomly assigned participants (practising auditors) to either a viability or failure hypothesis frame. Subjects were provided with information on a hypothetical client and were asked to make an initial assessment of going concern status. They were then presented with contrary information and mitigating factors, and were asked to provide their revised beliefs. The magnitude of the belief revision after processing contrary information was measured. No evidence of belief revision was found, suggesting that auditors focus more on information content than on the nature of the information (whether confirmatory or non-confirmatory).

In a related study, Asare (1992) hypothesized that the order in which evidence is processed (i.e., whether confirmatory evidence is assessed first, followed by non-confirmatory evidence, or vice versa) leads to a recency effect in auditors' going concern decisions. Thus, auditors evaluating contrary information followed by mitigating factors will issue a relatively larger number of unqualified opinions than those evaluating exactly

the same evidence, but in reverse order. The study found support for Asare's hypothesis, indicating the existence of recency effects in both belief revisions and audit report choices.

The foregoing discussion suggests that auditors do not perform as well as statistical models in predicting firm failure, and may also be subject to some biases in evaluating evidence. An important environmental variable in auditing contexts is the presence of information sets that are typically quite broad. Libby and Libby (1989) suggest that humans have difficulty drawing inferences from multiple sources of information. The going concern assessment task is by nature a complex one, and the existence of a diversity of information cues (not all of which may be relevant) adds to its complexity. The next sub-section discusses the literature relating to decision making in contexts characterized by the existence of irrelevant information. The succeeding sub-section reviews the literature concerning another variable important to the audit environment: decision aid availability.

2.2 Irrelevant information and the "dilution effect"

Is there evidence to indicate that decision making is affected by the existence of irrelevant information? Several studies have examined judgement and decision making in the context of mixed information sets consisting of both diagnostic and nondiagnostic information. Although the latter is by definition irrelevant to the decision problem at hand, there is evidence to suggest that it does affect the decision process.

The earliest studies on irrelevant information related to its effects on learning in discrimination tasks. Montague (1965) conducted an experiment in which 42

undergraduate students were provided with auditory stimuli, and were required to identify the stimulus samples in terms of the value of each of three dimensions: the pitch, the loudness, and the relevant third dimension (from different sequences comprising varying numbers of irrelevant dimensions). The study found that subject groups receiving different amounts of irrelevant information (1, 2, or 3 dimensions) never relevant to their task made fewer errors than groups receiving different amounts of irrelevant information which sometimes required differential responding. Errors increased with the number of irrelevant dimensions. Varying the discriminability of the relevant information resulted in enhanced effects of irrelevant information. The effects of irrelevant information, however, were mitigated somewhat through repeated practice sessions.

In a study on the effect of irrelevant cues on learning performance, Castellan (1973) assigned 595 subjects to 24 groups manipulating three factors (validity of relevant cue dimension, number of irrelevant cue dimensions, and replications) at 4, 3, and 2 levels respectively. The study aimed at investigating whether subjects were able to learn to ignore irrelevant cues in multiple-cue probability learning situations. Each subject was presented with a set of cues, but each of the cues was only partly related to the events to be predicted. Subjects were informed that the cues might be helpful to them in making predictions, and that they could perform better or worse depending on how much they learned. The cue dimensions were specifically labelled, and related to shape (x or y), colour (red or green), and "dot" (left or right). Cues were presented to the subjects on each trial, and the procedure waited until the subject made a response.

The study found that subjects were not able to ignore irrelevant cue dimensions

even after a large number of trials. When relevant cues with a high validity were presented, subjects were almost completely able to ignore irrelevant cues. When the relevant cue dimension had very low validity, subjects had great difficulty distinguishing relevant cue dimensions from irrelevant ones. However, the greatest decrement in performance was observed when the relevant cue dimension was of moderate validity.

Troutman and Shanteau (1977) employed a simple "book bags and poker chips" task to determine if information that was obviously nondiagnostic would affect judgements. Two boxes containing different numbers of red, white, and blue beads (70/30/50 and 30/70/50 respectively) were used in two different experiments. Subjects were presented with successive samples of beads. The experimental task was to assess, after each sample, the probability that the predominantly white box had been sampled. Three different types of nondiagnostic samples were used: an equal number of red and white beads indicated a neutral sample, a sample of just blue beads was also irrelevant, as was a null sample that contained no beads at all. The first experiment demonstrated that these three different types of nondiagnostic samples (neutral, irrelevant, and null) consistently led to subjects making less extreme inferences. The results of the second experiment suggested that the size of this effect depended on serial location, and was less with aggregate than sequential samples. Overall, the results suggest that the nondiagnostic samples influenced subjects' judgement performance as if they were in fact diagnostic.

Gaeth and Shanteau (1984) conducted two experiments to determine whether experienced judges were influenced by irrelevant information in a task involving soil judgement. The study also sought to compare the effectiveness of two training procedures

designed to reduce the influence of irrelevant information. One training procedure involved a lecture, while the other involved interaction and practice. Results of a pretest indicated that irrelevant information influenced the judgements of 12 experienced student soil judges. Lecture-style training was then provided to the judges, but was found to reduce the impact of irrelevant information only minimally. The judges subsequently received interactive training, which was observed to reduce the influence of irrelevance as well as enhance judgement accuracy.

In a series of studies aimed at determining how people combine items of information that they believe to be diagnostic with items of information they believe to be nondiagnostic, Nisbett, Zukier and Lemley (1981) presented subjects with information that had been categorized by pretest subjects as either diagnostic or nondiagnostic. Subjects were asked to perform experimental tasks such as predicting shock tolerance for engineering majors versus music majors, or predicting the likelihood that several "middle-class, male social work clients" were child abusers. Results of all five studies consistently indicated that subjects given a mixture of diagnostic and nondiagnostic information made much less extreme predictions than subjects given only diagnostic information. Nisbett, Zukier and Lemley dubbed this tendency the "dilution effect", surmising that it was the result of the "representativeness" heuristic involving similarity judgements in the decision-prediction process. The use of this heuristic involves a feature matching process utilizing the information available on a target entity, to compare it with a hypothetical entity most likely to exhibit extreme and atypical behaviour. The nondiagnostic information serves to render the target entity less "similar" to the

hypothetical entity, leading to less extreme judgements. The Nisbett, Zukier and Lemley studies also indicated that even expert judges are susceptible to the dilution effect.

The literature presented so far suggests that irrelevant information affects decision making in non-auditing contexts. Does irrelevant information affect decision making in auditing contexts too? Hackenbrack (1992) had auditor subjects perform two experimental tasks. The first involved assessing how much a given company's exposure to fraudulent reporting changed during a year in which a fraud-related situation had occurred. In the second task, subjects estimated how much each of ten independent fraud-related situations would change their assessment of a company's exposure to fraudulent reporting. Thus, subjects evaluated the same fraud-related situation, first with mixed information, and then with only diagnostic information. The study found that auditor subjects given a mixture of diagnostic and nondiagnostic evidence made decisions that were less extreme than those made by subjects using only diagnostic evidence. Hackenbrack suggests that the results indicate that the nondiagnostic evidence failed to affirm the outcome suggested by the fraud-related evidence, reducing both the perceived similarity between the client and the suggested outcome, as well as the judged likelihood of that outcome.

While Hackenbrack's (1992) study found evidence of the dilution effect in an auditing context, Shelton (1994) did not observe the dilution effect in a going concern task involving auditor subjects. Participants were presented with information relating to a hypothetical firm, and were asked to make an estimate of the probability of the firm continuing as a going concern for a period of one year from its most recent financial

statements. The study used a 2 x 2 factorial design, with information availability manipulated at two levels (diagnostic and mixed), and accountability also manipulated at two levels (accountable and not accountable). The assessments of subjects given only diagnostic information were not found to be significantly different from those given mixed information. In addition, accountability did not enhance a dilution effect.

The studies reviewed in this sub-section suggest that irrelevant information does influence human information processing. However, while the influence of irrelevant information on judges' cognitive processes have been consistently documented in non-auditing contexts, the evidence is inconsistent in auditing contexts. As stated before, a possible reason for the inconsistent findings could be the non-inclusion in these studies of individual personality variables possessing the potential to influence decision making. An important personality variable that has been observed to influence information processing behaviour is locus of control. This study posits that auditors' perceptions of what constitutes relevant information will be affected by their individual loci of control.

The next sub-section reviews the literature on decision aids and decision making. Although many of the studies described examined decision aid use in non-auditing contexts, decision aids are an increasingly important constituent of the present-day audit environment. As such, it is meaningful to examine their role in audit decision making.

2.3 Decision aids and their usefulness

Decision aids are an important constituent of the audit environment (Messier, 1995), with firms making increasingly large outlays towards their development. Although a survey of the literature on the use of decision aids suggests that decision aids generally

contribute to the improvement of judgement and decision making, some evidence of decision aids hampering decision performance has also been found.

Peterson and Pitz (1986) conducted an experiment to determine whether decision making performance would be affected by the use of output from a mechanical model using a bootstrapping technique². Subjects were asked to predict the number of games won by a National League baseball team during one season, based on three of the team's statistics for that year. Values for the three statistics (the team's earned run average, the team's batting average, and the average number of home runs per game) were provided for several teams, and decision makers gave estimates of the number of games won by each team. In the first stage of the experiment, the predictions given were used in a linear multiple regression analysis. In the second stage, predictions from the regression model as well as the three statistics were provided to the subjects. Subjects were allowed to accept or alter the model's predictions in the second stage. The study found that providing estimates derived from the bootstrapping model improved decision makers' predictions. The improvement in prediction performance appeared to be caused by an increase in the consistency of decision makers' predictions, although inconsistency was not completely eliminated.

Sharda, Barr and McDonnell (1988) examined the effectiveness of decision

² The bootstrapping technique involves using a linear model to describe a series of judgements made by a decision maker, and then using it alone as a predictive model. Since the bootstrapping model integrates information consistently, its predictions are more accurate than the decision maker's predictions (Peterson and Pitz, 1986: 163).

makers using an aid relative to those without an aid over an eight-week period. Subjects in their study were 96 senior level undergraduate students enrolled in either of two sections of a business policy course. These subjects were allowed to self-select themselves into three-person teams responsible for the operations and performance of an organization. Assuming the role of upper level managers, they made group decisions on investment in plant and equipment, purchase or sale of securities, and a series of decisions for each of three product lines, while participating in a computer assisted simulation that modelled a business environment. One of the course sections was arbitrarily selected as the control group, and was required to make decisions without the use of a computerized decision support system (DSS). The second group was given instruction in the use of a DSS. The experiment evaluated the effectiveness of the DSS by examining the performance of the DSS- versus the non-DSS group.

The results of the study indicate that use of a particular DSS resulted in significantly better decision making performance. Use of the DSS also resulted in a reduction of variance in the decision makers' profit performance. The DSS groups reported investigating more alternatives and having greater confidence in their decisions relative to the non- DSS groups.

Not all studies have reported positive results of decision aid use. Aldag and Power (1986) carried out a study to determine the efficacy of a computerized decision-analysis program in improving decision performance. Eighty-eight subjects (business students in undergraduate and graduate-level normative decision-making courses covering topics such as utility models, decision trees and matrices, game theory, and subjective

probability elicitation) analyzed two strategic management cases after being assigned randomly to two groups. Subjects in the first group analyzed the first case with the use of the computerized decision aid and the second case a week later without the aid. Subjects in the other group analyzed the first case without the decision aid, and the second case a week later using the aid. The cases were short and ill-structured. Subjects were required to adopt the perspective of a management advisor, and provide written recommendations in a three- to five-page decision report. Independent raters examined the subjects' decision performance, attitudes towards the program, and individual differences.

The study found that users generally supported the use of computerized decision analysis. However, neither the subjects nor the independent raters (of subjects' decision performance) perceived the use of the decision aid as helpful in improving subjects' judgements. Overall, results indicate a general lack of improvement in rated decision quality with the use of the decision aid.

These studies suggest that decision aids are not uniformly helpful. Could the inconsistent results be attributed to the non-inclusion of individual personality variables in the analysis? Some evidence on this question may be obtained from the Benbasat and Dexter (1982) study, which involved an experiment to assess whether decision aids could improve the performance of subjects with low analytical ability (low analytics) in task environments unsuited to their cognitive styles. The task environment consisted of a relatively structured inventory control/ production scheduling system better suited for decision makers possessing high analytical abilities (high analytics). The decision aid used in the study was a simulation model. Subjects were fourth-year undergraduate and

second-year graduate business administration majors who were enrolled in an advanced logistics course. Acting as the inventory/production managers of a hypothetical firm, they interacted with a computerized game divided into ten decision points with 20 "game" days between each decision point. At each of these ten decision points, subjects made three decisions: set an order point, set an order quantity, and set the daily production figures for the next 20 days, within the overall objective of maximizing firm profit. Subjects were randomly assigned to either the "decision aid" group which had access to a report and the decision aid, or the "no-decision aid" group which had access to the report only. Subjects' cognitive styles were assessed using the Group Embedded Figures Test (GEFT).

Results indicate that high analytics had a higher profit performance than low analytics, and low analytics with the decision aid performed better than those without the decision aid. The decision aid also improved the performance of those high analytics who were not very good decision makers. Overall, while the decision aid improved the profit performance of only 33 percent of the high analytic subjects, 70 percent of the low analytics with the decision aid performed better than the best low analytic without the aid. This study indicates that decision aids may benefit users differentially depending upon their individual cognitive styles.

What characteristic of decision aids renders them useful for decision-making? One line of research suggests that it is the ability of the decision aid to induce decisions that are closer to the normative criterion than unaided decisions. For instance, Todd and Benbasat (1994) examined the role of computer-based decision aids in influencing

cognitive strategy selection through the reduction of cognitive effort. They proposed that specific features can be incorporated within a set of decision aids to induce the decision maker to adopt a normative rather than an intuitive decision strategy, leading to a normative result. Forty-eight subjects took part in a preferential choice task using different decision aids. Subjects were given different levels of support to reduce the cognitive effort associated with different preference choice strategies.

Results indicated that a decision aid which reduced the effort associated with a non-compensatory strategy (elimination by aspects) induced behaviours associated with elimination by aspects. More importantly, however, a treatment group provided with support for a compensatory strategy (additive difference) but not for elimination by aspects, processed information about available choices in a manner consistent with an additive difference strategy. This result suggests that decision aids can induce the use of a compensatory (normative) strategy by helping to reduce the cognitive effort associated with its use. More specifically, decision aids may be developed for the performance of complex decision tasks so that decision makers using them may choose to pursue decision accuracy with reduced cognitive effort.

The ability of decision aids to induce normative decision making has also been observed in audit-related studies. Butler (1985), for example, conducted a study to experimentally test a simple decision aid that helped to direct the decision maker's attention to possibly underutilized information. The study was based on the assumption that auditors have cognitive difficulty in assessing the sampling risk in a substantive test of details, and use heuristics to overcome this difficulty. Subjects were practising auditors

from five different audit firms of various sizes, and were randomly assigned to either the control group or the treatment group. They were each provided with a booklet containing instructions for the performance of the experimental task, two practice cases, and eight decision cases. The task involved the assessment of sampling risk when evaluating the sample results of accounts receivable confirmations. The eight cases covered a wide range of sampling risk. Three independent variables (the number of errors found in the balance confirmation process, the sample size, and the tolerable error for the account balance) were manipulated at two levels each in a within-subjects design.

Results suggested that auditors who had access to the decision aid made risk assessments that were closer to the normative criterion than those who did not. Over a wide range of sampling risk, the aid was effective in leading to the correct audit decisions with regard to accepting or rejecting a reported account balance.

Ashton (1992) examined the effect on judgement performance of an explicit justification requirement, and of having available the recommendations of a mechanical judgement aid. Professional auditor subjects used three financial ratios (Net Operating Income/Net Sales, Price/Earnings, and Long Term Debt/Total Assets) to predict the ratings assigned by Moody's Investors Service to bonds issued by 16 industrial corporations. The corporations had had a stable Moody's rating for at least four consecutive years. Four rating categories were employed, and a brief description of each was provided. The study used two treatment groups and a control group. The first treatment group (the JUS group) was required to provide justifications by writing, for each of the 16 bond issues, a brief explanation for predicting a particular rating instead of

one of the other three. Subjects in the other treatment group (the AID group) were given a mechanical judgement aid based on the three ratios, but were told to use it only if they saw fit to do so. The control group simply made a bond rating prediction for each of the 16 issues without a justification requirement or the availability of a mechanical aid.

The results of the study indicate that both a justification requirement as well as the use of a mechanical aid were associated with a significant improvement in accuracy. The improvement in judgement performance was partly attributable to an increase in decision consistency. The benefit associated with the mechanical aid exceeded that associated with justification.

Other audit-related studies relating to the effectiveness of decision aids have drawn mixed results. Kachelmeier and Messier (1990) examined the effects of a decision aid provided in the AICPA's *Audit Sampling* Audit Guide, on the magnitude and variability of auditor sample size judgements. 176 auditors from two (then) Big Eight firms participated in a between- subjects experiment after being randomly assigned to one of six treatment groups. The basic case used in all experimental conditions included background information and a set of financial statements for a manufacturer of various parts for small consumer appliances. Subjects were also provided with information on the internal controls, expectation of errors, and other substantive tests for the supplies inventory. Internal control was manipulated at two levels (weak and strong). There were three experimental conditions for each of the two internal control environments, leading to a 3x2 factor design. The basic task for subjects was to determine a nonstatistical sample size for the supplies inventory. The three experimental conditions were: (1) an

intuitive judgement group that provided a sample size without the decision aid; (2) a decision aid group which calculated sample size using the formula; and (3) a group that provided only the parameters for the formula with the researchers calculating the sample size afterwards. The study hypothesized that the sample sizes of the intuitive group would be smaller than those generated by the decision aid group, because the decision aid would force auditors to focus on the audit assurance implicit in the formula rather than directly on the sample size. The parameters-only group was hypothesized to generate the largest sample sizes, since subjects in this group would tend to "back into" their desired sample size by manipulating the parameters of the formula.

The results were generally in the hypothesized direction. The decision aid led to systematically larger sample sizes than those elicited from unaided judgement. The sample sizes generated by the parameters group were the largest, indicating that subjects in this group had attempted to circumvent the decision aid by working backwards. This third group also showed the greatest variability (i.e., the least consistency) of all the groups, with the intuitive group paradoxically exhibiting the highest consistency. Kachelmeier and Messier (1990) interpret this finding as supporting the conjecture that decision aids may have both positive and negative effects.

Ashton (1990) investigated the effects on decision making of three factors commonly found in audit settings: incentives, feedback, and justification. The study also examined the influence of decision aids on audit judgement, both individually and in combination with these factors. 182 auditor subjects from a Big Six auditing firm were required to perform a bond rating task in which they were provided with a single page

listing the values of certain financial ratios for 16 different firms. Subjects in the decision aid group were provided with additional information relating to the computed bond rating scores, as well as the ratings recommended by the aid. Subjects could evaluate the 16 bond issues in any order (except for those who received feedback) and could refer to the experimental materials as often as they wished. Prediction performance was measured in terms of classification accuracy, or the number of correct predictions.

Results indicate that subjects provided with the decision aid performed significantly better than those who did not have the aid. However, the decision aid interacted with incentives, feedback and justification in unexpected ways. Whereas providing an incentive resulted in enhanced judgement performance (measured in terms of lower rating variance) in a no-decision aid situation, it had a detrimental effect on decision performance when the decision aid was available. The decision aid had a similarly deleterious effect on judgement performance when combined separately with either feedback or justification. Similar results were obtained when the feedback and justification treatments were combined (with and without decision aid availability). Overall, the results suggest that combining three features of naturally occurring decision settings with decision aid availability can produce unintended results.

This brief survey of the literature indicates that while the use of decision aids may result in improved decision performance as well as user satisfaction, it may also lead to unintended consequences. The efficacy of a decision aid may stem from its ability to induce normative decision making. The inconsistent results observed from the research may be a function of differences in individual personality characteristics affecting

information processing ability. Thus, decision makers may be affected differentially by the use of a decision aid depending on their innate information processing capabilities (which, in turn, are a function of their individual personalities). An important personality characteristic that has been observed to affect decision making is locus of control. This study posits that locus of control interacts with decision aid availability to influence decision making. The following sub-section describes the locus of control construct in detail. In the subsequent sub-section, the linkage between locus of control and decision behaviour is presented in terms of a theoretical framework based on the problem-solving theory of Newell and Simon (1972) and the effort-accuracy theory of Beach and Mitchell (1978).

2.4 Locus of control

This study seeks to examine the role of the individual's locus of control on going concern assessment. Lefcourt (1982: 81) asserts that the "link between locus of control and cognitive activity appeals to common sense". Locus of control is a personality characteristic that is assumed to have stability and generalization (Lefcourt, 1991: 414). The construct evolved from Rotter's (1954) social learning theory, which implicitly assumes that the psychological situation is an extremely important determinant of behaviour (Phares, 1976: 17). In the terminology of social learning, locus of control is a generalized expectancy pertaining to the connection between personal characteristics and/or actions and experienced outcomes (Lefcourt, 1991: 414). Rotter (1954: 107) defines expectancy as the "probability held by the individual that a particular reinforcement will occur as a function of a specific behaviour on his part in a specific

situation or situations". Generalized expectancies are considered to be more important in determining individuals' expectancies when placed in a relatively novel situation than specific expectancies based on prior experience in that situation (Phares, 1976: 16).

Individuals are classified as either "externals" or "internals" depending upon their generalized expectancies with regard to the outcomes of their behaviour. Individuals with an external locus of control believe that outcomes are not determinable by one's personal efforts. Those with an internal locus of control, on the other hand, believe that outcomes are contingent upon their actions.

Several studies have examined the influence of the construct on individual behaviour. "Internal" managers function better in situations of stress (Anderson, 1977), favour a more participative work environment (Runyon, 1973), and rely more on personal persuasive powers than "externals" (Goodstadt and Hjelle, 1973). Internally-oriented workers reported perceptions of greater autonomy, and of receiving more feedback from their jobs than did externals (Kimmons and Greenhaus, 1976). They have been found to contribute to employee turnover less frequently than externals (Andrisani and Nestel, 1976).

The influence of locus of control on the individual's information processing behaviour has also been examined. Davis and Phares (1967) hypothesized that internals, having a higher generalized expectancy that reinforcements are contingent upon their own behaviours, would make attempts to more effectively control their environment through actively seeking additional information. The study tested this hypothesis in a social influence situation in which subjects believed their task was to attempt to influence the

attitude of another person concerning the Vietnam war. Forty-two internal and forty-two external male subjects were randomly assigned to one of three experimental conditions — skill, chance or ambiguous. The subjects were led to believe that they would later attempt to influence the attitude of another person concerning the Vietnam war. Skill subjects were told that success in influencing another person's attitude depended on the skill and ability of the persuader. Chance subjects were instructed that attitude change was dependent upon chance and luck factors. Subjects in the ambiguous condition were given neither skill nor chance instructions. During the general procedure, subjects were given the opportunity to acquire information both about the other person they would attempt to influence and about the Vietnam issue itself. The measure of information seeking consisted of a count of the number of written questions from the subject requesting information about the other person. Results indicated that (1) under ambiguous conditions, internals sought more information than did externals; (2) under chance conditions, internals and externals did not differ in information seeking behaviour; and (3) under skill conditions, externals sought significantly less information than did internals.

