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The Effects of Experience on Complex Problem Representation and Judgment In Auditing: An Experimental Investigation

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ABSTRACT: The purpose of this study is to investigate problem representation and judgment by auditing professionals within the context of a going-concern task. Our results suggest more experienced auditors have more concise problem representations than do novices. In addition, our results show that some types of concepts listed in the problem representation are associated with judgment, regardless of experience level.

This study makes several contributions. First, understanding differences in problem representation at different levels of experience (novice, intermediate, and experienced) gives insight into the process of how representations change as experience changes/ develops. Understanding the development of "becoming qualified" to make judgments regarding the going-concern evaluation assists in (1) the development of teaching approaches for analyzing a company's financial condition, and (2) professional development for less-experienced professionals. Further, our measure of problem representation, similar to that in Christ's (1993) study, provides a task-sensitive measure of problem representation for accounting research. This should have important implications for understanding expertise development in complex problem-solving tasks that auditors and accountants face.

Keywords: expertise; problem representation; going-concern; expert-novice paradigm.

Data Availability: Data from this study is available from the first author.

INTRODUCTION

Accounting researchers (e.g., Wright 2001; Chung and Monroe 2000; Choo and Tan 1995; Christ 1993; Choo and Trotman 1991; Moeckel 1990), as well as those in other disciplines (e.g., Van de Wiel et al. 2000; Sylvan and Voss 1998; Tan 1997; Bordage 1994; Gagne et al. 1993), continue to investigate the role of experience in problem representation and judgment because of its pivotal role in decision making. The problem-solving process starts with an individual forming a mental representation of the problem. Based on this representation, an individual then develops a strategy to solve the problem or make a decision (judgment).

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These studies usually use a novice group and an expert group to examine the differences in problem representation that may be explained based on experience. The extant medical literature suggests that experts have more concise representations than do novices (e.g., Rickers et al. 2000; Schmidt and Boshuizen 1993a, 1993b; Boshuizen and Schmidt 1992). The medical literature has also extended the novice-expert paradigm to include an ''intermediate'' group (e.g., Van de Wiel et al. 2000; Rickers et al. 2000; Boshuizen and Schmidt 1992). The present study investigates complex problem representation of accounting professionals by testing whether conciseness of the representation varied with experience level. We analyzed whether certain types of problem representation concepts were associated with the assessment of company survival and/or the type of audit report recommended. Further, we included an intermediate group in our study.

Similar to studies in medicine, we found that more experienced individuals had more concise problem representations—i.e., experienced accounting professionals mentioned fewer concepts, relationships, and summaries than did either the novices or the intermediates in the sample; the intermediates cited significantly fewer relationships than did the novices. This is consistent with much of the extant research in problem representation, which finds that novices typically represent more superficial aspects of a problem than do experts (e.g., Gagne et al. 1993; Van de Wiel et al. 2000). Our results also suggest that some types of concepts mentioned in the problem representations were associated with judgment variables, regardless of experience level.

This makes several contributions. First, it is important to many groups of individuals (e.g., professionals, educators, researchers) to understand how levels of experience are manifested in systematic differences in problem representation. This understanding might inform training of professionals. An analysis of which concepts appear associated with judgment can provide insight into patterns of problem identification used in the going-concern evaluation, which could aid in the development of expert systems and training for professionals at all levels of experience. In addition, understanding the process of becoming qualified to make judgments regarding the going-concern evaluation might enlighten development of college curriculum to teach novices.

Second, our measure of problem representation provides a task-sensitive measure of problem representation for accounting research, and might be a more sensitive measure of judgment expertise. Third, the results of our study suggest that the generalizability of findings might be sensitive to the task that is given to participants. Specifically, we believe our results differ from Christ's (1993) study based on task-specific characteristics. Our study used a going-concern task, which requires a focused evaluation of large amounts of information to concisely ''diagnose'' financial health, while developing an audit plan (Christ's [1993] study) requires auditors to continue to gather information until they are convinced that sufficient evidence exists.[1]

Finally, our study has potentially important implications for future studies in auditing, where a number of tasks are unstructured and require professional judgment. Most of the studies in accounting use the expert-novice paradigm to explain how accountants acquire

[1] A going-concern evaluation typically requires a review of large amounts of information to choose specific items to develop an opinion of the firm's ability to continue operations (per SAS No. 59). According to Arens and Loebbecke (2000), some conditions that may cause auditors to question the going-concern assumption include negative cash flows from operations, defaults on loan agreements, adverse financial ratios, work stoppages, and legal proceedings.

expertise in various auditing tasks. However, acquiring expertise is a process, not a dichotomy. The present study suggests the value to future research of including an intermediate group to help understand the development of expertise from novice to intermediate to expert levels.

The remainder of the paper is organized as follows: the next section provides background information on problem representation and develops the hypothesis and research question. The third section describes the methodology of the study. The fourth section discusses the results, and the final section concludes with a discussion of the study, its limitations, and suggestions for future research.

BACKGROUND AND DEVELOPMENT OF HYPOTHESES

Problem Representation

Gagne et al. (1993) identify the problem-solving process as: (1) forming a representation of the problem, (2) searching the problem space, and (3) evaluating possible solutions (although in our study, judgments are made). These authors claim this process is the same regardless of the problem to be solved, and the quality of the representation formed will rely more on domain-specific knowledge and strategies than on general processing ability. We suggest that, while the process may be similar among tasks, the nature of a task will affect the elaborateness of the problem representation—i.e., our expectation of more concise problem representations by more experienced auditors in a going-concern evaluation versus Christ's (1993) results of more elaborate problem representations by more experienced auditors in an audit-planning task.

Numerous studies in psychology, accounting, and medicine have employed the expert-novice paradigm to focus on experience in performing different tasks. As a result, cognitive psychologists are able to identify factors that appear to be important to the development of expertise. Chi et al. (1982) suggest that an expert in a particular area differs from a novice in the amount, content, and organization of his/her domain knowledge. Glaser and Chi (1988) identify a number of attributes that are typical of experts who have high levels of domain knowledge—for example, they can perceive meaningful patterns in their domain and have superior short- and long-term memory for domain-relevant information. In addition, they represent problems at a deeper level and spend more time analyzing a problem prior to attempting a solution to the problem.

Accounting researchers began studying the role of experience on performance and judgment in an auditing context in the mid-1970s. After a decade of research in this area, a number of review articles were published (Choo 1