Internals' tendency to seek more information may be linked to their expectancies for future success. Disbelief in the ability to influence future outcomes through one's own actions could be positively correlated with the preclusion of sustained efforts aimed at achieving success. Conversely, a belief in future achievement and gratification would be positively correlated with the formation and execution of long-range plans. Support for this hypothesis has been reported by Mischel, Zeiss, and Zeiss (1974). Their study used a

forced-choice version of the Stanford Preschool Internal-External Scale (SPIES) to classify 211 subjects (with a mean age of 4 years 5 months) as either internals or externals. Subsequently, subjects were offered options of early small rewards or later larger prizes. The study found that internality for success was positively related to persistent efforts to obtain the larger delayed prizes. Thus, internals have a more long-term perspective than externals.

Internals have also been observed to be more likely to pay attention to potentially relevant cues than externals in complex task situations. Lefcourt and Wine (1969) conducted two investigations of the difference between internals and externals in respect of attention to cues in an experimental situation. The first experiment ascertained visual attention and observation for 28 third-year college students whose task was to conduct an interview with two graduate students in order to construct a personality portrait of each. The second experiment ascertained the observation of unusual, situation-defining cues for 61 first-year undergraduates who were asked to describe an experimental room they had just been in as accurately and in as great detail as they could. Results of both experiments indicate that internals exhibited different attention behaviour than externals, appearing more vigilant when confronting a person exhibiting unusual behaviour, and observing more potentially relevant cues.

Internals have been observed to be superior in both the acquisition and utilization of information than externals. Phares (1968) conducted an experiment with 52 subjects placed into four groups (based on their locus of control scores): an internal treatment and control group, as well as an external treatment and control group. Subjects were presented

information about four different persons, and were told to memorize this information in order to be able to influence each person's beliefs later. The subjects were then brought back after a seven-day period, and, in a computer simulation task, asked to make predictions about each person's preferences regarding a marriage partner and a job. They wrote their reasons for their judgements, and also all the characteristics of each of the four persons that they could remember. While the former served as a measure of information utilization, the latter served as a measure of information retention. For control subjects, no utilization measure was taken. While internals and externals did not differ in material acquisition, internals provided significantly more reasons for their decisions during the task than externals, suggesting superior information utilization.

Phares (1976) suggested that locus of control as a problem-solving generalized expectancy could best be demonstrated in "ambiguous" decision contexts. As stated above, the going concern assessment problem in auditing is an example of a highly unstructured task. In addition, since the auditor typically has to sift through broad information sets containing both relevant and irrelevant information, variations in information seeking and processing behaviour arising from differences in individual auditors' loci of control could affect decision performance. The following sub-section develops a framework to explain why differences in individual loci of control could lead to differential information processing behaviour.

2.5 Framework for decision making

The previous sub-sections reviewed the literature on the effect of irrelevant information in various cognitive processing-related contexts, as well as the differences in

information behaviour arising from differences in individual loci of control. The reviews suggest that decision makers are unable to completely disregard irrelevant information, treating it as though it had diagnostic value in solving the decision problem at hand. In addition, significant differences exist between internal and externals with respect to their information processing behaviour. These differences are exacerbated in ambiguous task situations. The following sub-section synthesizes the Newell and Simon (1972) model of human problem solving with the effort-accuracy theory of Beach and Mitchell (1978) to form a theoretical framework that presents probable reasons as to why individual responses to a given decision problem may vary.

2.5.1 The Newell and Simon (1972) theory of problem solving

Newell and Simon (1972) proposed a theory of decision making consistent with a problem-solving approach. The theory represents problem solving as the interaction among an information processing system, the problem solver, and a task environment. Problem solving occurs within the bounds of the problem space, which is the problem-solver's representation of the problem task and its characteristics. The problem solving process begins with an initial state characterized by the existence of a set of alternatives available to the problem solver. A desired goal state exists for a given problem situation. The problem solver's task is to transform the initial state into the goal state. Assuming that the problem task is non-routine, the problem solver does not know in advance what action is necessary in order to achieve this transformation.

The Newell and Simon (1972) theory suggests that problem solving is achieved by the application of operators or activities to alter existing states. A sequence of several

operators may be applied to achieve the desired solution. The problem solver progresses from the initial state to the goal state through several intermediate states or nodes arising as a consequence of the application of these operators. The intermediate states as well as the operators applied constitute the problem space. Thus, problem solving is represented as merely a journey through the problem space.

This description of problem-solving behaviour is encapsulated in the following four propositions or "*laws of qualitative structure*" for human problem solving (Simon, 1978: 272-273):

1. Only a few gross characteristics of the human information-processing system are invariant over task and problem solver. The information processing system is an adaptive system, capable of moulding its behaviour, within wide limits, to the requirements of the task.
2. These invariant characteristics of the information-processing system are sufficient, however, to determine that it will represent the task environment as a problem space and that the problem solving will take place in a problem space.
3. The structure of the task environment determines the possible structures of the problem space.
4. The structure of the problem space determines the possible programs (strategies) that can be used for problem solving.

An individual's problem space is only a subset of one objectively possible, and the same problem may be represented by different problem solvers in considerably different

problem spaces (Huber, 1989: 4). Since the structure of the problem space determines the choice of the strategy adopted for solving the decision problem, different problem solvers may conceivably use widely divergent decision strategies for solving the same decision problem. In recognizing this, the Newell and Simon (1972) theory allows for the possibility of individual differences in problem solving behaviour by characterizing the human information processing system as being highly adaptive, within wide limits. However, it stops short of providing a more complete explanation of the *causes* (and effects) of individual differences in information processing. The effort-accuracy theory of contingent decision making behaviour extends the Newell and Simon (1972) theory to provide such an explanation.

2.5.2 The effort-accuracy theory

The effort-accuracy theory of contingent decision behaviour (Beach and Mitchell, 1978; Shugan, 1980, Payne, 1982) presents a contingency-based explanation for the differential choice of decision strategies by individual decision makers faced with a given decision problem. A decision strategy, as defined by Payne et al. (1993: 9) is "a sequence of mental and effector (actions on the environment) operations used to transform an initial state of knowledge into a final goal state of knowledge where the decision maker views the particular decision problem as solved". Cognitive strategies described in the decision making and judgement literature may be broadly categorized as being either normative, i.e., based on the concept of perfect rationality, or non-normative, i.e., based on the concept of "bounded rationality" (Simon, 1957). Examples of normative (or analytical) decision strategies include expected utility theory (von Neumann and

Morgenstern, 1944), multi-attribute utility theory (Keeney and Raiffa, 1976), and Bayes' theorem. Examples of non-normative or intuitive strategies (labelled as "heuristics" by Kahneman et al., 1982) are satisficing (Simon, 1955), availability (Tversky and Kahneman, 1982a), and representativeness (Tversky and Kahneman, 1982b). Normative models assume consistent processing across alternatives, as well as the utilization of all available information for every alternative and attribute. Heuristics, on the other hand, use only part of all the information available. Consequently, normative strategies, although capable of yielding high-quality decisions, demand greater cognitive effort as compared to non-normative ones. Non-normative strategies interact with the manner in which the decision maker acquires information, consequently inducing people to make choices that do not reflect their true preferences (Hogarth, 1987: 83).

The question of why a decision maker would choose an intuitive strategy such as a heuristic as opposed to a normative one to solve a decision problem may possibly be answered in terms of the effort-accuracy framework. According to the framework, decision strategy selection is a function of the characteristics of (1) the decision problem, (2) the decision environment, and (3) the decision maker. The first relates to the task dimensions of unfamiliarity, ambiguity, complexity, and instability, the second to irreversibility, significance, accountability, and time or money constraints. Decision maker characteristics relate to knowledge, ability, and motivation. The Newell and Simon (1972) theory suggests that decision makers are highly adaptive. The effort-accuracy framework extends this to suggest that their adaptability actually permits decision makers to switch from normative strategies to intuitive ones depending on the characteristics

mentioned above. The decision maker is motivated by the desire to attain the twin objectives of maximizing decision effectiveness (i.e., accuracy), and minimizing the use of personal resources of time and effort. Since normative strategies require consistent information processing across alternatives and the utilization of all available information for every alternative and attribute, they demand a greater level of expenditure of personal resources than non-normative ones, which use only part of the information available. For example, unfamiliarity with a problem may lead to the use of a heuristic. Similarly, decision makers may choose to use normative strategies for solving simple problems requiring a lower expenditure of personal cognitive resources than for complex ones, where a heuristic may be used instead. Thus, “strategy selection is contingent upon a (cost/benefit) compromise between the decision maker's desire to make a correct decision and his or her negative feelings about investing time and effort in the decision making process” (Beach and Mitchell, 1978: 448).

The effort-accuracy framework provides a plausible rationale for individual decision makers' tendency to alternate between normative and intuitive decision strategies. However, although it recognizes the role of differences in individual characteristics, the framework takes only a few of these characteristics into consideration. As the review of the literature on the effect of locus of control on information processing suggests, locus of control is an important personality variable that could possibly affect the decision maker's tolerance for cognitive effort in decision making. For instance, internals are stronger information processors, make more sustained information searches, and pay more attention to potentially relevant clues than externals. Thus, their perception

of the degree of relevance of the information cues provided, as well their perceptions of task complexity, may vary from those of externals. These perceptions could in turn influence individuals' decision strategy selection, resulting in differential decision performance. This line of reasoning is presented in the following sub-section in the form of hypotheses relating to the effects of the decision maker's locus of control, the presence of mixed information, and the use of a decision aid, on subjects' perceptions of information relevance and task complexity, and on decision accuracy.

2.6 Development of the research hypotheses

This section incorporates the development of the research hypotheses based on the review of the literature and the theoretical framework on decision making presented in the preceding sections. Specifically, this study posits that internals and externals faced with a going concern evaluation task will differ significantly in their decision behaviour by forming different perceptions of information relevance and task complexity associated with the task. Locus of control is hypothesized to also affect the accuracy of auditors' going concern estimates. The following sub-section develops the hypotheses of the study under the categories of information relevance, task complexity, and decision accuracy³.

2.6.1 Perceptions of information relevance

A review of the literature suggests that decision makers are unable to distinguish between relevant cues and non-relevant cues, treating the latter as relevant to the decision task. The ability to distinguish between relevant and irrelevant information, therefore,

³ Since the study uses a case involving a real-world business organization with a known outcome, decision accuracy is measurable in this study.

constitutes a key factor influencing decision performance. Locus of control is hypothesized to be an important factor in influencing subjects' perceptions of information relevance. Decision aids are also posited to influence these perceptions.

2.6.1.1 Hypothesis 1—Locus of control and information relevance: The decision making framework suggests that the twin objectives of maximizing decision accuracy and minimizing cognitive effort influence decision makers' strategy selection. However, differences among decision makers relating to their individual personality traits may also affect decision strategy selection. For example, decision makers with a lower tolerance for cognitive effort may elect to switch to an intuitive decision strategy earlier than others with a higher level of tolerance for cognitive effort. This study posits that the decision maker's locus of control may be such a personality trait. Prior research suggests that there are clearly observable differences between internals and externals in respect of their information processing behaviour. Internals tend to make wider, more sustained information searches than externals (Davis and Phares, 1967; Lefcourt and Wine, 1969). This may lead them to ascribe a higher degree of relevance to the informational cues evaluated than externals. This may be stated in terms of the following hypothesis:

H1: Subjects' perceptions of information relevance will be higher for internals than externals.

2.6.1.2 Hypothesis 2—Decision aid availability, mixed information, locus of control, and information relevance: Decision aids are an important part of the audit setting, and several firms incur enormous expenditures in developing and maintaining them in various

forms (Bailey et al., 1987) with the objective of supplementing the auditor's subjective decision making processes (Ashton, 1983). As devices that have the potential to support cognitive information processing, decision aids may induce the decision maker to utilize an analytic decision strategy with a level of effort that would normally only permit the use of an intuitive strategy (Todd and Benbasat, 1994). Thus, in settings characterized by factors such as task complexity and high information quantity, the use of a decision aid may induce the choice of a normative decision strategy. This would have the effect of reducing perceptions of information relevance associated with relatively larger volumes of information, such as in mixed information settings. This leads to the following hypothesis:

H2A: In a mixed information environment, the use of a decision aid will reduce perceived information relevance.

While the study expects decision aid availability to reduce perceived information relevance, it is possible for a decision aid to have the opposite effect. For instance, the use of a decision aid may reduce perceived information relevance (as hypothesized above) if the decision maker is inclined to use a normative decision strategy. However, if the decision maker is actually using a heuristic strategy so as to reduce cognitive effort, the use of a decision aid may actually increase the level of perceived information relevance by drawing attention to previously underutilized information. This may result in higher observed levels of information relevance.

Locus of control is hypothesized to be an important variable influencing decision

strategy selection. Internals are observed to be stronger information processors than externals. They may be expected, therefore, to be disposed towards utilizing a normative strategy for a decision task for which externals might tend to utilize a heuristic. Thus, in order to assess the influence of decision aids in mixed information environments on perceptions of information relevance, it becomes essential to control not only for decision aid availability, but also for locus of control. This lays the basis for the following hypothesis:

H2B: Controlling for locus of control, in a mixed information environment, the use of a decision aid will reduce perceived information relevance.

2.6.1.3 Hypothesis 3—Information type, locus of control, decision aid availability, and information relevance: The extant literature on judgement and decision making in settings characterized by the presence of both diagnostic and nondiagnostic information suggests that, when presented with mainly diagnostic cues, or with diagnostic cues of high validity, decision makers have relatively little difficulty in distinguishing diagnostic cues from nondiagnostic ones. However, they are less able to make the distinction when presented with information consisting of a mixture of both types of cues in roughly the same proportion, or with diagnostic cues of low validity (Castellan, 1973; Troutman and Shanteau, 1977). This would suggest that when assessing mixed information containing both relevant as well as irrelevant cues, decision makers are unable to distinguish clearly between the two. As such, they may ascribe a degree of relevance to the irrelevant cues as well, thus enhancing their perceptions of information relevance relating to the

information provided as a whole. This forms the basis for the following hypothesis:

H3A: Subjects' perceptions of information relevance will be higher in mixed information settings than in diagnostic information settings.

Although this effect is hypothesized, it is recognized that the effect of mixed information on perceptions of information relevance may not be entirely unambiguous. For example, in a bid to reduce cognitive effort, subjects may switch to a heuristic strategy when faced with mixed information as opposed to just diagnostic information. The use of a heuristic may lead to reduced, rather than enhanced, perceptions of information relevance. This study expects, however, that the tendency to treat nondiagnostic cues as diagnostic will be more evident than the tendency to lower perceptions of information relevance in a mixed information setting.

The literature also suggests that locus of control influences cognitive activity, with internals observed to be making wider information searches than externals. They may be expected, therefore, to find a higher degree of relevance in the information provided than externals. Consequently, in order to clearly observe the influence of mixed information on subjects' perceptions of information relevance, it is necessary to control for locus of control. This lays the basis for the following hypothesis:

H3B: Controlling for locus of control, subjects' perceptions of information relevance will be higher in mixed information settings than in diagnostic information settings.

Decision aids are believed to assist in facilitating the use of a normative decision strategy by guiding the decision maker to focus on the information cues relevant to the decision problem at hand. In doing so, they may be expected to reduce the number of cues considered, thus leading to decreased perceptions of information relevance. In assessing the influence of mixed information on perceived information relevance, therefore, it becomes necessary to control for decision aid availability. Thus, the following hypothesis is presented:

H3C: Controlling for decision aid availability, subjects' perceptions of information relevance will be higher in mixed information settings than in diagnostic information settings.

2.6.2 Perceptions of task complexity

The effort-accuracy framework suggests that decision makers seek to maximize decision quality and minimize decision effort. For simple decision tasks, it is relatively less effortful to adopt a normative decision strategy. However, as the decision task gets more complex, the decision maker tends to adopt a heuristic in order to reduce cognitive effort. This study posits that individual decision makers differ with respect to their information processing abilities, with these abilities ranging from high to low. In complex task situations, it is posited that individuals who are strong information processors will not switch to a heuristic strategy as early as weak information processors. However, the choice of a normative decision strategy will serve to maintain task complexity at a high level for such individuals. Consequently, they may be expected to perceive the level of

complexity of the decision task as being higher than weak information processors whose early adoption of a heuristic would have reduced their perceptions of task complexity. As such, perceived task complexity is an important dependent variable related to information processing. Since locus of control is posited to influence information processing ability, it is also expected to influence subjects' perceptions of task complexity.

2.6.2.1 Hypothesis 4—Information type, locus of control, and task complexity:

Several studies (e.g., Beach and Mitchell, 1978; Payne et al., 1988) have found that the number of alternatives a judge must evaluate and the number of cues or attributes per alternative relate to the degree of task complexity. According to the effort-accuracy framework, task complexity leads to the use of an intuitive decision strategy requiring a smaller expenditure of cognitive resources. Going concern evaluation is, by its very nature, a complex task, and auditors may be expected to use a heuristic decision strategy to resolve it. Consequently, it may be reasonable to expect a given decision maker evaluating relatively greater quantities of information (including both diagnostic and nondiagnostic informational cues) to be more likely to resort to an intuitive strategy than another trying to resolve the same decision problem with only diagnostic cues. The perceptions of the former with respect to task complexity, therefore, may be expected to be different from those of the latter. However, individual personality traits may have an effect on decision strategy selection. The literature suggests that there are significant differences between internals and externals in information-processing behaviour (Davis and Phares, 1967; Lefcourt and Wine, 1969). Internals have been found to be superior to externals in both the acquisition and utilization of information (Phares, 1968). In a

diagnostic information setting, therefore, internals may be capable of considering all of the information available without switching to a heuristic. Consequently, task complexity may be higher for internals in diagnostic settings relative to externals. This is expressed as the following hypothesis:

H4A: Task complexity will be perceived to be higher by internals than externals in diagnostic information settings.

Although internals may have higher perceptions of task complexity than externals in diagnostic information environments, they may resort to a heuristic to simplify information processing in mixed information settings due to the greater volume of information being considered. While externals may also resort to a heuristic in such settings, the superior information processing capabilities of internals may cause them to perceive the decision task as less complex than externals. This leads to the following hypothesis:

H4B: Task complexity will be perceived to be lower by internals than externals in mixed information settings.

2.6.2.2 Hypothesis 5—Decision aid availability, information type, locus of control, and task complexity: Decision aids may induce the decision maker to utilize an analytic decision strategy with a level of effort that would normally only permit the use of an intuitive strategy (Todd and Benbasat, 1994). Thus, in settings characterized by mixed information, a decision aid may assist the decision maker to focus on potentially relevant

clues, thereby limiting the use of an intuitive decision strategy. The resultant use of a decision strategy more consistent with a normative approach would then result in greater perceived task complexity, since normative strategies require greater cognitive effort.

However, since there are differences between individual decision makers in their preferences relating to decision strategy selection, the increase in perceived task complexity will not be the same for everyone. Locus of control is posited to be an important personality characteristic influencing strategy selection. As such, individuals with different loci of control will be affected differentially by decision aids with respect to perceived task complexity. Since internals are posited to be stronger information processors than externals, the decision aid will supplement their innate information processing abilities, allowing them to use a normative approach to the decision task, thus making it seem significantly more complex than it would have been without the aid.

Externals too are expected to choose a heuristic when evaluating mixed information. The use of a decision aid will induce the use of greater cognitive resources, thus enhancing the level of perceived task complexity. However, since they are not strong information processors, externals are posited to continue using a heuristic despite the assistance available from the aid. Consequently, the enhancement in the level of task complexity induced by the decision aid will not be of as high an order as it would be in the case of internals. These propositions may be expressed in terms of the following hypotheses:

H5A: In mixed information settings, task complexity for internals will increase with the use of a decision aid.

H5B: In mixed information settings, task complexity for externals will increase with the use of a decision aid (but the increase will be less than for internals).

In situations characterized by diagnostic information only, a decision aid is expected to assist the decision maker in sifting through the informational cues more efficiently. This would lead to perceptions of lower task complexity relative to the non-use of a decision aid.

However, as stated above, individual decision makers differ in their ability to process informational cues in order to solve a decision task. For instance, individuals with an internal locus of control are stronger information processors than those with an external locus of control. Internals are also able to pinpoint relevant cues more effectively than externals. In view of their innate information processing capabilities, internals may not benefit as much from decision aids as externals. Externals, on the other hand, have lower information processing skills. The use of a decision aid, therefore, would benefit them, making it easier for them to pursue a normative strategy with relatively less expenditure of cognitive resources. Thus, while the decision aid is expected to reduce perceptions of task complexity for both internals as well as externals, the reduction for internals may not be of the same magnitude as it would be for externals. These propositions are expressed in terms of the following hypotheses:

H5C: In diagnostic information settings, task complexity for internals will decrease with the use of a decision aid.

H5D: In diagnostic information settings, task complexity for externals will decrease with the use of a decision aid (and the decrease will be more than for internals).

2.6.2.3 Hypothesis 6—Interaction of information type, decision aid availability, and locus of control: The literature on decision making in the context of mixed information suggests that irrelevant information influences the decision maker's cognitive processes (Nisbett, Zukier and Lemley, 1981). Decision aid availability has also been observed to influence decision behaviour (Todd and Benbasat, 1994). There is evidence to indicate that the decision maker's locus of control affects decision behaviour in terms of information search and processing (e.g., Davis and Phares, 1967; Lefcourt and Wine, 1969; Phares, 1968). These three variables may be reasonably expected, therefore, to interact with each other to influence decision behaviour in terms of the decision maker's perceptions of task complexity. The nature of the interaction is posited below.

The effort-accuracy framework suggests that decision makers seek to minimize cognitive effort and maximize decision quality. Thus, for simple tasks, they choose normative decision strategies that do not involve the expenditure of a large amount of cognitive resources. For more complex tasks, they prefer to choose intuitive strategies so as to reduce cognitive effort.

The going concern assessment task is an inherently complex one. The introduction of nondiagnostic information in the data set being evaluated as part of the task adds to its complexity. The introduction of a decision aid serves to reduce the complexity through

inducing the decision maker to focus on the relevant informational cues. Depending on the locus of control of the decision maker, the particular combination of the two environmental factors would result in different strategy choices. This in turn would influence subjects' perceptions of task complexity differentially.

Internals have been observed to be superior to externals in their information processing capabilities, making stronger information searches and identifying more relevant informational cues than externals. This characteristic is posited to hold across different environmental conditions (e.g., the existence of mixed information or the availability of a decision aid). Thus, in settings characterized by mixed information and the non-availability of a decision aid, the superior information processing abilities of internals would allow them to process the available information more efficiently relative to externals, although both internals and externals may be expected to be using a heuristic strategy to reduce cognitive effort. This would result in lower perceptions of task complexity for internals.

In diagnostic information settings, both internals and externals may be expected to be processing the information provided in a manner consistent with a normative strategy. Without the benefit of decision aid use (to limit the number of cues being considered), however, the relatively stronger predilection of internals (relative to externals) to process all of the available information would result in internals perceiving the task to be more complex than externals.

In mixed information settings characterized by decision aid availability, the decision aid would serve to induce a normative strategy by reducing the cognitive effort

associated with it. This would, however, bolster the already strong information searching and processing capabilities of internals, thereby engendering a perception of low task complexity relative to externals.

In settings characterized by diagnostic information only, although everyone may be expected to be using a normative decision strategy, the decision aid would assist the decision maker process the information cues more efficiently by reducing the number of information cues to be assessed. However, since internals are already strong information processors, this would result in greater processing efficiency and a correspondingly low level of perceived complexity relative to externals.

These propositions are expressed in terms of the following hypotheses:

H6A: In mixed information situations characterized by the non-availability of a decision aid, perceived task complexity for internals will be lower than that for externals.

H6B: In diagnostic information situations characterized by the non-availability of a decision aid, perceived task complexity for internals will be higher than that for externals.

H6C: In mixed information situations characterized by the availability of a decision aid, perceived task complexity for internals will be lower than that for externals.

H6D: In diagnostic information situations characterized by the availability of a decision aid, perceived task complexity for internals will be lower than that for externals.

2.6.3 Decision accuracy

The effort-accuracy framework of cognitive strategy selection suggests that decision makers select a decision strategy with the objective of maximizing decision quality and minimizing cognitive effort. In simple task situations, it is relatively easy to adopt a normative strategy, but in more complex situations, the decision maker may be willing to forego decision quality in order to reduce the expenditure of cognitive resources. The evaluation of purely diagnostic information as part of the going concern task may possibly be carried out by the auditor using an approach consistent with a normative strategy, resulting in a high-quality decision. However, the introduction of a variety of nondiagnostic informational cues to the data set would increase the level of task complexity. According to the effort-accuracy framework, this would trigger off a switchover to a heuristic strategy, with a decrease in decision quality. Thus, decision quality (which is proxied in this study by decision accuracy) acquires considerable significance as an important variable affecting decision behaviour. There is, however, a caveat. While the relationship between decision accuracy and strategy selection may hold true in general, it may be obscured by the effect of individual personality factors such as locus of control, or environmental factors such as decision aid availability. This indicates the need to control for these factors in assessing the influence of strategy selection on decision accuracy.

2.6.3.1 Hypothesis 7—Locus of control and decision accuracy: A review of the extant literature on the cognitive processing abilities of internals and externals suggests that

these are different for internals and externals. For instance, internals are stronger information searchers and processors compared to externals, and are able to detect relevant cues more readily than externals (Davis and Phares, 1967; Lefcourt and Wine, 1969; Phares, 1968). These characteristics are posited to lead to greater decision accuracy for internals relative to externals. However, in order to isolate this effect, it is necessary to control for information type and decision aid availability. While externals are posited to be weaker information processors than internals in general, the availability of only diagnostic clues may allow them to use a normative strategy, while an internal could be using an intuitive strategy to evaluate mixed information. This would result in an uneven comparison. The use of a decision aid would also give an external an advantage over an internal not using the aid. These considerations make it necessary to control for both information type as well as decision aid availability.

These propositions are expressed in terms of the following hypotheses:

H7A: Internals will display greater decision accuracy relative to externals.

H7B: Internals will display greater decision accuracy relative to externals, controlling for information type.

H7C: Internals will display greater decision accuracy relative to externals, controlling for decision aid availability.

2.6.3.2 Hypothesis 8—Mixed information, locus of control, and decision accuracy:

Decision makers seem to be unable to distinguish clearly between relevant and irrelevant information, processing both as though they were equally diagnostic. The influence of

irrelevant information on decision activity is termed the “dilution effect” (Nisbett, Zukier and Lemley, 1981) indicating that irrelevant information has the potential to dilute or reduce the diagnosticity of relevant information through an interference with the decision maker’s ability to correctly weigh the cues available from relevant information. In terms of the effort-accuracy framework, the introduction of irrelevant information possibly increases the level of task complexity, making it difficult for the decision maker to follow a normative strategy with the same expenditure of cognitive resources as before. This leads to the use of a heuristic strategy which, while reducing cognitive effort, has the effect of simultaneously reducing decision accuracy.

However, while this may hold true in general, individual differences among decision makers may come into play, rendering the relationship between the existence of irrelevant information and the loss of decision accuracy obscure. For instance, locus of control is an important individual personality variable that affects individuals’ information processing abilities. Internals are stronger information processors than externals. As such, they may be able to continue to follow normative strategies where externals would prefer to use heuristic ones. This would serve to reduce the strength of the relationship between the existence of mixed information and the reduction in decision accuracy. Consequently, the decrease in decision accuracy for externals (i.e., between externals evaluating only diagnostic information and externals evaluating mixed information) will be greater than for internals. This suggests that in order to isolate the effect of irrelevant information on decision accuracy, it is necessary to control for subjects’ loci of control.

The foregoing discussion leads to the following hypothesis:

H8A: Decision accuracy for externals will be affected more by mixed information than decision accuracy for internals.

While it is posited that the introduction of mixed information will trigger the use of a heuristic strategy with a resultant loss of decision accuracy in keeping with the effort-accuracy framework, this effect is not expected to be uninfluenced by other factors. As described above, locus of control is a factor posited to moderate the influence of irrelevant information on decision accuracy. Another such factor is decision aid availability. Although the introduction of irrelevant information increases task complexity and may trigger a heuristic strategy to conserve cognitive resources, a decision aid could reduce this effect by inducing the decision maker to use a normative strategy with the equivalent level of effort as an intuitive one (Todd and Benbasat, 1994). Consequently, the reduction in decision accuracy of subjects assessing mixed cues relative to those assessing diagnostic cues may be reduced if the former have the use of a decision aid to assist in the decision. In other words, the availability of a decision aid may reduce the diminishment in decision accuracy arising from the evaluation of mixed information. This suggests that it is also important to control for decision aid availability when measuring the effects of information type on decision accuracy.

The foregoing discussion leads to the following hypothesis:

H8B: Decision accuracy will be affected less by information type in the presence of a decision aid.

2.6.3.3 Hypothesis 9—Interaction of information type, decision aid availability, and locus of control: As suggested in the preceding paragraphs, information type, decision aid availability, and the decision maker's locus of control may be expected to individually influence the decision maker, as well as to interact with each other to influence decision behaviour. These three variables may be expected to interact with each other to influence decision accuracy as well.

Specifically, internals are strong information seekers. Thus, they consider more of the information as relevant, rendering themselves more susceptible to the dilution effect in a mixed information setting. The use of a decision aid in such a setting will assist them to focus only on the more relevant cues, leading to an improvement in decision accuracy. Since externals are not strong information seekers, they would consider fewer informational cues than internals. Improvements in decision accuracy with the use of a decision aid in mixed information settings, therefore, would not be as extensive for externals as they would be for internals.

In diagnostic information settings, on the other hand, decreases in accuracy on using a decision aid are greater for internals than for externals, since internals, being stronger information processors, use more of the available (relevant) information than externals do. This renders internals better off without a decision aid in a diagnostic environment.

The above propositions are stated in the form of the following hypotheses:

H9A: In mixed information settings, improvements in accuracy with a decision aid (versus without) are greater for internals than externals.

H9B: In diagnostic information settings, decreases in accuracy with a decision aid (versus without) are greater for internals than externals.

2.7 Chapter summary

This chapter incorporated a review of the literature pertaining to judgement and decision making in auditing with particular reference to going concern evaluation. The literature relating to decision making in contexts characterized by the existence of both diagnostic and nondiagnostic information was then reviewed. Studies on the effectiveness of decision aids in non-auditing as well as auditing contexts were presented, followed by studies relating to the differences in cognitive information processing between internals and externals.

The study uses the Newell and Simon (1972) theory of problem solving, and the Payne et al. (1988) effort-accuracy framework of cognitive information processing to explain the differences in cognitive information processing between internals and externals. The research hypotheses posited the effect of the three independent variables—locus of control, information type, and decision aid availability—individually and jointly on each of the three dependent variables (perceived information relevance, perceived task complexity, and decision accuracy). For convenience, the hypotheses are presented again below.

Hypothesis 1:

Subjects' perceptions of information relevance will be higher for internals than externals.

Hypothesis 2:

H2A: In a mixed information environment, the use of a decision aid will reduce perceived information relevance.

H2B: Controlling for locus of control, in a mixed information environment, the use of a decision aid will reduce perceived information relevance.

Hypothesis 3:

H3A: Subjects' perceptions of information relevance will be higher in mixed information settings than in diagnostic information settings.

H3B: Controlling for locus of control, subjects' perceptions of information relevance will be higher in mixed information settings than in diagnostic information settings.

H3C: Controlling for decision aid availability, subjects' perceptions of information relevance will be higher in mixed information settings than in diagnostic information settings.

Hypothesis 4:

H4A: Task complexity will be perceived to be higher by internals than externals in diagnostic information settings.

H4B: Task complexity will be perceived to be lower by internals than externals in mixed information settings.

Hypothesis 5:

H5A: In mixed information settings, task complexity for internals will increase with the use of a decision aid.

- H5B: In mixed information settings, task complexity for externals will increase with the use of a decision aid (but the increase will be less than for internals).**
- H5C: In diagnostic information settings, task complexity for internals will decrease with the use of a decision aid.**
- H5D: In diagnostic information settings, task complexity for externals will decrease with the use of a decision aid (and the decrease will be more than for internals).**

Hypothesis 6:

- H6A: In mixed information situations characterized by the non-availability of a decision aid, perceived task complexity for internals will be lower than that for externals.**
- H6B: In diagnostic information situations characterized by the non-availability of a decision aid, perceived task complexity for internals will be higher than that for externals.**
- H6C: In mixed information situations characterized by the availability of a decision aid, perceived task complexity for internals will be lower than that for externals.**
- H6D: In diagnostic information situations characterized by the availability of a decision aid, perceived task complexity for internals will be lower than that for externals.**

Hypothesis 7:

H7A: Internals will display greater decision accuracy relative to externals.

H7B: Internals will display greater decision accuracy relative to externals, controlling for information type.

H7C: Internals will display greater decision accuracy relative to externals, controlling for decision aid availability.

Hypothesis 8:

H8A: Decision accuracy for externals will be affected more by mixed information than decision accuracy for internals.

H8B: Decision accuracy will be affected less by information type in the presence of a decision aid.

Hypothesis 9:

H9A: In mixed information settings, improvements in accuracy with a decision aid (versus without) are greater for internals than externals.

H9B: In diagnostic information settings, decreases in accuracy with a decision aid (versus without) are greater for internals than externals.

The next chapter (Chapter III) presents a review of the financial distress literature on which the decision aid used in the study is based. The subsequent chapter (Chapter IV) provides a description of the research methodology used to test the research hypotheses. The results of the data analysis as well as a discussion on them are presented in Chapter V. The final chapter presents the conclusions and limitations of the study.

Chapter III

Development of the Decision Aid

3.0 Review of the financial distress literature

This section presents a brief review of the financial distress literature. Models available in the financial distress literature have mainly been developed using samples of firms that have declared bankruptcy. However, as Boritz (1991, p.15) suggests, while bankruptcy may be the ultimate outcome of business failure, it represents only one of the several ways of resolving business difficulties. Although an entity experiencing financial distress may lose the ability to continue as a going concern in the future, it does not necessarily have to declare bankruptcy—reorganizations, receiverships and mergers or acquisitions may also result (Boritz, 1991: 3). Thus, exclusive reliance on the bankruptcy prediction models for assessing an entity's going concern ability may not be entirely warranted.

3.1 Bankruptcy prediction models

Beaver (1966) developed one of the earliest bankruptcy prediction models available in the literature, employing 30 individual financial ratios in a univariate analysis. Identifying the ratios from financial accounting information, Beaver compared the group means for 79 failed and 79 non-failed firms for each of these ratios in an attempt to determine whether they differed significantly. "Failure" was defined as the inability of a firm to pay its financial obligations as they came due. The firms in each of the two groups were matched to form pairs on the basis of industry and asset size. The 30 ratios used in the study were selected on the basis of their popularity in the literature, their

performance in previous studies, and adherence to the “cash flow” concept, which represents the firm in the form of a reservoir of liquid assets replenished by cash inflows and exhausted by cash outflows. Beaver proposed that a firm’s solvency can be defined in terms of the probability that the reservoir will be exhausted. Therefore, other things being equal, a relatively large reservoir would indicate a smaller probability of failure, as would a relatively large net liquid-asset flow from operations. Similarly, a relatively large amount of debt held would indicate a higher probability of firm failure, as would relatively larger fund expenditures for operations.

The comparison of mean values of each ratio indicated that they were different for the failed and non-failed firms in a direction consistent with these hypotheses. The cash flow and the reservoir of liquid assets were on the average smaller for the failed firms than for the non-failed firms. The failed firms had more debt than the non-failed firms. Over the 5-year period that the data pertained to, the deterioration in the ratios is more readily evident for the failed firms relative to the non-failed firms. Beaver then determined a cutoff score for each ratio to distinguish between these two groups, and tested the predictive ability of each ratio using a holdout sample.

The best performing ratio (i.e., the ratio with the smallest average percentage of false classification) was the ratio of cash flow to total debt, with the ratio of net income to total assets emerging as the second best indicator of financial failure. Overall, the model was able to classify 87 percent of the firms in the holdout sample correctly one year before bankruptcy. The performance of the model deteriorated with time, although it was still impressive (78 percent correct classification five years before bankruptcy). Type I

errors (misclassification of a failed firm as non-failed) were 22 percent on average, while Type II errors (misclassification of a non-failed firm as failed) were on average 5 percent.

While Beaver's (1966) univariate firm-failure prediction model performed fairly well (in addition to providing the impetus for subsequent studies), it has been criticized on several counts. Zavgren (1983) summarizes these criticisms as relating to ratio selection, model validation, and adequacy of the univariate approach. The selection of ratios on the basis of popularity may be of concern because of the lack of a theoretical or empirical rationale. Consequently, the most important ratios may not be included in the ratio set selected. Second, Beaver used a matched pair sample of distressed and non-distressed firms, implying a prior probability of financial failure of 50 percent. However, the actual probability of firm failure is certainly substantially lower. Assuming a prior probability of about 3 percent of failure in the business population, a naive model using a pure strategy and predicting non-failure consistently would be wrong only 3 percent of the time (although, admittedly, the naive model ignores the cost of misclassification errors). Third, the univariate approach only evaluates one ratio at a time for its ability to predict corporate failure. However, since many of the ratios are highly correlated with each other in a complicated pattern, using them individually leads to the danger of not being able to capture these inter-relationships. Several other bankruptcy prediction models have therefore utilized a multivariate approach in order to overcome this limitation.

Multivariate bankruptcy prediction models have mainly adopted one of two statistical approaches—predictive discriminant analysis and conditional probabilities.

Predictive discriminant analysis is a technique used to classify subjects into one of several groups which they most closely resemble on the basis of a set of measurements, a subject being said to most closely resemble a group if the vector of scores for that subject is closest to the vector of means for that particular group (Stevens, 1996). The assumptions underlying the use of discriminant analysis are that the two (or more, as the case may be) populations from which the samples are derived are multivariate normal and have the same covariance matrix. Tests of significance are used basically to determine whether the populations are truly unique.

The earliest use of a discriminant model to predict bankruptcy was made by Altman (1968). The model was developed using a sample of 33 bankrupt firms that had filed bankruptcy petitions under Chapter 10 of the US National Bankruptcy Act, and an equal number of non-bankrupt firms. Data on all these firms pertained to the period 1946-1965. Bankrupt and non-bankrupt firms were matched on the basis of industry and asset size over the same chronological period. The predictive ability of 22 ratios was investigated. The most efficient discriminant function observed included only 5 ratios of the original 22, and is given below:

$$Z = .021 X_1 + .014 X_2 + .033 X_3 + .006 X_4 + .999 X_5$$

where

Z = the discriminant score of the firm

X₁ = net working capital/total assets

X₂ = retained earnings/total assets

X₃ = earnings before interest and taxes/total assets

X₄ = market value equity/book value of total debt

X₅ = sales/total assets.

The model performed reasonably well in terms of predictive ability. Using a critical Z-score of 2.68 at which the overlap of the Z-score distributions of the groups was minimal, Altman evaluated the predictive accuracy of the model on a holdout sample of 25 bankrupt firms with an asset size similar to the first sample. Type I error (of incorrectly classifying a bankrupt firm as non-bankrupt) was found to be 4 percent, while Type II error (of misclassifying a non-bankrupt firm as bankrupt) was 21 percent. The predictive accuracy of the model declined with time, with Type I errors increasing to 52 percent in the third year and 64 percent in the fifth year respectively prior to bankruptcy.

The Altman (1968) model achieved a higher success rate with respect to bankruptcy prediction than Beaver's (1966) univariate model, at least one year prior to bankruptcy. Despite this, there are several problems with it (Zavgren, 1983). First, although the predictive accuracy of the model was higher than Beaver's model one year prior to bankruptcy, it deteriorated quite sharply for earlier years, including even the second year prior to failure. In contrast, the Beaver (1966) model was capable of predicting bankruptcy with 78 percent accuracy even five years prior to failure. Second, the selection of ratios for the study was based on their popularity in the literature and their potential relevance to the study, without any underlying theoretical basis guiding the selection. The variables in the final discriminant model were retained on the basis of their ability to improve the discriminating ability of the function, which is sample-dependent. Third, the firms included in the samples of bankrupt and non-bankrupt firms were not selected on a random basis. While the discriminant procedure assumes normality of the discriminating variables, this assumption may be violated by the non-random selection of

the sample firms. Fourth, prior probabilities of any firm in the sample belonging to either group are distorted by the use of an equal number of bankrupt and non-bankrupt firms in the sample. Thus the error rates observed by Altman may not actually be reflective of the true extent of each type of classification error—Zmijewski (1984) points out that the population frequency of financial failure has never exceeded .75 percent since 1934.

Several other studies have used discriminant analysis for predicting corporate failure. Altman, Haldeman and Narayanan (1977) employed a sample of 53 bankrupt firms, matching them with 58 non-bankrupt companies. Data was collected for the period 1969 through 1975. In contrast to the earlier study, a new set of optimally discriminating financial ratios was observed, the most important of which was the ratio of retained earnings to total assets, the only ratio that overlaps the two studies.

The identification of a different set of ratios as important indicators of financial distress would seem to point to the limitation arising from selecting ratios without an underlying theoretical basis. Recently, Baldwin and Glezen (1992) used discriminant analysis to assess the usefulness of quarterly data for predicting bankruptcy, and also to determine whether the earlier (more timely) predictions by quarterly prediction models can be obtained without sacrificing the accuracy obtained by the annual bankruptcy models. The study used a sample of 40 public firms entering bankruptcy from 1977 to 1983. These were matched on the basis of industry, asset size and fiscal year with 40 non-bankrupt firms. The study utilized three sets of ratios—a full set comprising 24 ratios derived from the prior literature, a reduced set determined by Pearson's product moment correlation, and another reduced set determined by factor analysis. Variations were also

introduced in the prior probabilities and costs of misclassification. Results showed the full set to be the best predictor of financial distress, achieving equal or greater accuracy than either of the two reduced sets. The results also suggested that the quarterly bankruptcy prediction model is at least as accurate as the annual model, thus being capable of predicting bankruptcy up to nine months earlier than the latter. However, no tests were conducted to determine the validity of the assumptions underlying discriminant analysis for the samples used in the study.

Boritz (1991) summarizes the advantages and disadvantages of discriminant analysis to predict firm distress. Advantages include its comparative objectivity, its ability to address an entire set of discriminating characteristics and their interrelationships for a sample of subjects, and its ability to reduce these characteristics to a single discriminant score. The disadvantages of the technique include its dependence on the samples studied, its reliance on past data (which may not be relevant for future prediction), the dependence of the discriminant function on assumptions about the relative costs of Type I and Type II errors, and its inability to provide a probability distribution for each classified observation (Boritz, 1991). This last limitation is avoided by the use of conditional probability models.

The restrictive assumptions of discriminant analysis (that the independent variables be multivariate normal or that groups have equal covariance matrices) are not applicable to the conditional probability models, two of which, the probit and logit models, have been used in several financial distress studies. The objective of conditional probability models is to provide the conditional probability of an observation belonging

to a particular class, given the values of the independent variable for that observation (Jones, 1987). The earliest study to use logit analysis to predict financial distress was that of Ohlson (1980). The study included a sample of 105 bankrupt industrial firms selected from the *Wall Street Journal Index*. The firms had to have been traded on the stock exchange for at least three years prior to failure. The non-bankrupt sample consisted of 2,058 unmatched industrials. The use of a non-matching sample of non-bankrupt firms permitted a firm size variable [log of (total assets/GNP price-level index)] to make a significant contribution to the predictive power of the model. Eight other independent variables were selected from the financial statements of the sample firms as follows: Total liabilities/total assets; working capital/total assets; current liabilities/current assets; net income/total assets; funds from operations/total liabilities; a dummy variable coded 1 if net income was negative for the last two years, 0 otherwise; a dummy variable coded 1 if total liabilities were greater than total assets, 0 otherwise; and the ratio $(NI_t - NI_{t-1}) / (|NI_t| + |NI_{t-1}|)$ where NI is net income, and t is the year-end at which the probability of failure is being evaluated.

Ohlson estimated three models: the first model to predict failure within the first year, and two more models to predict failure within two years and three years if the firm had not failed within the first and second years respectively. Coefficients of seven variables were found to be significant at the 10 percent significance level at least. A cutoff point of 0.038 was selected, with firms with predicted probabilities of non-failure below this cutoff point being classified as failing. The model's error rates (for the first year) were 12.4 percent for the bankrupt firms and 17.5 percent for the non-bankrupt

firms. The predictive accuracy of the model was not validated on a holdout sample.

Zavgren (1983) analysed the reasons for the relatively low predictive accuracy of the model. She concluded that the inability of the model to achieve higher predictive accuracy was essentially a function of the following factors: the specification of the model without reference to an underlying theory of variable selection, multicollinearity among the variables, and the sample-specific nature of the results.

Another study (Gentry, Newbold and Whitford, 1985) used logit analysis to ascertain whether cash-based fund flow variables can be successfully employed in bankruptcy prediction. A sample of 33 failed and 33 non-failed firms matched on the basis of size, industry and the year of data was used for the study. The cash-flow ratios were normalized by dividing by a measure of total funds flow. The model correctly classified 79 percent of the failed firms and 88 percent of the non-failed firms in the estimation sample. For the holdout sample, the corresponding figures were 70 percent and 74 percent respectively. The most significant indicator of future financial failure was found to be funds used for dividends.

Under the assumption that the use of unadjusted financial ratios may not lead to accurate results if ratios are industry-specific, Platt and Platt (1991) used a logit model to determine whether industry-relative financial ratios have the potential for effecting an improvement in the ability to predict bankruptcy over unadjusted ratios. The study used two samples of companies, the first being a collection of 114 equally matched failed and non-bankrupt companies. The companies were matched on the basis of industry, asset size and data availability for the same year. The second was a holdout sample of 68

equally matched companies. Data on these samples was obtained from Compustat tapes. The following set of ratios was used in both an industry-adjusted and an adjusted generalized logit specification: cash flow to total sales; net fixed assets to total assets; total debt to total assets; short term debt to total debt; sales growth; industry output * cash flow to sales; and industry output * total debt to total assets.

Results showed that the signs of the estimated coefficients did not fluctuate across sample time periods for the industry-relative specification, while there was considerably more variation in the signs of the coefficients across sample time periods for the unadjusted model. In any particular time period, the industry-relative model provided a better fit than the unadjusted model. For example, the overall predictive accuracy of the industry relative model for the time period 1972-1987 was 85 percent, while that of the unadjusted model for the same period was 80.5 percent. The results of the study appear to indicate that industry-adjusted ratios are more stable than unadjusted ratios.

On the surmise that factors that contribute to a financially distressed condition may not necessarily be the same ones that motivate bankruptcy filing, Gilbert, Menon and Schwartz (1990) investigated whether a logit model could distinguish between “at risk” firms that survive and “at risk” firms that fail. The model was developed using an estimation sample of bankrupt firms and randomly selected non-bankrupt firms. The predictive accuracy of the model was tested on two types of holdout samples—one consisting of bankrupt and randomly drawn firms and the other of financially distressed firms, some of which filed for bankruptcy. Another model was estimated from a sample of bankrupt and distressed firms. The bankrupt group comprised US firms that had filed a

Chapter 11 bankruptcy petition between 1974 and 1983. The random group was selected from the Compustat industrial file. The distressed group consisted of firms that had negative cumulative earnings (income from continuing operations) over any consecutive three-year period between 1972 and 1983.

Results obtained were somewhat contrary to expectations. The model that was estimated using the bankrupt/random estimation sample had an overall predictive accuracy of 88.5 percent. However, it had a high misclassification rate for Type I errors (32.5 percent in the estimation sample and 37.5 percent in the holdout sample). On using the model to predict the status of firms in the bankrupt/distressed holdout sample, its overall predictive accuracy dropped significantly to 66.6 percent. The model incorrectly classified 32.3 percent of the non-bankrupt distressed firms as bankrupt. Re-estimation of the model using a bankrupt/distressed estimation sample resulted in lower predictive ability than that obtained in the bankrupt/random case. The authors concluded that the reason for the disappointing results could be that bankrupt firms' pre-filing financial ratios may not be sufficiently different from the ratios of other firms in financial distress to allow the development of a ratio-based model that predicts bankruptcy with reasonable accuracy. Incidentally, they also conjectured that the high error rates could be the result of two methodological refinements, one of which had been suggested by Zmijewski (1984): the use of unequal proportions of bankrupt and non-bankrupt firms.

To summarize, although several bankruptcy prediction models have been used at various times, their predictive accuracy is still a matter of debate. For instance, while Hamer (1983) found no significant differences in the classification accuracy of logit and

linear discriminant models, Martin (1977) found that probability estimates provided by a logit model were significantly better than those provided by a discriminant model using a maximum likelihood estimation technique. Boritz (1991) points to this as a limitation. In addition, several other factors relating to bankruptcy prediction models also serve to reduce their applicability to the prediction of going concern status. First, the selection of ratios is made on an ad-hoc basis without reference to underlying theory. The ratios selected are thus sample-specific. In fact, while Argenti (1976) acknowledges that financial ratios are useful indicators of corporate distress, he does not believe that they can be solely relied upon in predicting corporate failure. Second, the use of samples comprising an equal number of distressed or non-distressed firms overstates the proportion of distressed firms occurring in the population from which the samples are derived, leading to inaccurate predictions. However, attempts to adjust for this have also not led to any significant improvements in predictive ability.

3.2 Generic characteristics of failing firms

The exclusive reliance on financial statement and market-based information for the prediction of firm failure may be inherently problematical. As Zavgren (1983) observes, a drawback of any methodology used to model a phenomenon with limited data is that it ignores many unobservable factors that influence the vulnerability of individual firms. For instance, the unmeasured qualities of assets, random events in the firm's environment, as well as regulatory constraints are factors generally overlooked by these bankruptcy prediction models (Zavgren, 1983). Thus they are subject to several problems that reduce their reliability for predicting the going concern status of an entity.

Consequently, this study does not make recourse to statistical models for the purpose of the development of the decision aid for going concern evaluation. Instead, it draws on the extant literature on generic characteristics of failing firms to formulate a decomposition-based decision aid much like a check-list. The objective of this decision aid is to help the decision maker in assimilating and evaluating each piece of information relevant to the decision problem by drawing his or her attention to possibly underutilized information. Basing the decision aid on generic characteristics of firm failure as described in the extant literature as well as the CICA Exposure Draft may be of advantage, considering the fact that auditors may eventually be faced with the responsibility of making explicit going concern assessments in compliance with its recommendations.

In one of the earliest attempts to understand and document the characteristic causes and symptoms of firm failure, Argenti (1976) found the following factors common to some well-known bankruptcies:

- **Management-related factors** such as one-man rule, a non-participating board of directors, an unbalanced top team, and lack of management depth;
- The failure of **accountancy information**, such as the lack of budgetary controls, non-reliance on cash flow forecasts, misleading costing systems, and the incorrect valuation of the firm's assets;
- **Changes** relating to the external environment, such as political, economic, social and technological changes;
- **Constraints** arising due to social, political or regulatory pressures that prevent the adoption of measures aimed at ensuring firm survival such as layoffs or divestitures;
- **Overtrading**, or the expansion of the business at a rate faster than the expansion of internally-generated cash flows, resulting in borrowing;

- **Misplaced reliance on one major project in the hopes of effecting a turnaround, such as the launch of a major new product, the introduction of a new service, or an expansion program;**
- **Leverage (or “gearing”), which results in the extreme sensitivity of the company’s profits to extreme variations (and even normal business hazards) in the business environment.**

Argenti (1976) also identified several symptoms of impending corporate failure, such as borderline accounting policies ⁴, low employee morale, a decline in quality or service, the tightening of credit policies, and rising inventory levels. While these indicators are symptoms rather than causes of business distress, they nevertheless are characteristic of failing firms, and as such are useful predictors of financial failure.

In another study of some major bankruptcies, Platt (1985) suggests that impending business failure may be predicted through the use of “common sense” indicators, although, admittedly, these indicators are subjective, and a firm exhibiting most or even all of them may nevertheless survive. Platt classifies them into the following categories:

Financial or company signs:

- the company announces the appointment of a new accounting firm or develops a new banking relationship
- a management dispute surfaces in a public forum
- members of the board of directors suddenly resign
- the borrowing credit line is reduced
- common stock is sold in a depressed market or for a price less than the book value
- company executives sell stock
- a major write-off of assets takes place

⁴ Examples of such accounting policies include delaying the publication of annual reports for as long as possible, continuing to pay dividends even if it is necessary to raise equity or loans to do so, and reducing expenditure on routine maintenance until a major renovation is needed, which may then be treated as a capital expenditure.

- the company suffers from severe cash flow problems, accumulates too many current assets, gets squeezed by capital equipment expenditures, has high levels of debt, or falls a prey to short-term debt under conditions of rising interest rates.

Product signs:

- new competition enters the market
- other firms seem to be selling products that are a generation ahead
- the research and development budget is proportionately less than that of the competition
- retailers always seem to be overstocked
- customers are asked by others as to why they bought that company's product.

These signs act as broad indicators of impending financial failure. Even though the firm may not actually fail (and may, in some cases, even prosper) the existence of these signs should act as an early warning system leading to a more careful investigation of the firm's situation.

In his landmark monograph, Boritz (1991) presents an exhaustive list of "going concern" indicators available in the financial distress and auditing literature. The list was developed on the basis of a review of relevant International, US and Canadian auditing standards governing "going concern" uncertainties, a survey of public accounting firm practices, as well as a review of both scholarly and professional literature to pinpoint any remaining indicators. The indicators are broadly classified into the following categories:

(A) **Macroeconomic** indicators such as increases in the prime rate, decreases in gross domestic product, and decreases in money supply.

(B) **Industry** factors such as the higher than average frequency of failure due to the fundamental riskiness of operations, the industry being adversely affected by

systematic economic, political or social trends, and the industry's susceptibility to domino effects flowing from problems in the same or other industries.

(C) Entity size, age and ownership characteristics. Several features common to larger, more established, and public-traded firms render them less susceptible to business failure than those that are smaller, newer, and privately-held.

(D) Management deficiencies may be the single most critical factor in firm failure. These include the autocratic style of the chief executive, the absence of a strong finance director, the amalgamation of the offices of the chief executive officer and the chairman, and the existence of non-participating directors.

(E) Financial ratios and negative trends. In addition to the information provided by financial ratios in the evaluation of an entity's financial condition, several other attributes could serve as reliable indicators of financial distress. Examples are the variability of stock prices, the pursuit of unsustainable growth, the sell-off of productive assets, and the contravention of regulatory requirements.

(F) Changes in accounting policies and management fraud may also herald impending disaster. For example, distressed companies frequently switch to LIFO or make changes to pension accounting. They may also avoid or delay the recognition of loan losses, or may recognize fee and interest income from renegotiated/uncollectible loans, among other practices. Management fraud is also highly correlated with bankruptcy.

(G) Operating indicators and internal matters relating to the four functional areas of marketing, production, finance and personnel. These indicators are

mainly internal in nature and may not be easily observable by external parties.

(H) Communications with lenders and other parties may also indicate impending financial failure, if the frequency of such communication is either unusually high or low.

(I) External matters and contingencies such as the sudden discoveries of unknown health hazards or environmental risks, the loss of a key franchise or patent, or that of a key supplier or customer, and the introduction of a competing product that causes existing markets for the entity's products to disappear.

Arguing for the promulgation of mandatory going concern assessment on every audit engagement, the CICA Exposure Draft (1995) categorizes the factors that may cast doubt on the entity's ability to continue as a going concern under the following four classes:

- (a) **operational factors**, including fundamental changes in the market or technology to which the entity is unable to adapt adequately, loss of key management without appropriate replacement or loss of a key supplier or customer;
- (b) **financial factors**, including substantial operating losses, insufficient funds to meet liabilities or to continue to provide services or an inability to obtain financing for essential assets;
- (c) **economic factors**, including recessionary trends or a prolonged period of high interest rates; and
- (d) **other factors**, including the possibility of an adverse outcome of one or more

contingencies or non-compliance with regulatory requirements.

The CICA Exposure Draft is partly an outcome of developments that have already taken place in the US. The Statement on Auditing Standards (S.A.S.) No. 59 of the AICPA (1988) introduced a fundamental change to the manner in which auditors approached the task of performing going concern evaluations. Prior to the promulgation of this Standard, auditors were required to evaluate an entity's ability to continue as a going concern only if there appeared to be substantial grounds to doubt the validity of the assumption with regard to the entity. However, S.A.S. No. 59 made it mandatory for the auditor to perform the going concern evaluation on each audit engagement, regardless of whether or not there was substantial doubt as to the entity's ability to continue as a going concern. The Standard provides the following examples of conditions or events affecting the entity that could indicate the existence of such doubt:

- **Negative trends** such as recurring operating losses, working capital deficiencies, negative cash flows from operations, and adverse key financial ratios.
- **Other indicators of possible financial difficulties.** These include, among others, default on loans agreements, denial of usual trade credit from suppliers, restructuring of debt, the need to seek new sources of financing, and the need to dispose of substantial assets.
- **Internal matters** such as work stoppages, substantial dependence on the success of a particular project, or the need to significantly revise operations.
- **External matters that have occurred** such as legal proceedings, legislation, the loss of a key franchise, licence, or patent, the loss of a principal customer or supplier, and an uninsured or underinsured catastrophe such as an earthquake.

3.3 The decision aid checklist

It is evident from these lists that some of the indicators recur frequently in situations of corporate failure. This makes them particularly useful for judging a firm's future viability, especially when they are evident to the observer. This study therefore uses these factors to develop a check-list of features to look for when trying to predict the going concern ability of an entity. The check-list is developed by collating the various indicators identified by the sources named above, and then integrating them under separate categories in loose conformity with the CICA Exposure Draft. The rationale underlying this approach is that since the Exposure Draft may possibly evolve into an auditing standard, developing a checklist that aids auditors to perform the judgement task that the future standard may mandate could prove to be beneficial to practitioners. Accordingly, the checklist comprises the following indicators and the categories under which they are subsumed:

A. Operational factors:

1. Loss of a key customer or supplier
2. Loss of key management personnel without appropriate replacement
3. Loss of a key franchise, licence or patent
4. Excessive reliance on one product or service
5. Excess or shortage of production capacity

B. Financial factors:

1. Substantial and recurring operating losses
2. Insufficient funds to meet liabilities or continue to provide services
3. Negative or decreasing cash flow from operations
4. Adverse key financial ratios
5. Level of debt financing increasing

C. External environment:

1. **Recessionary trends, decreases in gross domestic product, decreases in money supply**
2. **The inherent riskiness of the industry in which the entity operates**
3. **Fundamental changes in the market or technology to which the entity is unable to adjust adequately**
4. **The introduction of a competitor's rival product that seems to be a generation ahead of the entity's product**
5. **Adverse effects of changes in legislation, government policy, or social values and norms**

D. Internal environment:

1. **Work stoppages, labour disputes, and high turnover in key positions**
2. **Weak Board of Directors, autocratic CEO, lack of management depth**
3. **Lack of budgetary controls, non-existent business plan, no statement of objectives**
4. **Lack of proper records, books not current, inability to provide timely financial statements**
5. **Significant changes in business practices**

E. Other factors:

1. **Possibility of an adverse outcome of one or more contingencies**
2. **Riskiness inherent in being relatively small and new, as well as privately-held**
3. **Frequent change of auditors, legal counsel, bankers or key consultants**
4. **Forced, substantial disposition of fixed assets**
5. **Changes in accounting policies, excessive management interest in effect of accounting alternatives**

The check-list does not attempt to include all the indicators identified in the literature—indeed, doing so would make it prohibitively awkward to use. However, it does contain the most important indicators, some of which figure repeatedly in business failure scenarios. The decision maker utilizing the checklist for assessing a given entity's going concern ability would have to carefully analyze the information available on the

entity to identify any of the indicators identified in the checklist. This would constitute the decomposition phase of the decision aid use. The aggregation phase would be completed through the use of a decision rule. Although arbitrary by definition, decision rules do help in the aggregation process through the utilization of a reasonably logical approach. For instance, a decision rule for a decision maker using this particular checklist may well be “the probability of an entity not being a going concern in the near future increases with an increase in the number of indicators identified from the information available on it”. A decision rule in general conformity with this approach was developed for the use of the subjects in the study.

Chapter IV

Research Design

4.0 Overview

The study used a 2x2x2 factorial design with two environmental factors (information quantity and decision aid availability) and one personality factor (locus of control). Each of the environmental factors was manipulated at two levels (diagnostic information versus mixed information; and no decision aid versus decision aid available, respectively), with subjects being randomly assigned to each level. Assignment of subjects to each of the two levels relating to locus of control (external versus internal) was done on the basis of their individual locus of control scores. Subjects comprised a mix of practising auditors as well as advanced graduate accounting students, the majority of whom had actual auditing experience. They were presented with a case adapted from Cushing (1996), which included, among other information, the financial statements and excerpts from the working papers pertaining to a client firm. Subjects were asked to estimate, on the basis of the information provided, the likelihood of the firm continuing as a going concern. Subjects were also required to respond to the 30-item Paulhus and Christie (1981) Spheres of Control scale. The pretest procedure involved obtaining the opinions of experienced judges regarding the relevance of the information in the case. The following sections provide a description of the research design in greater detail.

4.1 The case

The case was adapted from Cushing (1996). Modifications made to the case included the deletion of the introductory and closing paragraphs (relating to the personnel

of the Genesis Investment Fund), changing names used in the case, changing the dates (to reflect greater recency), and re-arranging the information under new sub-headings.

The Cushing (1996) case was utilized for the study because of its suitability. Specifically, although the company in the case did eventually file for bankruptcy protection (shortly after a year of the most recent of the financial statements presented in the original case), it had a history of success in term of profitability and growth in its recent past. Although indicators of possible failure are available in the case material, they are not manifestly obvious, enhancing the complex nature of the case. Making a going concern assessment about the firm would require considerable judgement, thus allowing for potential variations in subjects' probability estimates. Using a case incorporating a real-world firm with a known outcome also allowed for gauging decision performance in terms of decision accuracy.

The manipulation with respect to information type was carried out as follows. Cases with diagnostic information only had information extracted solely from the original case itself. This included the history and background of the company, its consolidated balance sheet for the current and previous year, consolidated income statements for the current and two preceding years, consolidated statements of cash flows for the current and two preceding years, notes 6, 9 and 10 to the financial statements, and an analysis of the company's financial performance and financial position during the current year. This last piece of information was presented as an excerpt from the audit working papers of the senior in charge of the audit engagement relating to the client firm described in the case.

Nondiagnostic information totally unrelated to the original case was added to the

diagnostic information described above in order to achieve the mixed information manipulation. This included note 1 to the consolidated financial statements⁵; information on the company's policies relating to personnel development, job rotation and the affirmation of commitment to the company's mission; the establishment of an audit committee and a good working relationship between the company and its auditors; and finally, the socially responsible activities of the company's Chief Executive Officer.

The case material was made available to the subjects in both English and French. Translation of the material into French was carried out by a competent translator conversant with translation techniques as well as accounting and auditing terminology. However, to ensure that the internal validity of the test instrument was preserved in the translation, the French version of the case material was re-translated back into English by another translator conversant with accounting and auditing terminology in both languages. The original English version was then compared with the re-translated version by an independent and knowledgeable judge to determine the degree of similarity of meaning between the two versions. The two versions were found to be highly similar, indicating the acceptability of the French translation.

4.2 The decision aid

The decision aid manipulation was carried out by either including or excluding the decision aid with the rest of the case materials. The decision aid itself was of the decomposition variety, allowing users to break up the information relating to the case into

⁵ The author is grateful to Prof. Cushing for making a suggestion related to this note.

distinct components classified under separate categories such as operational, financial and environmental factors. Chapter III incorporates a review of the financial distress literature on which the development of the decision aid is based.

4.3 Pretest procedures

The pretest procedures were carried out with a view to ascertaining the opinions of a panel of experienced judges on the degree of relevance of each item of information included in the case, and removing any inconsistent or incomprehensible information in the case material that could pose a problem to the uninterrupted completion of the decision task.

The opinion of a panel of judges on the degree of relevance of the information in the case was ascertained as follows. Each unique item of information in the case was numbered sequentially. Four judges with a mean experience in auditing of nine years as either partners or managers, and some experience in going concern assessments and reporting decisions (resulting in ten going concern opinions), agreed to volunteer. The judges were presented with a version of the case that had all items of information serially numbered, and were asked for their opinions on the degree of relevance of each numbered item to going-concern assessment. They indicated their responses separately for each numbered item on a scale from 0 ("Not at all relevant") to 10 ("Completely relevant").

The responses of all the judges were compared with each other in order to determine the degree of consensus achieved. In general, diagnostic and non-diagnostic items were unanimously perceived as such by the judges, with the exception of only two items: the history and background of the firm, and the firm's plan to gain market share.

Although the former was originally introduced into the case as a relevant item of information, there was inter-judge disagreement on this item, with two judges considering it decidedly irrelevant, one undecided, and one decidedly relevant. In view of the lack of inter-judge consensus, as well as the necessity of incorporating some introductory material designed to provide a measure of orientation to the subjects, the item was retained without any modifications in the final version of the case.

The other item of information (relating to the company's plans to boost market share) was originally introduced into the case as an irrelevant piece of information. However, it was deemed relevant by three of the judges, with one remaining undecided. Follow-up interviews with the dissenting judges elicited their reasons for considering this information as relevant. Consequently, in response to their concerns, the item was modified to eliminate any information that could be perceived as relevant. Figure 1 presents the original and modified versions of this piece of information. An overview of the judges' opinions on information relevance relative to those of the study is presented in Table 1.

Figure 1

Original and modified versions of market share plans

Original version of the company's plans to boost market share:

However, under the leadership of the company's recently appointed Chief Executive Officer, Mr. Mike Totsis, the company has effected several programs in order to boost market share in the short term, and achieve market leadership in the long term. These programs include:

14. — enhanced personnel development programs
15. — job rotation at the middle and lower management levels
16. — aggressive recruitment of personnel with proven track records in marketing
17. — company-wide affirmation of commitment to the company's mission

Revised version of the company's plans to boost market share:

However, under the leadership of the company's Chief Executive Officer, Mr. Mike Totsis, the company has effected several programs in order to change the status quo. These programs are:

- enhanced personnel development programs
- job rotation at the middle and lower management levels
- company-wide affirmation of commitment to the company's mission.

Table 1

Results of comparison of pretest judges' perceptions with the original categorization of the study relating to relevance of different information items used in the case

Case section	Originally perceived as	Judges' perception	Action taken
History and background	relevant	irrelevant	Retained
Consolidated balance sheet	relevant	relevant	Retained
Consolidated income statement	relevant	relevant	Retained
Consolidated cash flow st.	relevant	relevant	Retained
Note 1 to financial statements	irrelevant	irrelevant	Retained
Note 6 to financial statements	relevant	relevant	Retained
Note 9 to financial statements	relevant	relevant	Retained
Note 10 to financial statements	relevant	relevant	Retained
Market perspective	relevant	relevant	Retained
Program for market share gain	irrelevant	relevant	Modified
Enhanced personnel development	irrelevant	irrelevant	Retained
Job rotation	irrelevant	irrelevant	Retained
Recruitment	irrelevant	irrelevant	Retained
Commitment to company mission	irrelevant	irrelevant	Retained
Financial position	relevant	relevant	Retained
Results of operations	relevant	relevant	Retained
Statement of cash flows	relevant	relevant	Retained
Entire "Results of operations"	relevant	relevant	Retained

The instrument was pretested by conducting a pilot study with graduate level accounting students preparing for the Uniform Final Examinations (UFE) of the Canadian Institute of Chartered Accountants (CICA). 81 students participated voluntarily in the pilot study, acting as surrogates for auditing professionals in carrying out the decision task. Assignment of students to each of the four treatment groups was done on a random basis. Students were also requested to indicate to the researcher whether they experienced any problems arising due to ambiguity, incomprehensibility, redundancy or any other factor. Overall, the material was found to be free from confusing or ambiguous information. However, some cosmetic improvements relating to design were suggested and incorporated in the test instrument subsequently distributed to audit firms⁶.

4.4 Subjects

Subjects were a mix of practising accountants from both Big Six as well as non-Big Six firms located in the Montreal area, as well as graduate students registered in the Diploma in Accountancy program at Concordia University. The study originally envisaged having as participants only practising accountants with at least four years of actual auditing experience. However, due to enormous problems associated with eliciting the participation of practising accountants, it was not possible to gather sufficient data for statistical analysis from practitioners. As such, the data obtained from the pilot test carried out on the graduate students was amalgamated with the practitioner data set. The

⁶ Examples of such improvements are the placement of the decision aid page before the case material pages (instead of after), and providing the meaning of the items on the Paulhus and Christie (1981) Spheres of Control Scale at the beginning of each page of questions relating to it.

two data sets were analyzed for significant differences using one-way analysis of variance. Table 2 presents the results of the analysis. The results indicate the absence of significant differences between the two populations in respect of going concern probability estimates, perceived task complexity, and perceived information relevance (Table 2, Panels A, C, and D). However, there is a significant difference between the two populations with respect to judgement confidence (Panel B). The results (indicating, as they do, an absence of dissimilarities for the most part) are not surprising, considering that 62.5 percent of the students possessed an average of more than a year of actual auditing experience (a circumstance unique to accounting students in Quebec). As a consequence of these results, the study is limited to analyzing the effects of information type, decision aid availability, and locus of control on going concern estimates, perceived task complexity, and perceived information relevance. Judgement confidence is not considered in the study.

Most of the practitioner subjects were of the rank of either partner, manager, or senior with at least four years of actual auditing experience. Their participation in the study (as that of the graduate accounting students) was purely voluntary. A majority of the practitioner subjects were male, and belonged to the Big Six group of audit firms. A minority of them had acquired experience in auditing client firms operating within specific industries ranging from forest products to telecommunications.

Table 2

Panel A: One-way ANOVA results for differences among Students and Practitioners with regard to going concern probability estimates

Main effect	df	F-value	Sig. Of F
Between Groups	1125	1.453	0.23
Within Groups			

Panel B: One-way ANOVA results for differences among Students and Practitioners with regard to confidence in judgement

Main effect	df	F-value	Sig. Of F
Between Groups	1129	3.41	0.06
Within Groups			

Panel C: One-way ANOVA results for differences among Students and Practitioners with regard to perceived task complexity

Main effect	df	F-value	Sig. Of F
Between Groups	1129	0.057	0.81
Within Groups			

Panel D: One-way ANOVA results for differences among Students and Practitioners with regard to perceived information relevance

Main effect	df	F-value	Sig. Of F
Between Groups	1127	2.138	0.14
Within Groups			

4.5 Administration

Audit firms were first provided with a two-page information sheet explaining the purpose of the study, its relevance to auditing professionals, and the criteria for participation. This information was also published in greater detail on the World Wide Web, and firms were encouraged to look it up for answers to any questions they had. The

information sheet was followed up by telephonic requests and/or personal visits. Firms that expressed an interest in participation were provided with as many questionnaires as they requested, through the intermediation of a contact person. While providing firms with the case, the four versions of the case (relating to the four experimental groups) were arranged in a repetitive sequence. A letter to the contact person accompanied the cases, incorporating guidelines for subject recruitment and material distribution. The necessity of the random assignment of subjects to each treatment group was emphasized, as was the need to complete the experimental task purely on an individual basis. Subjects were given a deadline for task completion. After having completed the task, subjects returned the entire case material to the contact person, who in turn returned them to the researcher. Since subjects were not required to identify themselves anywhere on the case material, their confidentiality was assured.

4.6 The task

Subjects were asked to assume the role of the audit partner for the current year's engagement. The experimental task required them to indicate, on the basis of the information provided to them, their probability estimates of the firm in the case continuing as a going concern, on a scale calibrated from 0 ("Certain not to continue") to 100 ("Certain to continue"). In addition, they were asked to indicate how confident they were in the probability assessments they made on a scale from 0 ("Not at all confident") to 10 ("Completely confident"); their perceptions regarding the level of task complexity on a scale from 0 ("Not at all complex") to 10 ("Extremely complex"); and their perceptions of the relevance of the given information to the going-concern assessment

task from 0 ("None of it was relevant") to 10 ("All of it was relevant").

Subjects were also asked to respond to the 30 items on the Paulhus and Christie (1981) Spheres of Control scale calibrated from +3 ("Agree strongly") to -3 ("Disagree strongly") in order to measure their perceptions with regard to locus of control. Subjects recorded their starting and ending times on the instrument. Demographic information pertaining to each subject was also collected.

4.7 The variables

Three independent variables (two environmental and one personality-related) were examined in the study. The environmental variables were information type and decision aid availability; the personality variable was locus of control. Information type was manipulated at two levels: diagnostic information only and mixed (diagnostic as well as nondiagnostic) information. Decision aid availability was manipulated at two levels: with or without the decision aid. Subjects were assigned randomly to each of these four (environmental variable-related) treatment groups. Locus of control was similarly dichotomous ("externals" versus "internals") but assignment of subjects to either of the related sub-groups was based on their individual locus of control scores rather than on a random basis⁷.

⁷ Additional analyses were carried out using continuous locus of control scores as a co-variate. In addition, the following variables were also included in the model as co-variables: gender, experience, and squared locus of control scores. No additional insights were observed on incorporating these variables as co-variables, with the exception of the continuous locus of control scores. Use of the continuous locus of control variable as a co-variate results in an effect on decision accuracy at a significance level of .095. At the main effect level, externals are more accurate than internals. However this result disappears once the analysis controls for the effect of the other two independent variables, information type

The dependent variables in the study were subjects' going concern probability estimates; their level of confidence in their going concern judgements; their perceptions of task complexity; and their perceptions of information relevance.

4.8 Analysis

Analysis of subjects' responses was carried out using a 2 (diagnostic versus mixed information) x 2 (no decision aid versus decision aid available) x 2 (external locus of control versus internal locus of control) full factorial analysis of variance (ANOVA) technique. Univariate t-tests were also utilized to test for significant differences between group means on the different dimensions tested.

The following chapter presents the results of the data analysis, as well as a discussion of the findings.

and decision aid availability, on decision accuracy. Further analysis using either the regression approach or ANOVA shows no significant interactions. Furthermore, the continuous locus of control variable ceases to be significant once the interaction effects are included in the regression analysis. Given that the research hypotheses in the study deal with the interaction effects of locus of control, decision aid availability and information type on the dependent variables, it is important to control for the interaction effects. Regression and ANOVA show the same results once interactions are included. The results are shown for the ANOVA analysis only.

Chapter V

Results

5.0 Overview

The dependent measures of interest are (1) subjects' probability estimates of the company in the case continuing as a going concern; (2) subjects' perceptions of information relevance; and (3) subjects' perceptions of task complexity⁸. The independent variables are information type (i.e., either diagnostic or mixed information), decision aid (i.e., decision aid either available or not), and locus of control (i.e., either "internal" or "external").. The former two variables are environment-related, and subjects were randomly placed in one of four treatment groups corresponding to each of their two levels in an analysis of variance (ANOVA) model.

To introduce subjects' loci of control in the analysis, the sample was split into two groups on the basis of individual average locus of control scores, forming a new dichotomous variable, LOCGROUP. Subjects with locus of control scores below the mean locus of control score for the full sample were assigned to the first group (externals), while those with scores above the sample mean were assigned to the second (internals)⁹. This factor was also introduced into the ANOVA model along with the other two (environment-related) variables, information type and decision aid availability.

Descriptive statistics for the overall sample as well as the four environmental-

⁸ It will be recalled that another measure, the level of confidence in one's probability assessment, was dropped from the analysis (see preceding chapter on research method).

⁹ Results did not differ with analyses carried out using the median locus of control score (4.93) instead of the mean.

variable related treatment groups (D1, D2, M1, and M2) are presented in Table 3. The table presents the means and standard deviations of subjects' going concern probability estimates, perceptions of task complexity, and perceptions of information relevance.

Table 3

Descriptive statistics for subjects' probability estimates, perceptions of task complexity, and perceptions of information relevance [means (standard deviations)]

Treatment	N	Probability estimates [*]	Perceived task complexity ^{**}	Perceived information relevance ^{***}
D1: Diagnostic information, no decision aid	32	61.41 (20.29)	6.19 (2.10)	6.10 (1.81)
D2: Diagnostic information, decision aid	30	66.79 (16.79)	5.23 (1.85)	6.03 (1.82)
M1: Mixed information, no decision aid	37	68.78 (15.96)	5.18 (1.97)	6.27 (1.35)
M2: Mixed information, decision aid	32	66.17 (16.17)	5.75 (1.67)	5.94 (1.39)
Overall sample	131	65.86 (17.39)	5.57 (1.93)	6.09 (1.58)
[*] Subject's probability estimates of the firm's likelihood of continuing as a going concern, on a scale from 0 to 100 ^{**} Subjects' perceptions of task complexity (after task completion), on a scale from 0 to 10 ^{***} Subjects' perceptions of the relevance of the information provided, on a scale from 0 to 10				

In addition to the analysis of variance, univariate t-tests were also conducted for hypothesis-testing. Results of these tests are presented in the following subsections.

5.1 Tests of hypotheses

The hypotheses of the study predict various effects of the independent variables (information type, decision aid availability, and locus of control) individually and jointly

on subjects' information processing related to the going concern decision. The hypotheses are classified under three categories relating to each of the three dependent variables: perceived information relevance, perceived task complexity, and decision accuracy.

5.1.1 Perceptions of information relevance

5.1.1.1 Hypothesis 1—Locus of control and information relevance: Hypothesis 1 predicts that internals perceive a higher level of information relevance than externals. Tables 4 through 8 present the results of the analysis relating to this hypothesis.

In Table 4, Panel A indicates a significant difference between internals and externals with respect to mean perceived information relevance (6.471 versus 5.629 respectively, t -value 3.15, $p=.001$). The results of the ANOVA presented in Panel B provide further support to this finding ($F_{1, 127} = 9.699$, $p = .001$). The results indicate that internals perceive more of the informational cues provided to be relevant than externals.

This difference between internals and externals with respect to perceived information relevance is also observed when controlling for information type. Evidence of this may be observed from Table 5. Panel A of Table 5 indicates that in a diagnostic-only information setting, internals tend to perceive more of the information as relevant (mean relevance 6.472) relative to externals (mean relevance 5.458, t -value = 2.25, $p = .0145$). Panel B supports this finding through an ANOVA ($F_{1, 58} = 4.853$, $p = .016$). Panel C indicates a similar difference in perceptions of information relevance between internals and externals when provided with a mixture of diagnostic and nondiagnostic information

Table 4 (H1)

Panel A: Results of t-test for differences between externals and internals relating to perceived information relevance

Group	N	Mean	S.D.	t-value	1-tailed sig.
Internals	71	6.471	1.601	3.15	0.001
Externals	58	5.629	1.434		

Panel B: Results of ANOVA for differences between externals and internals relating to perceived information relevance

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	22.660	1	22.660	9.699	.001
LOCGROUP	22.660	1	22.660	9.699	.001
Explained	22.660	1	22.660	9.699	.001
Residual	296.724	127	2.336		

(mean relevance 6.471 and 5.750 respectively, $t\text{-value} = 2.25$, $p = .0135$). Panel D shows the results of the ANOVA for the mixed information scenario ($F_{1,67} = 5.071$, $p = .014$).

Further tests were carried out to ascertain whether internals would perceive a higher degree of information relevance than externals on controlling for decision aid availability. Table 6 presents the results of the analysis relating to this research question.

Panel A of Table 6 indicates that when a decision aid is used, internals tend to perceive more of the information as relevant (mean relevance 6.361) relative to externals (mean relevance 5.440, $t\text{-value} = 2.38$, $p = .0105$). Panel B supports this finding through an ANOVA ($F_{1,59} = 5.258$, $p = .0125$). Panel C indicates a similar difference in perceptions of relevance between internals and externals when a decision aid is not available (mean relevance 6.585 and 5.772 respectively, $t\text{-value} = 2.20$, $p = .0155$). Panel

Table 5 (H1 continued)

Panel A: Results of t-test for differences between externals and internals relating to perceived information relevance (with diagnostic information only).

Group	N	Mean	S.D.	t-value	1-tailed sig.
Internals	36	6.472	1.812	2.25	0.0145
Externals	24	5.458	1.641		

Panel B: Results of ANOVA for differences between externals and internals relating to perceived information relevance (with diagnostic information only).

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	14.803	1	14.803	4.853	.016
LOGGROUP	14.803	1	14.803	4.853	.016
Explained	14.803	1	14.803	4.853	.016
Residual	176.931	58	3.051		

Panel C: Results of t-test for differences between externals and internals relating to perceived information relevance (with mixed information).

Group	N	Mean	S.D.	t-value	1-tailed sig.
Internals	35	6.471	1.377	2.25	0.0135
Externals	34	5.75	1.281		

Panel D: Results of ANOVA for differences between externals and internals relating to perceived information relevance (with mixed information).

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	8.976	1	8.976	5.071	.014
LOGGROUP	8.976	1	8.976	5.071	.014
Explained	8.976	1	8.976	5.071	.014
Residual	118.596	67	1.770		

D presents the results of the ANOVA for the non-availability of a decision aid ($F_{1,66} = 4.818, p = .016$).

Table 6 (H1 continued)

Panel A: Results of t-test for differences between externals and internals relating to perceived information relevance (with decision aid availability).

Group	N	Mean	S.D.	t-value	1-tailed sig.
Internals	36	6.361	1.659	2.38	0.0105
Externals	25	5.44	1.356		

Panel B: Results of ANOVA for differences between externals and internals relating to perceived information relevance (with decision aid availability).

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	12.518	1	12.518	5.258	.0125
LOGGROUP	12.518	1	12.518	5.258	.0125
Explained	12.518	1	12.518	5.258	.0125
Residual	140.466	59	2.381		

Panel C: Results of t-test for differences between externals and internals relating to perceived information relevance (without decision aid use).

Group	N	Mean	S.D.	t-value	1-tailed sig.
Internals	35	6.585	1.555	2.2	0.0155
Externals	33	5.772	1.495		

Panel D: Results of ANOVA for differences between externals and internals relating to perceived information relevance (without decision aid use).

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	11.226	1	11.226	4.818	.016
LOGGROUP	11.226	1	11.226	4.818	.016
Explained	11.226	1	11.226	4.818	.016
Residual	153.788	66	2.330		

Another important research question related to H1 is whether the hypothesized effect of internals perceiving a higher degree of information relevance than externals would be observed when controlling for the interaction effects of information type and

Table 7 (H1 continued)

Panel A: Results of t-test for differences between externals and internals relating to perceived information relevance (for mixed information with decision aid availability).

Group	N	Mean	S.D.	t-value	1-tailed sig.
Internals	18	6.333	1.572	2.02	0.0265
Externals	14	5.428	0.938		

Panel B: Results of ANOVA for differences between externals and internals relating to perceived information relevance (for mixed information with decision aid availability).

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	6.446	1	6.446	3.620	.0335
LOGGROUP	6.446	1	6.446	3.620	.0335
Explained	6.446	1	6.446	3.620	.0335
Residual	53.429	30	1.781		

Panel C: Results of t-test for differences between externals and internals relating to perceived information relevance (for diagnostic information with decision aid availability).

Group	N	Mean	S.D.	t-value	1-tailed sig.
Internals	18	6.388	1.787	1.36	0.095
Externals	11	5.454	1.809		

Panel D: Results of ANOVA for differences between externals and internals relating to perceived information relevance (for diagnostic information with decision aid availability).

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	5.960	1	5.960	1.850	.0925
LOGGROUP	5.960	1	5.960	1.850	.0925
Explained	5.960	1	5.960	1.850	.0925
Residual	87.005	27	3.222		

decision aid availability. Tables 7 and 8 present the results of the analysis relating to this question, for decision aid availability and the non-availability of a decision aid respectively.

Panel A of Table 7 indicates that when a decision aid is used with mixed information, internals tend to perceive more of the information as relevant (mean relevance 6.333) relative to externals (mean relevance 5.428, t -value = 2.02, $p = .0265$). Panel B supports this finding through an ANOVA ($F_{1, 30} = 3.620$, $p = .0335$). Panel C indicates a similar difference in perceptions of relevance between internals and externals when a decision aid is used, and diagnostic information only is available (mean relevance 6.388 and 5.454 respectively, t -value = 1.36, $p = .095$). Panel D presents the results of the ANOVA for the diagnostic information, decision aid situation ($F_{1, 27} = 1.850$, $p = .0925$). All these findings are statistically significant at conventional levels. In general, therefore, internals perceive a higher degree of information relevance than externals when controlling for the interaction between information type and the use of a decision aid.

Table 8 presents the results of the analysis relating to the interaction between information type and the non-use of a decision aid. Panel A of Table 8 indicates that when a decision aid is not used with mixed information, internals tend to perceive more of the information as relevant (mean relevance 6.617) relative to externals (mean relevance 5.975, t -value = 1.49, $p = .0725$). Panel B, Table 8 reports the results of the ANOVA for this treatment condition ($F_{1, 35} = 2.142$, $p = .076$).

Panel C of Table 8 indicates a difference in perceived relevance between internals and externals when a decision aid is not used and diagnostic information only is available (mean relevance 6.555 and 5.461 respectively, t -value = 1.76, $p = .0445$). Panel D presents the results of the ANOVA for the mixed information, no decision aid situation ($F_{1, 29} = 2.922$, $p = .049$). In general, therefore, internals are observed to perceive more of

Table 8 (H1 continued)

Panel A: Results of t-test for differences between externals and internals relating to perceived information relevance (for mixed information and no decision aid availability).

Group	N	Mean	S.D.	t-value	1-tailed sig.
Internals	17	6.617	1.166	1.49	0.0725
Externals	20	5.975	1.455		

Panel B: Results of ANOVA for differences between externals and internals relating to perceived information relevance (for mixed information and no decision aid availability).

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	3.795	1	3.795	2.142	.076
LOCGROUP	3.795	1	3.795	2.142	.076
Explained	3.795	1	3.795	2.142	.076
Residual	62.002	35	1.771		

Panel C: Results of t-test for differences between externals and internals relating to perceived information relevance (for diagnostic information and no decision aid availability).

Group	N	Mean	S.D.	t-value	1-tailed sig.
Internals	18	6.555	1.886	1.76	0.0445
Externals	13	5.461	1.561		

Panel D: Results of ANOVA for differences between externals and internals relating to perceived information relevance (for diagnostic information and no decision aid availability).

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	9.034	1	9.034	2.922	.049
LOCGROUP	9.034	1	9.034	2.922	.049
Explained	9.034	1	9.034	2.922	.049
Residual	89.675	29	3.092		

the information as relevant on controlling for the interaction between information type and the non-availability of a decision aid.

5.1.1.2 Hypothesis 2—Decision aid availability, mixed information, locus of control, and information relevance: Hypothesis 2 is a composite of two hypotheses, H2A and H2B.

H2A predicts that given mixed information, a decision aid will reduce perceived information relevance. Table 9 presents the results of the t-tests relating to H2A.

Table 9 (H2A)

Panel A: Results of t-test for differences in perceived information relevance for subjects in mixed information settings without a decision aid versus subjects in mixed information settings with a decision aid.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Decision aid	32	5.937	1.39	-1.00	0.1595
No Decision aid	37	6.27	1.352		

Panel B: Results of ANOVA for differences in perceived information relevance for subjects in mixed information settings without a decision aid versus subjects in mixed information settings with a decision aid.

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	1.900	1	1.900	1.013	.159
DA_AVAIL	1.900	1	1.900	1.013	.159
Explained	1.900	1	1.900	1.013	.159
Residual	125.672	67	1.876		

Panel A of Table 9 indicates that the results are in the hypothesized direction, although not statistically significant. Of the subjects in the mixed information category, those who did not have a decision aid perceived the information to be more relevant (mean perceived relevance 6.270) than those who had the decision aid (mean perceived relevance 5.937, t-value -1.00, $p = .1595$). The results of the ANOVA analyses carried out to test this hypothesis are similarly non-significant ($F_{1, 57} = 1.013$, $p = .159$, Panel B). Overall, therefore, H2A is not supported.

H2B predicts that on controlling for locus of control, in a mixed information environment, the use of a decision aid will reduce perceived information relevance. Table 10 reports the results of the analysis relating to this hypothesis.

Table 10 (H2B)

Panel A: Results of t-test for differences in perceived information relevance for internals in mixed information settings without a decision aid versus internals in mixed information settings with a decision aid.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Decision aid	18	6.333	1.572	-0.61	0.273
No Decision aid	17	6.617	1.166		

Panel B: Results of ANOVA for differences in perceived information relevance for internals in mixed information settings without a decision aid versus internals in mixed information settings with a decision aid.

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.707	1	.707	.366	.2745
DA_AVAIL	.707	1	.707	.366	.2745
Explained	.707	1	.707	.366	.2745
Residual	63.765	33	1.932		

Panel C: Results of t-test for differences in perceived information relevance for externals in mixed information settings without a decision aid versus externals in mixed information settings with a decision aid.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Decision aid	14	5.428	0.251	-1.33	0.0965
No Decision aid	20	5.975	0.325		

Panel D: Results of ANOVA for differences in perceived information relevance for externals in mixed information settings without a decision aid versus externals in mixed information settings with a decision aid.

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	2.459	1	2.459	1.523	.113
DA_AVAIL	2.459	1	2.459	1.523	.113
Explained	2.459	1	2.459	1.523	.113
Residual	51.666	32	1.615		

Table 10 indicates that the results of the analysis are generally in the predicted direction. Panel A presents the results of the t-test for comparing levels of perceived relevance of internals in the mixed information condition without the decision aid with those using the decision aid (means of 6.617 and 6.333 respectively, $t\text{-value} = -0.61$, $p = .273$). Panel C reports similar results for externals with mixed information and no decision aid when compared with those with the use of a decision aid (means of 5.975 and 5.428 respectively, $t\text{-value} = -1.33$, $p = .0965$). The results are non-significant for internals, but significant at conventional levels for externals. The results of the ANOVA tend to support these findings (for mixed information internals, $F_{1,33} = 0.366$, $p = .2745$, Panel B; for mixed information externals, $F_{1,32} = 1.523$, $p = .113$, Panel D). Overall, therefore, hypothesis H2B is partially supported.

5.1.1.3 Hypothesis 3—Information type, locus of control, decision aid availability, and information relevance: Hypothesis 3 consists of three related hypotheses, H3A, H3B, and H3C.

H3A predicts that subjects' perceptions of information relevance will be higher in mixed information settings than in diagnostic information settings. Table 11 presents the results relating to this hypothesis.

Panel A of Table 11 reports the results of the t-test for H3A. Subjects given mixed information perceived the information to be only marginally more relevant than those with diagnostic information (means of 6.115 versus 6.066 respectively, $t\text{-value} = 0.17$, $p = .4315$). The non-significant nature of the differences is also indicated from the results of the ANOVA relating to this hypothesis, presented in Panel B ($F_{1,127} = .031$, $p = .4305$).

H3A is therefore not supported overall.

Table 11 (H3A)

Panel A: Results of t-test for differences in perceived information relevance between subjects with diagnostic information and subjects with mixed information.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Mixed	69	6.115	1.37	0.17	0.4315
Diagnostic	60	6.066	1.803		

Panel B: Results of ANOVA for differences in perceived information relevance for INFOQTY (subjects with diagnostic information vs. subjects with mixed information).

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.078	1	.078	.031	.4305
INFOQTY	.078	1	.078	.031	.4305
Explained	.078	1	.078	.031	.4305
Residual	319.306	127	2.514		

H3B predicts that on controlling for locus of control, subjects' perceptions of information relevance will be higher in mixed information settings than in diagnostic information settings.

Table 12 presents the results of the t-tests relating to this hypothesis. There are almost no differences in the levels of perceived relevance of internals with diagnostic information versus those with mixed information (Panel A, means of 6.472 and 6.471 respectively, t-value = .00, p = .499). The results are similarly non-significant for the t-test comparing externals with diagnostic information versus externals with mixed information (Panel B, means of 5.458 and 5.750 respectively, t-value = 0.73, p = .2355). The results of the ANOVA are not reported, but tend to support the non-significant nature

of these findings. Overall, therefore, H3B is not supported.

Table 12 (H3B)

Panel A: Results of t-test for differences in perceived information relevance between internals with diagnostic information and internals with mixed information.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Mixed	35	6.471	1.377	0.00	0.499
Diagnostic	36	6.472	1.812		

Panel B: Results of t-test for differences in perceived information relevance between externals with diagnostic information and externals with mixed information.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Mixed	34	5.75	1.281	0.73	0.2355
Diagnostic	24	5.458	1.641		

H3C predicts that on controlling for decision aid availability, subjects' perceptions of information relevance will be higher in mixed information settings than in diagnostic information settings. Table 13 presents the results of the analysis relating to this hypothesis.

Panel A of Table 13 indicates that there were no significant differences observed between the level of perceived information relevance of subjects given diagnostic information and a decision aid versus subjects given mixed information and a decision aid (means of 6.034 and 5.937 respectively, t-value = -0.24, p = .817). Panel B indicates a similar lack of any significant differences between subjects given diagnostic information and no decision aid, versus subjects given mixed information and no decision aid (means of 6.096 and 6.270 respectively, t-value 0.44, p = .662). Overall, therefore,

H3C is not supported.

Table 13 (H3C)

Panel A: Results of t-test for differences in perceived information relevance between subjects with diagnostic information and a decision aid versus subjects with mixed information and a decision aid.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Mixed	32	5.937	1.39	-0.24	0.817
Diagnostic	29	6.034	1.822		

Panel B: Results of t-test for differences in perceived information relevance between subjects with diagnostic information and no decision aid versus subjects with mixed information and no decision aid.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Mixed	37	6.27	1.352	0.44	0.662
Diagnostic	31	6.096	1.814		

5.1.2 Perceptions of task complexity

5.1.2.1 Hypothesis 4—Information type, locus of control, and task complexity:

Hypothesis 4 consists of H4A and H4B.

H4A predicts that task complexity will be perceived to be higher by internals than externals in diagnostic information settings. Panel A of Table 14 presents the results of the analysis relating to this hypothesis. Panel A indicates that externals given diagnostic information actually found the task to be marginally more complex (mean perceived task complexity 5.807) than internals (mean perceived task complexity 5.666) with diagnostic information. However, the result is not statistically significant (t-value = -0.27, $p = .393$).

H4B predicts that task complexity will be perceived to be lower by internals than externals in mixed information settings. Panel B of Table 14 presents the results of the t-

Table 14 (H4A and H4B)

Panel A: Results of t-test for differences between externals and internals relating to perceived task complexity (with diagnostic information only).

Group	N	Mean	S.D.	t-value	1-tailed sig.
Internals	36	5.666	2.125	-0.27	0.393
Externals	26	5.807	1.919		

Panel B: Results of t-test for differences between externals and internals relating to perceived task complexity (with mixed information).

Group	N	Mean	S.D.	t-value	1-tailed sig.
Externals	34	5.632	1.746	0.84	0.201
Internals	35	5.257	1.945		

test relating to H4B. Although non-significant, the results are in the hypothesized direction. Externals given mixed information again found the task to be marginally more complex (mean perceived task complexity 5.632) than internals (mean perceived task complexity 5.257) with mixed information (t-value = .84, $p = .201$). The results of the ANOVA carried out to test these two sub-hypotheses were also found to be non-significant, and are not reported here. Overall, therefore, the results, while in the expected direction, do not lend support to Hypothesis 4.

5.1.2.2 Hypothesis 5—Decision aid availability, information type, locus of control, and task complexity: Hypothesis 5 is a composite of four hypotheses: H5A, H5B, H5C, and H5D.

H5A predicts that in mixed information settings, task complexity for internals will increase with the use of a decision aid. Hypothesis H5B posits the same effect for externals in mixed information settings. However, the effect of the decision aid on

internals in mixed information settings (H5A) is expected to be stronger than that on externals in similar settings (H5B). Results of the analysis pertaining to these two hypotheses are presented in Table 15.

Table 15 (H5A and H5B)

Panel A: Results of t-test for differences between internals with mixed information and no decision aid versus internals with mixed information and a decision aid, relating to perceived task complexity.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Decision aid	18	5.777	1.865	1.67	0.052
No decision aid	17	4.705	1.929		

Panel B: Results of ANOVA for differences between internals with mixed information and no decision aid versus internals with mixed information and a decision aid, relating to perceived task complexity.

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	10.045	1	10.045	2.794	.052
DA_AVAIL	10.045	1	10.045	2.794	.052
Explained	10.045	1	10.045	2.794	.052
Residual	118.641	33	3.595		

Panel C: Results of t-test for differences between externals with mixed information and no decision aid versus externals with mixed information and a decision aid, relating to perceived task complexity.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Decision aid	14	5.714	1.437	0.24	0.4065
No decision aid	20	5.575	1.969		

Panel D: Results of ANOVA for differences between externals with mixed information and no decision aid versus externals with mixed information and a decision aid, relating to perceived task complexity.

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.160	1	.160	.051	.4115
DA_AVAIL	.160	1	.160	.051	.4115
Explained	.160	1	.160	.051	.4115
Residual	100.495	32	3.140		

Panel A of Table 15 indicates a significant difference in perceived task complexity of internals with mixed information and no decision aid (mean of 4.705) versus internals with mixed information and a decision aid (mean of 5.777, t -value = 1.67, $p = .052$). Panel B presents the results of the ANOVA relating to H5A ($F_{1,33} = 2.794$, $p = .052$). Panel C presents the results of the t -test for differences in perceived task complexity for externals in a mixed information setting without a decision aid versus those with a decision aid (means of 5.575 and 5.714 respectively, t -value = 0.24, $p = .4065$). Panel D reports on the ANOVA for H5B ($F_{1,32} = .051$, $p = .4115$). The results indicate a strong effect for internals with mixed information and a decision aid (H5A) relative to externals with similar information and the availability of a decision aid (H5B).

Hypothesis H5C predicts that in diagnostic information settings, task complexity for internals will decrease with the use of a decision aid. Hypothesis H5D posits the same effect for externals in diagnostic information settings. However, the effect for externals (H5D) is posited to be stronger than the effect for internals (H5C). Results pertaining to the analysis for these two hypotheses are presented in Table 16.

Panel A of Table 16 indicates a difference (albeit non-significant) between the perceptions of internals with diagnostic information and no decision aid (mean of 6.000) versus internals with diagnostic information and a decision aid (mean of 5.333, t -value = .94, $p = .177$). Panel B presents the results of the ANOVA relating to H5C ($F_{1,34} = .883$, $p = .177$).

Panel C presents the results of the t -test for differences in perceptions of task complexity for externals in a diagnostic information setting without a decision aid (mean

Table 16 (H5C and H5D)

Panel A: Results of t-test for differences between internals with diagnostic information and no decision aid versus internals with diagnostic information and a decision aid, relating to perceived task complexity.

Group	N	Mean	S.D.	t-value	1-tailed sig.
No decision aid	18	6.000	2.301	0.94	0.177
Decision aid	18	5.333	1.940		

Panel B: Results of ANOVA for differences between internals with diagnostic information and no decision aid versus internals with diagnostic information and a decision aid, relating to perceived task complexity.

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	4.000	1	4.000	.883	.177
DA_AVAIL	4.000	1	4.000	.883	.177
Explained	4.000	1	4.000	.883	.177
Residual	154.000	34	4.529		

Panel C: Results of t-test for differences between externals with diagnostic information and no decision aid versus externals with diagnostic information and a decision aid, relating to perceived task complexity.

Group	N	Mean	S.D.	t-value	1-tailed sig.
No decision aid	14	6.428	1.869	1.88	0.0365
Decision aid	12	5.083	1.782		

Panel D: Results of ANOVA for differences between externals with diagnostic information and no decision aid versus externals with diagnostic information and a decision aid, relating to perceived task complexity.

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	11.693	1	11.693	3.493	.037
DA_AVAIL	11.693	1	11.693	3.493	.037
Explained	11.693	1	11.693	3.493	.037
Residual	80.345	24	3.348		

of 6.428) relative to externals in a diagnostic information setting with a decision aid (mean of 5.083, t-value = 1.88, p = .0365).

Panel D presents the results of the ANOVA relating to H5D ($F_{1,24} = 3.493$, p =

.037). The results indicate a weak effect for internals with diagnostic information and a decision aid (H5C) relative to externals in the same situation (H5D).

5.1.2.3 Hypothesis 6—Interaction of information type, decision aid availability, and locus of control: Hypothesis 6 consists of hypotheses H6A, H6B, H6C, and H6D.

H6A predicts that in mixed information situations characterized by the non-availability of a decision aid, perceived task complexity for internals will be lower than that for externals. H6B posits that in diagnostic information situations characterized by the non-availability of a decision aid, perceived task complexity for internals will be higher than that for externals.

H6C predicts that in mixed information situations characterized by the availability of a decision aid, perceived task complexity for internals will be lower than that for externals. H6D predicts that in diagnostic information situations characterized by the availability of a decision aid, perceived task complexity for internals will be lower than that for externals.

Table 17 presents the results of the t-tests relating to each of the four hypotheses. Panel A indicates a significant difference in the perceptions of task complexity of externals with mixed information and no decision aid (mean of 5.575) versus that of internals with mixed information and no decision aid (mean of 4.705, t -value = 1.35, p = .0925). H6A is thus supported.

Panel B reports a marginal difference in the perceptions of task complexity of externals with diagnostic information and no decision aid (mean of 6.428) versus internals with diagnostic information and no decision aid (mean of 6.000). The results

Table 17 (H6A to H6D)

Panel A: Results of t-test for differences between externals with mixed information and no decision aid versus internals with mixed information and no decision aid, relating to perceived task complexity.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Externals	20	5.575	1.969	1.35	0.0925
Internals	17	4.705	1.929		

Panel B: Results of t-test for differences between externals with diagnostic information and no decision aid versus internals with diagnostic information and no decision aid, relating to perceived task complexity.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Internals	18	6.000	2.301	-0.58	0.2825
Externals	14	6.428	1.869		

Panel C: Results of t-test for differences between externals with mixed information and a decision aid versus internals with mixed information and a decision aid, relating to perceived task complexity.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Externals	14	5.714	1.437	-0.11	0.457
Internals	18	5.777	1.865		

Panel D: Results of t-test for differences between externals with diagnostic information and a decision aid versus internals with diagnostic information and a decision aid, relating to perceived task complexity.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Externals	12	5.083	1.782	-0.36	0.3595
Internals	18	5.333	1.94		

are not in the predicted direction. However, they are not statistically significant (t-value = -0.58, $p = .2825$). H6B is, therefore, not supported.

In Panel C, the mean perceived task complexity of externals with mixed information and a decision aid is reported as 5.714, while that of internals with mixed information and a decision aid is 5.777. Again, while the results are not in the

hypothesized direction, they are statistically non-significant (t-value = $-.11$, $p = .457$).

H6C is not supported.

Panel D indicates that in a diagnostic setting, perceived task complexity for internals with a decision aid was actually marginally higher than that for externals with a decision aid (means of 5.333 and 5.083 respectively). The results are not statistically significant (t-value = $-.36$, $p = .3595$). H6D is also not supported.

5.1.3 Decision accuracy

5.1.3.1 Hypothesis 7—Locus of control and decision accuracy: Hypothesis 7 consists of three hypotheses: H7A, H7B, and H7C.

H7A posits that internals will display greater decision accuracy relative to externals. H7B predicts that internals will display greater decision accuracy relative to externals, controlling for information type. H7C predicts that internals will display greater decision accuracy relative to externals, controlling for decision aid availability. Table 18 reports the results of the analyses relating to these hypotheses.

Panel A of Table 18 indicates that internals had a slightly higher going concern probability estimate (66.071%) compared to externals (65.614%). Although the results are not in the hypothesized direction, they are non-significant (t-value = -0.15 , $p = .441$).

Panels B and C report the results of the tests for H7B (differences in decision accuracy between internals and externals on controlling for information type). Panel B indicates that internals with mixed information were more accurate than externals with mixed information with respect to their going concern estimates (66.911% versus 68.333%, t-value = 0.36 , $p = .3585$).

Table 18 (H7A to H7C)

Panel A: Results of t-test for differences between externals versus internals relating to decision accuracy.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Externals	57	65.614	15.898	-0.15	0.441
Internals	70	66.071	18.629		

Panel B: Results of t-test for differences between externals with mixed information versus internals with mixed information, relating to decision accuracy.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Externals	33	68.333	12.542	0.36	0.3585
Internals	34	66.911	18.91		

Panel C: Results of t-test for differences between externals with diagnostic information versus internals with diagnostic information, relating to decision accuracy.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Externals	24	61.875	19.27	-0.68	0.25
Internals	36	65.277	18.591		

Panel D: Results of t-test for differences between externals with a decision aid versus internals with a decision aid, relating to decision accuracy.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Externals	23	65.217	15.917	-0.47	0.319
Internals	35	67.285	16.775		

Panel E: Results of t-test for differences between externals with no decision aid versus internals with no decision aid, relating to decision accuracy.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Externals	34	65.882	16.118	0.23	0.409
Internals	35	64.857	20.49		

Panel C, Table 18, indicates that internals provided with diagnostic information attained lower decision accuracy (mean probability estimate of 65.277%) relative to externals with diagnostic information (mean of 61.875%). This finding, however, is not

statistically significant at conventional levels of significance (t -value = -0.68, p = .2500). While the results reported in Panel B are in the hypothesized direction, those in Panel C are not. None of the results, however, is significant statistically. Taken together, these results do not provide support to H7B.

Panels D and E present the results of the test for H7C (decision accuracy of internals versus externals when controlling for decision aid availability). Panel D indicates that internals with a decision aid had slightly higher going concern probability estimates than externals with the aid (means of 67.285% and 65.217% respectively, t -value = -0.47, p = .319). This result, while not statistically significant, is not in the expected direction. Panel E indicates that the mean going concern probability estimates of externals without a decision aid (65.882%) are slightly higher than internals in the same treatment condition (64.857%). The results of this test are similarly non-significant (t -value = 0.23, p = .409). H7C is thus also not supported.

5.1.3.2 Hypothesis 8—Mixed information, locus of control, and decision accuracy:

H8 is a composite of hypotheses H8A and H8B.

H8A predicts that decision accuracy for externals will be affected more by mixed information than decision accuracy for internals. H8B predicts that decision accuracy will be affected less by information type in the presence of a decision aid. Table 19 presents the results of the tests of these hypotheses.

Panels A and B of Table 19 report on the analysis related to hypothesis H8A. Panel A indicates that internals with diagnostic information are slightly more accurate than internals with mixed information (mean probability estimates of 65.277% and

Table 19 (H8A and H8B)

Panel A: Results of t-test for differences between internals with diagnostic information versus internals with mixed information, relating to decision accuracy.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Mixed	34	66.911	18.91	0.36	0.3585
Diagnostic	36	65.277	18.591		

Panel B: Results of t-test for differences between externals with diagnostic information versus externals with mixed information, relating to decision accuracy.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Mixed	33	68.333	12.542	1.44	0.08
Diagnostic	24	61.875	19.27		

Panel C: Results of t-test for differences between subjects with diagnostic information and a decision aid versus subjects with mixed information and a decision aid, relating to decision accuracy.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Mixed	30	66.166	16.172	-0.14	0.4435
Diagnostic	28	66.785	16.789		

Panel D: Results of t-test for differences between subjects with diagnostic information and no decision aid versus subjects with mixed information and no decision aid, relating to decision accuracy.

Group	N	Mean	S.D.	t-value	1-tailed sig.
Mixed	37	68.783	15.96	1.66	0.051
Diagnostic	32	61.406	20.29		

66.911% respectively). However, the results are not significant (t-value =0.36, p = .3585).

Panel B, Table 19 suggests that externals with diagnostic information are significantly more accurate than externals with mixed information (mean probability estimates of 61.875% and 68.333% respectively, t-value = 1.44, p = .08). The results indicate that the decrease in decision accuracy for externals (going from the diagnostic to

the mixed information condition) is greater than that for internals. H8A is thus supported.

Panels C and D of Table 19 relate to hypothesis H8B. Subjects with diagnostic information and a decision aid versus those with mixed information and a decision aid exhibit negligible differences in decision accuracy (Panel C, mean probability estimates of 66.785% and 66.166% respectively, t -value = -0.14, p = .4435). Panel D, however, indicates a significant difference in the decision accuracy of subjects with diagnostic information and no decision aid (mean probability estimate 61.406%) relative to those with mixed information and no decision aid (mean probability estimate 68.783%, t -value = 1.66, p = .051). These results indicate that reductions in decision accuracy stemming from the evaluation of mixed cues (in contrast to diagnostic cues) may be mitigated by the use of a decision aid. Like H8A, therefore, H8B is supported.

5.1.3.3 Hypothesis 9—Interaction of information type, decision aid availability, and locus of control: Hypothesis 9 is composed of H9A and H9B.

H9A predicts that in mixed information settings, improvements in accuracy with a decision aid (versus without) are greater for internals than externals. H9B posits that in diagnostic information settings, decreases in accuracy with a decision aid (versus without) are greater for internals than externals. Table 20 presents the related results.

Panel A indicates that for the mixed information condition, internals provided with a decision aid attained a mean improvement in their going concern probability estimates of 5.554% (relative to the non-use of a decision aid). In contrast, externals in the mixed information condition who were provided with a decision aid improved their

probability estimates by 1.538% relative to those who did not have the use of the decision aid.

Table 20 (H9A and H9B)

Panel A: Improvement in accuracy of the mean probability estimates of internals vs. externals due to decision aid use (mixed information subjects only)

	Internals	Externals
No decision aid	68.823	68.75
Decision aid	65	67.692
Improvement in accuracy (absolute)	3.823	1.058
Improvement in accuracy (percentage)	5.554	1.538

Panel B: Reduction in accuracy of the mean probability estimates of internals vs. externals due to decision aid use (diagnostic information subjects only)

	Internals	Externals
No decision aid	61.111	61.785
Decision aid	69.444	62
Reduction in accuracy (absolute)	8.333	0.215
Reduction in accuracy (percentage)	13.635	0.347

Panel B reports the corresponding results for the diagnostic information condition.

The decrease in decision accuracy for internals who used the decision aid (relative to those who did not) is 13.635%. In contrast, the decrease in decision accuracy for externals using the decision aid (in the diagnostic information situation) is only 0.347%. H9A and H9B therefore are supported.

The results of the tests of hypotheses presented above are summarized in Table 21 for convenience.

Table 21

Summary of results of tests of hypotheses

Sr. #	Hypo. #	Description	See tbl. # in text	Results		
				In hypzd. direction?	Signif.?	Overall, supprtd.?
1	H1	Internals perceive higher information relevance (IR) than externals	4 to 8	Y	Y	Y
2	H2A	IR with mixed information (MI) and a decision aid (DA) is lower than IR with MI, no DA	9	Y	N	N
3	H2B	IR with MI, DA is lower than IR with MI, no DA, controlling for locus of control (LOC)	10	Y	Partly	Partly
4	H3A	IR in MI settings is greater than IR in diagnostic information (DI) settings	11	Y	N	N
5	H3B	IR in MI settings is greater than IR in DI settings, controlling for LOC	12	Partly	N	N
6	H3C	IR in MI settings is greater than IR in DI settings, controlling for DA availability	13	Partly	N	N
7	H4A	TC for internals with DI is greater than TC for externals with DI	14	N	N	N
8	H4B	TC for internals with MI is lower than TC for externals with MI	14	Y	N	N
9	H5A	DAs increase TC for internals in MI settings (strong effect)	15	Y	Y	Y
10	H5B	DAs increase TC for externals in MI settings (weak effect)	15	Y	N	Partly
11	H5C	DAs decrease TC for internals in DI settings (weak effect)	16	Y	N	Partly
12	H5D	DAs decrease TC for externals in DI settings (strong effect)	16	Y	Y	Y
13	H6A	TC for internals with MI and no DA is lower than TC for externals with MI, no DA	17	Y	Y	Y
14	H6B	TC for internals with DI and no DA is higher than TC for externals with DI, no DA	17	N	N	N
15	H6C	TC for internals with MI and DA is lower than TC for externals with MI, DA	17	N	N	N
16	H6D	TC for internals with DI and DA is lower than TC for externals with DI, DA	17	N	N	N
17	H7A	Internals display greater decision accuracy (DAcc) than externals	18	N	N	N
18	H7B	Internals display greater DAcc than externals, controlling for information type (IT)	18	Partly	N	N
19	H7C	Internals display greater DAcc than externals, controlling for DA availability	18	N	N	N

Sr. #	Hypo. #	Description	See tbl. # in text	Results		
				In hypzd. direction?	Signif.?	Overall, supprtd.?
Table 21 (continued) Summary of results of tests of hypotheses						
20	H8A	DAcc for externals affected more by MI than Dacc for internals	19	Y	-	Y
21	H8B	DAcc affected less by IT in the presence of a DA	19	Y	-	Y
22	H9A	In MI settings, improvements in DAcc with a DA are greater for internals than externals	20	Y	-	Y
23	H9B	In DI settings, reductions in DAcc with a DA are greater for internals than externals	20	Y	-	Y

5.2 Discussion of the results

The primary objective of the study was to examine the influence of the decision maker's locus of control on the going concern assessment decision. Secondary objectives involved investigating whether the existence of nondiagnostic information affects auditor decision behaviour in this task to cause the dilution effect; whether a decision aid can help mitigate the effects (if any) of irrelevant information; and whether audit decision makers are differentially influenced by irrelevant information and decision aids depending on their loci of control. The results of the study hold implications for audit decision making, particularly in view of the continuing proliferation of information that decision makers (including auditors) have to contend with as a result of the revolution in information technology.

The results of the analysis provide mixed support for the hypotheses of the study. Prior research on differences between individuals with an internal locus of control and those with an external locus of control have consistently observed that they exhibited different decision behaviours. However, such differences have not been studied

previously in an audit task situation. One of the observed differences reported in the literature relates to information relevance, with internals perceiving more of the information cues as relevant as a result of their tendency to make more extensive information searches. This effect was predicted (Hypothesis 1) for decision makers engaged in a complex audit judgement task. The results indicate clear differences between externals and internals with respect to their perceptions of information relevance — as hypothesized, internals perceive a higher level of information relevance than externals. This result holds when controlling for decision aid availability and also when controlling for information type.

This finding has implications for audit firms, faced with the potential prospect of making the going concern assessment on every audit engagement. Whether perceptions of information relevance are intrinsic to relatively large data sets containing a mixture of both diagnostic and mixed information becomes an important question in view of this finding. The results related to this question (Hypothesis 3) indicate that this does not appear to be the case. Hypothesis 3 posited that perceptions of information relevance would be higher in mixed information settings relative to diagnostic information settings. This effect was hypothesized to be observed even when controlling for decision aid availability and locus of control. Although this effect was predicted, it was recognized that the complexity of the problem would not render such an effect entirely unambiguous. For instance, while perceived information relevance may be expected to increase in a mixed information environment, it would also be equally reasonable to expect some or all of the subjects to switch to a heuristic in order to reduce cognitive effort, thus reducing

perceived information relevance. This effect may have come into play in this case, since subjects with mixed information generally did not perceive the given information to be more relevant than those given only diagnostic information.

The lack of significant differences relating to perceived information relevance between subjects with mixed information and those with diagnostic information may be related to the non-significant results observed for Hypothesis 2A, which predicted that a decision aid would mitigate perceived information relevance for subjects with mixed information. The prediction that this effect would hold on controlling for the decision maker's locus of control also seems to be only partially supported. While the results do not lend support to Hypothesis 2, they suggest that decision aids have a two-way impact on perceived information relevance depending on decision strategy. This is possible because, although decision aids may reduce information relevance if the subject is using a normative strategy, they may increase perceptions of relevance if the subject has already switched to a heuristic decision strategy. In the mixed information setting, although the decision aid was expected to decrease perceived relevance, it could increase perceived relevance if subjects were using a heuristic (especially if they were internals). This seems to be borne out by the results, which suggest that the effect of decision aids on perceptions of information relevance is a complex area of investigation.

The lack of significant differences between subjects with mixed information and subjects with diagnostic information extends to subject's perceptions of task complexity as well. Hypothesis 4 predicted a difference between internals and externals in their perceptions of task complexity depending on whether they were in a diagnostic or mixed

information environment. Part of the results are in the hypothesized direction, although they are not significant. This finding again points to the complexity of the area of investigation, and the relative difficulty in obtaining any clear-cut answers.

The ability of a decision aid to influence perceptions of task complexity was also examined. Hypothesis 5 predicted that a decision aid would increase task complexity in mixed information settings and decrease it in diagnostic information settings. Although the same effect was predicted for both internals as well as externals, the relative strength of the effect was hypothesized to be different. The effect for internals was posited to be stronger than that for externals in a mixed information setting, and was posited to be weaker than that for externals in a diagnostic setting. Despite the complex nature of the interaction between locus of control and decision aid availability, the results support this hypothesis to an extent. This finding has implications for the use of decision aids in auditing contexts.

Hypothesis 6 examines a complex issue: the interaction of information type, decision aid availability, and locus of control, and its effect on the going concern assessment task. The background for this hypothesis was derived from the literature, which suggests that decision strategy selection depends on the features of the decision task, as well as the individual characteristics of the decision maker. Although largely not supported, the predicted effect of mixed information and no decision aid availability on internals and externals was observed. Lack of results supporting other facets of this hypothesis may again be attributed to the ambiguous and complex nature of the decision making process.

The non-significant nature of the results pertaining to Hypothesis 7, which posited the influence of the decision maker's locus of control on decision accuracy also, points to the complex nature of the going concern task in auditing. Although the literature indicates the superior information processing abilities of internals relative to externals, this effect was not clearly observed from the results. This may be due, again, to the complex nature of decision making in going concern assessment. It may also point to the influence of other probable factors such as training and experience on the task, which would serve to make the innate information processing differences between internals and externals much less pronounced.

Hypothesis 8 addresses the dilution effect, examining whether it exists in an auditing context. In contrast to previous studies on the dilution effect, this study posits an interaction between locus of control and nondiagnostic information. Externals are hypothesized to be more susceptible to the dilution effect than internals. The hypothesis also addresses the ability of a decision aid to mitigate the dilution effect. The results indicate a dilution effect that is more pronounced for externals. Decision aid availability is also observed to reduce dilution. These findings have implications for recruitment decisions as well as investment decisions relating to decision aids in audit firms.

Differences in the cognitive processes of internals and externals are indicated again by the results pertaining to Hypothesis 9, which posits a complex interaction among information type, decision aid availability, and locus of control on decision accuracy. The predicted relationships are supported by the results. Like Hypothesis 8, this hypothesis too has implications for audit firms' staffing and investment decisions.

The results thus far seem to indicate that the decision making process related to the auditing task of making a going concern assessment is a complex one involving the interplay of several factors. The nature of the information that the decision maker evaluates as well as access to a decision aid influence the decision process significantly, but their influence is not always well-defined. This suggests that individual personality factors such as the decision maker's locus of control also play an important role in the decision process.

Chapter VI

Conclusions

6.0 Overview

The following sections present the conclusions of the study, its limitations, as well as suggestions for future research. Previous studies on the influence of nondiagnostic information on auditor judgement and decision making [e.g., Hackenbrack (1992), Shelton (1994)] have reported inconsistent results. A probable reason for this may be their examination of only environmental variables, to the exclusion of individual personality variables. This study therefore examined the dilution effect in the context of two environmental variables (information type and decision aid availability) as well as an individual personality variable (locus of control). The theoretical framework supporting the analysis was derived from the integration of the Newell and Simon (1972) theory of problem solving as well as the effort-accuracy theory of contingent information strategy selection (Beach and Mitchell, 1978). Nine hypotheses were developed on the basis of this theoretical framework.

6.1 Conclusions of the study

As a consequence of the fact that this study represented a preliminary investigation into a complex phenomenon—the influence of locus of control on auditor judgement—its nature was largely exploratory. It was also constrained by the relatively limited number of subjects. Despite this, some noteworthy results do emerge, permitting the drawing of some firm conclusions that may guide further research.

Auditors have to process broad sets of information in carrying out complex

decision tasks. Audit firms also use decision aids extensively to support their reporting decisions. These features of the audit environment were incorporated in the research design, along with an individual personality variable, locus of control. Despite the simplicity of the research design, as well as the preliminary nature of the study, the findings clearly indicate the complex nature of the going concern assessment task. Among other things, the results also have implications for decisions made by audit firms relating to staffing, and the development of decision aids.

The dilution effect has been frequently observed in non-auditing contexts (e.g., Castellan, 1973; Troutman and Shanteau, 1977; Nisbett, Zukier, and Lemley, 1981; Gaeth and Shanteau, 1984), but only inconsistently for auditing tasks (Hackenbrack, 1992; Shelton, 1994). Since the effect of dilution has been to reduce decision performance, the possibility of its occurrence in auditing tasks such as going concern evaluation is cause for concern. This study found clear evidence of dilution (i.e., loss of decision accuracy) when irrelevant information was provided to subjects in addition to relevant information, and subjects did not have access to a decision aid (Panel D, Table 19). Thus, despite their training, auditors are susceptible to the effects of nondiagnostic information. This finding serves to diminish the inconsistency associated with findings relating to the effect of nondiagnostic information on decision making in auditing contexts.

The findings of the study suggest that decision aids could have an important influence on auditor decision making depending on the nature of the informational cues being assessed. Where the evidence being assessed is voluminous and likely to contain a mixture of diagnostic and nondiagnostic information, using a decision aid may not result

in making the decision maker better off, but will, in all probability, not make him/her worse off than if he/she were assessing only diagnostic cues. In the diagnostic-only information environment, however, a decision aid does not seem to lead to as high a level of decision performance as the auditor's unaided judgement does. This finding suggests that the auditor's professional judgement is a crucial factor in decision making, and that decision aids are only effective if used to supplement, and not supplant, this factor. This finding may explain the inconsistent results observed by Kachelmeier and Messier (1990) and Ashton (1990), who found that decision aids may have both positive and negative effects.

The study also suggests that even if the influence of irrelevant information on decision making may not be unequivocally mitigated by the use of a decision aid, decision aids may help in achieving decision consensus by focusing decision makers' attention towards various aspects of the decision problem. Previous research in audit judgement and decision making has used judgement consensus most frequently as an indicator of judgement performance¹⁰. The results of this study suggest that, by that yardstick, decision aids do lead to better decision performance. For audit firms, this alone would justify the expenditure on decision aid development — a consensus opinion would stand up to greater scrutiny in court than one made without consensus. However, whether decision aids actually do lead to greater decision accuracy is still a matter of debate, and the results of this study are in conformity with the inconsistent findings reported in prior

¹⁰ For an overview of audit judgement studies using consensus as an evaluation criterion, see Solomon and Shields (1995).

studies.

This study introduced a personality variable, locus of control, into the investigation of the influence of irrelevant information on audit judgement and decision making. Individuals with an internal locus of control were found to perform stronger information searches, consequently perceiving the information provided as more relevant relative to those with an external locus of control. In this respect, this study is consistent with the prior research, carried out mainly in non-audit studies (e.g., Davis and Phares, 1967; Phares, 1968; Lefcourt and Wine, 1969). In respect of decision accuracy, while internals were not observed to be significantly better decision makers than externals overall, it was found that the decision accuracy of externals was affected more seriously by nondiagnostic information than it was for internals. Internals with mixed information performed better than externals with mixed information. The study thus makes a significant contribution to the extant literature by extending to an auditing context an examination of the relationship between locus of control and cognitive information processing. The findings related to the interaction effect of locus of control and information type represent another significant contribution that this study makes to the existing literature.

The findings of the study related to the interaction between locus of control and decision aid availability hold implications for recruiting in audit firms, which typically rely on decision aids to a large extent (Bailey et al., 1987). Internals also appeared to be more affected than externals by decision aid availability. In the mixed information setting, internals used the decision aid to greater advantage than externals. In the

diagnostic information setting, on the other hand, internals evidenced a greater loss of decision accuracy than externals. This suggests, once again, that the stronger information processing of internals leads them to exercise audit judgement in a more effective way than externals. The use of a decision aid only serves to hamper the exercise of professional judgement for internals, resulting in reduced decision performance. However, considering that internals benefit more from decision aids than externals in mixed information situations, for firms with an emphasis on the use of decision aids, recruiting personnel with an internal locus of control could result in a significant difference to decision making (since auditors typically have to deal with broad data sets).

6.2 Limitations of the study

The study is characterized by the following limitations. First, some limitations arise from practical difficulties associated with any study seeking to enlist practitioners as subjects. The severe time constraints under which practitioners typically function render such an endeavour quite problematical. For example, a measure of control over the experiment may have been sacrificed in exchange for auditor participation by handing the cases for distribution and subsequent collection to a contact person in each firm. Another consequence of the low level of practitioner participation was the amalgamation of different datasets relating to students and practitioners (although, as stated above, a majority of the students did possess actual auditing experience). The study sought to reduce any potentially negative effects of these constraints to a minimum by (1) clearly specifying that the task was to be carried out on an individual basis, and (2) by testing the datasets for systematic differences between them.

Second, although subjects provided with the decision aid were expressly instructed to make use of it, there were no means to ensure that they actually used it in arriving at their probability estimates. Examination of the material returned by these subjects did indicate, however, that on the average, about 80 percent of the subjects did utilize the decision aid (as evidenced by the check marks made). Despite this, the extent of the decision aid's influence cannot be measured precisely.

Third, based on the accuracy-effort framework, the study assumes that decision makers faced with mixed information will find the decision task to be more complex than if they were faced only with diagnostic information, and would resort to a heuristic in such cases. In turn, this assumes that diagnostic information would not readily lead to the use of a heuristic. However, since different individuals may be expected to possess different thresholds for complexity tolerance, some individuals could conceivably switch to an intuitive strategy even when provided only with diagnostic information. Unfortunately, the use of an intuitive versus a normative strategy could not be controlled for in this study, but could only be inferred indirectly from the results.

Fourth, a between-subjects design was used (as opposed to a repeated measures within-subjects design). While a within-subjects design would have been ideal, a between-subjects design was used primarily to eliminate the demand effect bias (see Schepanski et al., 1992).

6.3 Suggestions for future research

Future research could investigate the possible influence of work experience as a factor affecting judgment processes. Familiarity with decision situations in the workplace

may possibly impart to decision makers the ability to diagnose the complexity of the situation, thereby leading to the choice of appropriate decision strategies. In audit judgment research, although experience (both in terms of number of years, as well as familiarity with different industries) is known to have an important influence on auditor judgment (cf. Bédard, 1989; Bonner, 1990), little is known of how experience interacts with decision aid availability in complex tasks such as a going concern assessment, particularly in the context of the presence of mixed information sets containing both diagnostic and nondiagnostic information. Incorporating experience as an explanatory variable in further research studies could lead to the acquisition of greater insights into the auditor's decision making processes.

This study used a decomposition type decision aid to examine whether a decision aid could mitigate the dilution effect. Results obtained were not clearly conclusive. A few studies (e.g., Davis, 1992) have found that decomposition-and-aggregation type decision aids help enhance decision performance to a greater extent than decomposition aids. Future research could address the issue of the mitigation of the dilution effect using decision aids that would assist the decision maker not only in breaking the decision task into smaller components, but also aggregating the evidence to form a judgement using structured decision rules.

While locus of control was found to influence the judgement process overall, whether it influences audit judgement in contexts characterized by the existence of irrelevant information was not unambiguously evident. Further research is necessary to understand how the decision maker's locus of control affects the judgement process.

Auditors typically have to function within severe time constraints, and are also accountable for their decisions. Future research studies could examine the effect of locus of control in relation to these two characteristics of audit environments by incorporating them into the research design.

Culture plays an important role in the workplace¹¹. Although the study was conducted in Montreal, which is culturally and ethnically diverse, the study did not measure ethnicity. Future research could examine whether there are systematic differences in subjects' going concern probability estimates or perceptions of task complexity and information relevance based on their ethnic backgrounds. The results obtained would throw some light on the influence, if any, of culture on auditor judgement and decision making.

Further studies could also investigate whether any systematic differences in decision making behaviour (in the context of irrelevant information) exist between auditors in small firms versus large firms, and between firms that use a structured approach to decision making using decision aids heavily, versus those that use an unstructured approach with minimal reliance on decision aids. The studies could be extended to examine how the decision maker's locus of control interacts with these variables to affect auditor judgement and decision making.

¹¹ See Hofstede (1983, 1984) for examples of how culture can affect people's behaviour at work.

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Appendix 1
Introductory letter to public accounting firms

Department of Accountancy

(Contact Person)
(Audit Firm)
Montreal, Quebec

Dear (Contact Person):

We would like to invite the participation of practising auditors from your firm, possessing at least five years' auditing experience, in a research study on audit judgement and decision making. The study forms part of the dissertation of Mr. Anamitra Shome, who is a doctoral student at Concordia University specializing in Accountancy. Mr. Shome is being supervised by Dr. George Kanaan.

Why should this interest you? First, from your experience of public accounting, you would agree that individual judgement plays an important role in the auditing function, especially for the more complex tasks. However, our current state of knowledge of what judgement factors lead to optimal auditor decision performance is still fairly rudimentary. Do individual characteristics influence decision making? Can a decision aid help improve decision performance? Does task complexity affect decision performance? We are still far from having definitive answers to these questions, despite their importance.

Second, going concern assessment may become mandatory on every audit engagement in light of the recent CICA Exposure Draft titled "Auditor's Responsibility to Evaluate the Going Concern Assumption" (September 1995). Since our study examines decision making in the context of going concern assessment, it is expected to lead to findings that could have much relevance for the optimal performance of this task.

We would request you, therefore, to support research on an area of great significance to auditing practitioners by engaging to participate, along with your colleagues. Since the study can only arrive at meaningful results if a sufficiently large number of people take part, your participation and that of other people within your firm will contribute immeasurably. Summarized results will be made available to participating firms.

The attached pages contain further details about the study, as well as how you can reach us to indicate your interest in participation. You may obtain even more details from our Web site at <http://alcor.concordia.ca/~ashome/>. Please note that the research material is available equally in both French and English.

Please do not hesitate to call either of us to discuss this further. We are looking forward most eagerly to your participation.

Thank you.
Yours very sincerely

George Kanaan, Ph.D.
Actg. Chair, Dept. of Accountancy

Anamitra Shome
Doctoral Candidate (Accountancy)

Further Information:

What is the research about?

The research focuses on judgement and decision making in auditing. We attempt to study whether auditors' decision making in an unstructured task situation (assessing a company's going concern ability) is affected by factors relating to the audit task, and by individual personality traits.

Why are we asking for your participation?

Obviously, a research study on audit judgement and decision making can only be useful if it studies the decision making of actual auditors! Hence our invitation to you to participate!

How do you qualify to take part?

If you are a practising public accountant with at least five years of auditing experience and are at a senior level (e.g., manager or partner), you would be an ideal candidate!

What does participation involve?

You will be asked to perform a decision task. A case from among a set of cases will be randomly assigned to you. The case will have information on a client firm. This will include background information, financial statements, as well as excerpts from the working papers of an audit senior who audited the client firm. You will be asked to assume that you are the partner in overall charge of the audit engagement. The decision task would be for you to judge, on the basis of the given information, the probability that the firm in the case will continue as a going concern for a period of one year from its latest financial statements. You will also be asked to respond to a questionnaire on individual personality characteristics to determine whether personality variables affect audit judgement.

How much time will this take?

The task is likely to take from 30 minutes to 1 hour, all told.

Is there one “right” answer to the questions in the questionnaire?

There are absolutely no “Right” or “Wrong” answers. This is not a test of accuracy or predictive ability. The questionnaire simply calls for your perceptions relating to the company described in the case, or to attitudes to life in general. As such, participants need not worry about not giving a “right” answer— there simply isn't one!

Is the questionnaire available in French?

Yes, the questionnaire is equally available in English and French.

What about confidentiality?

Full confidentiality is assured. You will not be required to indicate your name or the name of your firm anywhere on the material. Your responses will be aggregated with those of

other participants and only summarized information will be presented in any reports relating to the research. We are quite prepared to discuss further measures, if you so wish, to assure you that anonymity and confidentiality are guaranteed.

How many participants do we need for the study?

For statistical validity, the participation of almost 200 persons is required.

How exactly do you go about participating in the study?

To let us know if you or other persons in your firm are interested in contributing to the research study, please contact us immediately through either of the following ways:

How to reach us:

	Dr. G. Kanaan	Mr. A. Shome
Address	Dept. of Accountancy Concordia University 1455 de Maisonneuve Blvd. West Montreal, Quebec H3G 1M8	
Telephone	(514) 848-2765	(514) 848-2738
Fax	(514) 848-8645	(514) 849-1524
E-mail	georgek@vax2.concordia.ca	ashome@vax2.concordia.ca

Once we hear from you, we will be delighted to discuss how best we could arrange for your participation. Normally, we would visit your firm with the case materials for participants. If, however, members of your firm would like to complete the case study at Concordia University, we could make the necessary arrangements if you let us know sufficiently in advance.

For further particulars, please visit our web site:

<http://alcor.concordia.ca/~ashome/>

Thank you for your interest!
We look forward to your participation!

Appendix 2

BASIC CASE: DIAGNOSTIC INFORMATION ONLY, NO DECISION AID (GROUP D1)

Audit Judgement Study General Information

This study is an investigation of judgement and decision making in auditing. As part of the study, several cases describing hypothetical client firms have been constructed. Each of these cases is mutually independent of the others, and the client firm described in each case is different. Your firm has been randomly assigned one case from among these cases.

The information package provided to you is divided into three sections as follows:

Section 1 comprises background information on the client firm. Following this information, the next few pages present audited financial statements of the last two years and the current year. This section also contains excerpts from the current year's audit work papers relating to the client firm.

Section 2 contains specific directions. Among other things, you will be asked to indicate your assessment of the probability of the client firm continuing as a going concern based on the information provided.

Section 3 comprises a questionnaire that seeks to identify and examine some individual factors that could affect auditor decision making. The questionnaire contains a number of statements. Each represents a commonly held opinion, and *there are no right or wrong answers*. You will probably disagree with some items and agree with others. We are interested in the extent to which you agree or disagree with such matters of opinion. Please respond to the statements as frankly as possible. Please note that since you are not required to identify yourself by name, responses to this questionnaire will be anonymous. *Full confidentiality is guaranteed.*

This study has to be completed on an individual basis. Therefore, please do not discuss it with other participants. You may work at your own pace, write on the materials, and refer to the instructions at any time. *Please note that your participation in this study is purely voluntary.* Once you have completed the entire exercise, please return the case materials to the person responsible for their collection.

Please record your **starting** time here:

Please record your **finishing** time here:

Thank you very much for your participation!

SECTION 1

HISTORY AND BACKGROUND OF RAND HOSPITALITY, INC.

Rand Hospitality, Inc., was incorporated in November, 1975, as Rand Equities, Inc., to own and manage a small pool of hotels and apartments. Between 1977 and 1980, Rand's revenues grew by over 400%, and the company changed its name to Rand Hospitality, Inc., to reflect its emphasis on hotels and motels. After a brief slump in the late-1970s, Rand began a period of sustained growth in 1983. Between 1983 and 1996, its revenues and earnings per share increased in every single year. Through the end of its 1996 fiscal year, Rand's quarterly earnings had increased in 47 of 48 consecutive quarters. Its common stock was one of the top 100 performers of the early 1990s, increasing by over 13 times.

Before 1991, Rand was primarily a franchisee, operating many of its inns under franchise agreements with well-known hotel chains. In 1991, Rand embarked on an aggressive acquisition program, financed primarily through long-term debt. In August of 1991 it acquired Comfort Motor Inns, Inc. In November, 1992, it acquired the Great Eastern Lodging chain, including 125 company-owned inns, 375 franchised inns, and 199 franchised restaurants, for \$235 million. To finance these and other acquisitions, Rand borrowed over \$300 million, pushing its debt-to-equity ratio from 0.87 in 1991 to 1.68 in 1993. The acquisition of Great Eastern began a transformation of Rand from a hotel franchisee to a franchisor.

In 1993, Rand moved to consolidate its growth and pay down its debt by selling off inns that either did not fit its operating strategy or that could be sold to investors who would retain Rand to operate the facilities. For example, in November, 1993, Rand sold eight Great Eastern hotels located across Canada for approximately \$92 million, but entered into a long-term agreement to continue to manage these inns under the Great Eastern name. By mid-1994, it had sold over two-thirds of the company-owned inns obtained in the Great Eastern acquisition, more than recouping the cost of purchasing the entire chain. Franchise fees, based on a percentage of gross room sales, continued to roll in from over 370 Great Eastern franchisees.

Another source of cash for Rand is through the establishment and marketing of limited partnerships. In a typical limited partnership, Rand sells 99% of its ownership interest in a set of hotel properties to investors in \$5,000 units. Rand serves as the sole general partner, retaining a 1% interest in each property, and continues to operate the hotels. The investors receive returns that are partially tax-sheltered by accelerated depreciation on the properties, and have the

opportunity to receive significant gains on the potential appreciation of the property values. In December of 1993, Rand completed a limited partnership offering consisting of twelve Vacationland Motel franchises, earning \$80 million more than its net cost of acquiring these properties in 1992. In 1994 another limited partnership consisting of 16 hotels was sold for \$124 million.

EXHIBIT 1
Rand Hospitality, Inc. and Subsidiaries
Consolidated Balance Sheets As of June 30, 1996 and 1995
(In Millions of Dollars)

	1996	1995
ASSETS		
Current assets		
Cash	\$ 34.9	\$ 108.2
Marketable securities	5.2	32.9
Accounts receivable	64.8	56.0
Current portion of mortgages and notes receivable	128.2	17.4
Other current assets	<u>37.0</u>	<u>38.6</u>
Total current assets	270.0	253.1
Noncurrent investments		
Property, equipment and leasehold improvements	150.1	164.3
Property held for sale	85.4	14.3
Mortgages and notes receivable, net of current portion	464.8	305.0
Franchise system	38.0	39.0
Other assets	<u>92.9</u>	<u>64.9</u>
Total assets	<u>\$ 1,143.6</u>	<u>\$ 903.7</u>
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current Liabilities		
Notes payable	\$ 132.6	—
Current portion of long-term debt	11.1	\$ 11.9
Other current liabilities	<u>52.1</u>	<u>44.2</u>
Total current liabilities	\$ 195.8	\$ 56.1
Long-term debt, net of current portion		
6-5/8% convertible subordinated debentures due 2018	192.8	177.3
7% convertible subordinated debentures due 2020	115.0	115.0
Deferred income taxes	47.4	24.0
Deferred income	13.6	38.0
Other liabilities	<u>11.7</u>	<u>3.6</u>
Total liabilities	\$ 691.4	\$ 528.9
Stockholders' equity		
Common stock, par value \$.05 per share	1.7	1.7
Capital in excess of par value	308.3	304.9
Retained earnings	147.9	73.1
Net unrealized loss on noncurrent marketable equity securities	(2.6)	(2.4)
Treasury stock, at cost	<u>(3.1)</u>	<u>(2.4)</u>
Total stockholders' equity	<u>\$ 452.1</u>	<u>\$ 374.9</u>
Totals	<u>\$ 1,143.6</u>	<u>\$ 903.7</u>

EXHIBIT 2
Rand Hospitality, Inc. and Subsidiaries
Consolidated Statements of Income Years Ended June 30, 1996, 1995 and 1994
(In Millions of Dollars, Except Per Share Amounts)

	1996	1995	1994
REVENUES			
Lodging	\$ 213.4	\$ 192.0	\$ 154.6
Food and beverage	55.4	59.7	55.0
Franchise	25.8	25.4	23.3
Interest and dividend income	53.8	38.2	33.9
Other	<u>61.9</u>	<u>55.1</u>	<u>34.3</u>
Total revenues	\$ 410.3	\$ 370.4	\$ 301.1
COSTS AND EXPENSES			
Direct operating expenses			
Lodging	39.3	38.6	31.3
Food and beverage	44.2	45.8	42.4
Franchise	10.8	10.5	11.7
Other operating and general	142.3	130.8	99.5
Depreciation and amortization	11.6	12.4	12.3
Interest	<u>37.3</u>	<u>23.2</u>	<u>20.2</u>
Total costs and expenses	\$ 285.4	\$ 261.5	\$ 217.3
Income from continuing operations before income taxes	\$ 124.9	\$ 108.9	\$ 83.8
Provision for income taxes	<u>47.5</u>	<u>41.3</u>	<u>34.9</u>
Income from continuing operations	\$ 77.4	\$ 67.6	\$ 48.8
Income (loss) from discontinued operations, net of taxes	<u>—</u>	<u>(0.1)</u>	<u>3.3</u>
NET INCOME	<u>\$ 77.4</u>	<u>\$ 67.5</u>	<u>\$ 52.2</u>
INCOME PER COMMON SHARE			
Primary:			
Continuing operations	<u>\$2.35</u>	<u>\$2.05</u>	\$1.49
Discontinued operations			<u>0.10</u>
Net income	<u>\$2.35</u>	<u>\$2.05</u>	<u>\$1.59</u>
Fully diluted:			
Continuing operations	<u>\$2.26</u>	<u>\$2.01</u>	\$1.48
Discontinued operations			<u>0.09</u>
Net income	<u>\$2.26</u>	<u>\$2.01</u>	<u>\$1.57</u>

EXHIBIT 3
Rand Hospitality, Inc. and Subsidiaries
Consolidated Statements of Cash Flows Years Ended June 30, 1996, 1995 and 1994
(In Millions of Dollars)

	1996	1995	1994
Cash flows from operating activities			
Net income	\$ 77.4	\$ 67.5	\$ 52.2
Adjustments to reconcile net income to cash flows from operating activities:			
Depreciation and amortization	11.6	12.4	14.3
Net gains on property sales	(26.9)	(25.2)	(18.4)
Increase in notes receivable	(50.7)	(30.7)	(10.5)
Increase in accts. receivable	(9.2)	(16.1)	(1.5)
Decrease in deferred income	(19.1)	(12.0)	—
Other (combined)	<u>18.7</u>	<u>(33.1)</u>	<u>(23.8)</u>
Net cash provided by (used in) operating activities	\$ 1.8	\$ (37.5)	\$ 12.3
Cash flows from investing activities			
Payments received on mortgages and notes receivable	21.2	27.5	104.4
Purchases of mortgages and notes receivable	(179.8)	(42.5)	(11.0)
Cash proceeds from property transactions	31.3	9.6	195.8
Payments to acquire property	(170.0)	(51.5)	(69.7)
Proceeds from sale of marketable investment securities	48.8	4.2	—
Purchases of marketable investment securities	—	(17.2)	(35.5)
Net cash received from disposing of discontinued operations	—	17.9	—
Other (combined)	<u>(13.8)</u>	<u>(12.6)</u>	<u>(36.0)</u>
Net cash provided by (used in) investing activities	\$ (262.3)	\$ (64.5)	\$ 148.0
Cash flows from financing activities			
Proceeds from issuing long-term debt	222.5	195.5	72.6
Payment of long-term debt	(35.0)	(11.3)	(237.5)
Other (combined)	<u>(0.4)</u>	<u>(1.8)</u>	<u>1.8</u>
Net cash provided by (used in) financing activities	\$ 187.1	\$ 182.4	\$ (163.1)
Net increase (decrease) in cash	(73.3)	80.4	(2.8)
Cash balance at beginning of year	<u>108.2</u>	<u>27.8</u>	<u>30.6</u>
Cash balance at end of year	<u>\$ 34.9</u>	<u>\$ 108.2</u>	<u>\$ 27.8</u>

EXHIBIT 4
Rand Hospitality, Inc. and Subsidiaries
Excerpts from Notes to the 1996 financial statements

Note 6: Mortgages and notes receivable consist of the following:

\$ 74,235,000	Mortgage notes secured by a resort hotel, payable in instalments with final payment due on July 31, 2002.
85,032,000	Secured note receivable from a major Great Eastern franchisee, due on December 31, 2004.
74,366,000	Note receivable from Finest Hospitality, Inc., due June 30, 1997.
64,044,000	Note receivable from Maxico, Inc., due April 15, 2004.
<u>295,363,000</u>	Other notes receivable bearing interest at effective rates ranging from 7% to 15% maturing through 2026, and secured primarily by hotels.
\$593,040,000	Total
<u>128,239,000</u>	Current portion
<u>\$464,801,000</u>	Long-term portion

Note 9: Notes payable consists of a demand note that bears interest at the prime rate. This loan was issued to finance the loans to Finest and Maxico (see Note 6). The balance is secured by the notes receivable from Finest and Maxico, other mortgage notes receivable, and certain assets with an aggregate net book value of approximately \$275 million. The company expects to convert the demand note to a term note during 1997.

Note 10: Long-term debt consists of the following:

\$166,475,000	Mortgage notes and bonds due through 2017, primarily at variable rates; the weighted average interest rate at June 30, 1996, was 10.9%.
<u>37,453,000</u>	Other
\$203,928,000	Total
<u>11,100,000</u>	Current portion
<u>\$192,828,000</u>	Long-term portion

Long-term debt is secured by mortgage notes and certain other assets with an aggregate book value of approximately \$133 million and substantially all property, equipment and leasehold improvements owned by the company. The various mortgage bond and note agreements contain restrictive covenants which include, among other requirements, maintenance of certain levels of tangible net worth and certain ratios. The covenants also restrict aggregate annual payments by the company for cash dividends and acquisition of the company's outstanding capital stock. Long-term debt totalling \$24,259,000 matures in fiscal 1998, \$12,285,000 in fiscal 1999, and \$9,354,000 in fiscal 2000.

Excerpts from the 1996 Rand Hospitality Working Papers

Presented below is a memo taken from the 1996 audit work paper files of Rand Hospitality, Inc. The memo was prepared by Doug Beaubien, the in-charge senior, during the pre-field work phase of the audit. The work papers are simply a convenient format to present information about Rand Hospitality.

Rand Hospitality, Inc. Analysis of 1996 Financial Performance and Financial Position

Prepared by Doug Beaubien (in-charge senior)

Market Perspective

Rand's main strategy has been to sell off the hotels it develops, while retaining lucrative management contracts. Market conditions hitherto have been favourable towards such a strategy. However, this approach may not work as well in the future. Weak economic conditions currently prevailing could affect the hotel industry, particularly through investor concerns about a possible economic slump and an oversupply of rooms.

Results of Operations

Forty new franchisees were added in 1996, bringing the total up to 450 by June, 1996. In addition, Rand has entered into partnership agreements with eight developers to build over 250 additional Great Eastern properties between 1997 and 2002, including over 100 LuxuriSuites units. Management expects these new properties to be essentially self-financing, as they would be sold to investors while Rand retains management contracts. As a result, it is expected that Rand's revenue mix will shift toward contributions from managing, franchising and development of lodging properties, with a lower relative contribution from owned and leased facilities.

In August of 1995, Rand acquired Cornwall Group, owner and operator of 18 hotels under the names Cornwall Inn and Elegant Budget Inn, for approximately \$90 million. During 1996, Rand has completed further development of nine of these properties and has sold them for a total of \$54 million, while retaining contracts to manage the hotels under the Great Eastern name. Rand intends to develop and dispose of the other nine Cornwall hotels in a similar manner.

In April of 1996, Rand loaned \$74 million to Finest Hospitality, an unaffiliated company, at an interest rate equal to the prime rate plus one-half percent. These funds were used by Finest to acquire all of the common stock of Maxico, Inc., a hotel operator. The loan was secured by the

common stock of Maxico and Finest. Finest is expected to rapidly sell or refinance the Maxico properties and pay Rand a consulting fee of \$55 million. However, the Maxico transaction has not yet generated any cash for Rand.

SECTION 2

Specific Instructions

A.

You are the audit partner for this year's engagement. Based on your analysis of the preceding financial statements, background information, and working paper excerpts, what is your probability estimate that Rand Hospitality, Inc. will continue as a going concern?

Indicate your probability assessment by marking an X at the appropriate point along the scale below:

0	10	20	30	40	50	60	70	80	90	100
Certain Not to Continue										Certain to Continue

How confident are you in your response?

Mark an X on the scale below to indicate how confident you are about your probability estimate:

0	1	2	3	4	5	6	7	8	9	10
Not at all Confident										Completely Confident

How complex was the decision task you just completed?

Indicate how complex you feel the task was by marking an X on the scale below:

0	1	2	3	4	5	6	7	8	9	10
Not at all Complex										Extremely Complex

Was all of the information provided in the case relevant to the decision task?

Indicate your perception of the relevance of the information by marking an X on the scale below:

0	1	2	3	4	5	6	7	8	9	10
None of it was Relevant										All of it was Relevant

List the three most relevant items that helped you to make your decision (in decreasing order of importance):

List three items in the case that were least relevant to your decision.

B. Please explain in the space below why you chose the response you did for the going concern assessment (please use a separate sheet if necessary):

C. Please provide the following information:

1. Sex: Male Female

2. Your position in the firm (check one):

Partner Manager Senior Assistant Other (specify) _____

3. Length of your overall experience in auditing: _____ months

4. Do you possess specialized auditing experience pertaining to a specific industry? Yes
No

If yes, please specify the industry _____ Length of experience _____ months

5. Please mark an X below to indicate your experience in evaluating the going concern status of a firm:

0 1 2 3 4 5 6 7 8 9 10
No experience Firm Expert

6. How extensively are decision aids and other decision tools used by your firm during audit engagements?

0 1 2 3 4 5 6 7 8 9 10
Not at all For some tasks For all tasks

SECTION 3

Listed below are a number of statements. Each represents a commonly held opinion, *and there are no right or wrong answers*. You will probably disagree with some items and agree with others. We are interested in the extent to which you agree or disagree with such matters of opinion. *Please give your opinion on every statement.*

Read each statement carefully. Then indicate the extent to which you agree or disagree by circling the number in front of each statement. *First impressions are usually best in such matters.* The numbers and their meaning are indicated below:

+3	+2	+1	-1	-2	-3
AGREE	AGREE	AGREE	DISAGREE	DISAGREE	DISAGREE
STRONGLY	SOMEWHAT	SLIGHTLY	SLIGHTLY	SOMEWHAT	STRONGLY

My major accomplishments are entirely due to hard work and intelligence.	+3 +2 +1 -1 -2 -3
By taking an active part in political and social affairs we, the people, can control world events.	+3 +2 +1 -1 -2 -3
Despite my best efforts I have few worthwhile accomplishments.	+3 +2 +1 -1 -2 -3
The average citizen can have an influence on government decisions.	+3 +2 +1 -1 -2 -3
It is difficult for people to have much control over the things politicians do in office.	+3 +2 +1 -1 -2 -3
I usually don't make plans because I have a hard time following through on them.	+3 +2 +1 -1 -2 -3
With enough effort we can wipe out political corruption.	+3 +2 +1 -1 -2 -3
Competition encourages excellence.	+3 +2 +1 -1 -2 -3
I often find it hard to get my point of view across to others.	+3 +2 +1 -1 -2 -3
I prefer games involving some luck over games requiring pure skill.	+3 +2 +1 -1 -2 -3
When I get what I want it's usually because I worked hard for it.	+3 +2 +1 -1 -2 -3

+3	+2	+1	-1	-2	-3
AGREE STRONGLY	AGREE SOMEWHAT	AGREE SLIGHTLY	DISAGREE SLIGHTLY	DISAGREE SOMEWHAT	DISAGREE STRONGLY

I'm not good at guiding the course of a conversation with several others.	+3	+2	+1	-1	-2	-3
Even when I'm feeling self-confident about most things, I still may not be able to control personal situations.	+3	+2	+1	-1	-2	-3
When being interviewed I can usually steer the interviewer toward the topics I want to talk about and away from those I wish to avoid.	+3	+2	+1	-1	-2	-3
This world is run by the few people in power and there is not much the little guy can do about it.	+3	+2	+1	-1	-2	-3
I find it easy to play an important part in most group situations.	+3	+2	+1	-1	-2	-3
I can learn almost anything if I set my mind to it.	+3	+2	+1	-1	-2	-3
In the long run we, the voters, are responsible for bad government, both national and local.	+3	+2	+1	-1	-2	-3
When I look at it carefully I realize it is impossible to have any really important influence over what politicians do.	+3	+2	+1	-1	-2	-3
When I make plans I am almost certain to make them work.	+3	+2	+1	-1	-2	-3
If I need help in carrying out a plan of mine, it's usually difficult to get others to help.	+3	+2	+1	-1	-2	-3
I have no trouble making and keeping friends.	+3	+2	+1	-1	-2	-3
The extent of personal achievement is often determined by chance.	+3	+2	+1	-1	-2	-3
If there's someone I want to meet I can usually arrange it.	+3	+2	+1	-1	-2	-3
On any sort of exam or competition I like to know how well I do relative to everyone else.	+3	+2	+1	-1	-2	-3
One of the major reasons we have wars is because people don't take enough interest in politics.	+3	+2	+1	-1	-2	-3

+3	+2	+1	-1	-2	-3
AGREE STRONGLY	AGREE SOMEWHAT	AGREE SLIGHTLY	DISAGREE SLIGHTLY	DISAGREE SOMEWHAT	DISAGREE STRONGLY

In attempting to smooth over a disagreement I usually make it worse.	+3 +2 +1 -1 -2 -3
I prefer to concentrate my energy on other things rather than solving the world's problems.	+3 +2 +1 -1 -2 -3
I can usually establish a close personal relationship with someone I find attractive.	+3 +2 +1 -1 -2 -3
There is very little we, as consumers, can do to keep the cost of living from going higher.	+3 +2 +1 -1 -2 -3

Appendix 3

MODIFICATIONS TO THE BASIC CASE TO INTRODUCE THE DECISION AID (GROUPS D2 AND M2)

Audit Judgement Study General Information

This study is an investigation of judgement and decision making in auditing. As part of the study, several cases describing hypothetical client firms have been constructed. Each of these cases is mutually independent of the others, and the client firm described in each case is different. Your firm has been randomly assigned one case from among these cases.

The information package provided to you is divided into three sections as follows:

Section 1 comprises background information on the client firm. Following this information, the next few pages present audited financial statements of the last two years and the current year. This section also contains excerpts from the current year's audit work papers relating to the client firm.

Section 2 contains specific directions. Among other things, you will be asked to indicate your assessment of the probability of the client firm continuing as a going concern based on the information provided. To help you in making this assessment, a decision aid is provided on the next page. Please use this decision aid.

Section 3 comprises a questionnaire that seeks to identify and examine some individual factors that could affect auditor decision making. The questionnaire contains a number of statements. Each represents a commonly held opinion, and *there are no right or wrong answers*. You will probably disagree with some items and agree with others. We are interested in the extent to which you agree or disagree with such matters of opinion. Please respond to the statements as frankly as possible. Please note that since you are not required to identify yourself by name, responses to this questionnaire will be anonymous. *Full confidentiality is guaranteed.*

This study has to be completed on an individual basis. Therefore, please do not discuss it with other participants. You may work at your own pace, write on the materials, and refer to the instructions at any time. *Please note that your participation in this study is purely voluntary.* Once you have completed the entire exercise, please return the case materials to the person responsible for their collection.

Please record your starting time here:

Please record your finishing time here:

Thank you very much for your participation!

Appendix 4

THE DECISION AID

To assist you with your probability assessment of Rand Hospitality, Inc.'s ability to continue as a going concern, a decision aid is presented below. *Please make use of the decision aid to support your assessment.*

How to use the decision aid: Refer to Section 1 for information relating to Rand Hospitality, Inc. Then place a check mark (✓) in the box associated with each condition or event that is relevant to the company. Your final probability assessment will be based on the results of your information search. As a general decision rule, the probability of the firm continuing as a going concern will normally be inversely proportional to the number of boxes checked off. In other words, the greater the number of boxes checked off, the lesser are the chances of the firm continuing as a going concern, and vice versa.

- A. **Operational factors:**
- Loss of a key customer or supplier
 - Loss of key management personnel without appropriate replacement
 - Loss of a key franchise, licence or patent
 - Excessive reliance on one product or service
 - Excess or shortage of production capacity
- B. **Financial factors:**
- Substantial and recurring operating losses
 - Insufficient funds to meet liabilities or continue to provide services
 - Negative or decreasing cash flow from operations
 - Adverse key financial ratios
 - Level of debt financing increasing
- C. **External environment:**
- Recessionary trends, decreases in gross domestic product, decreases in money supply
 - The inherent riskiness of the industry in which the entity operates
 - Fundamental changes in the market or technology to which the entity is unable to adjust adequately
 - The introduction of a competitor's rival product that seems to be a generation ahead of the entity's product
 - Adverse effects of changes in legislation, government policy, or social values and norms
- D. **Internal environment:**
- Work stoppages, labour disputes, and high turnover in key positions
 - Weak Board of Directors, autocratic CEO, lack of management depth
 - Lack of budgetary controls, non-existent business plan, no statement of objectives
 - Lack of proper records, books not current, inability to provide timely financial statements
 - Significant changes in business practices

E.

Other factors:

- Possibility of an adverse outcome of one or more contingencies
- Riskiness inherent in being relatively small and new, as well as privately-held
- Frequent change of auditors, legal counsel, bankers or key consultants
- Forced, substantial disposition of fixed assets
- Changes in accounting policies, excessive management interest in effect of accounting alternatives

Appendix 5

MODIFICATIONS TO THE BASIC CASE TO INTRODUCE NONDIAGNOSTIC INFORMATION (MIXED INFORMATION GROUPS M1 AND M2)

EXHIBIT 4

Rand Hospitality, Inc. and Subsidiaries Excerpts from Notes to the 1996 financial statements

Note 1:

- (A) The consolidated financial statements have been prepared in accordance with generally accepted accounting principles.
- (B) Noncurrent investments are accounted for under the equity method of accounting.
- (C) Mortgages and notes receivable, and property held for sale are carried at the lower of cost and estimated realizable value.
- (D) Fixed assets are recorded at cost of acquisition, which includes (in the case of hotels) interest and property taxes which are capitalized during the development period. Any gains and losses resulting from the disposal of assets are included in earnings.
- (E) Depreciation and amortization are computed primarily on a straight-line basis, except for hotel buildings, in which case the sinking fund method is used whereby the original cost of the buildings is amortized over their estimated useful lives (not exceeding 50 years) in a series of annual instalments increasing at the rate of 4% compounded annually.

[All other notes (i.e., Notes 6, 9, and 10) remained unchanged.]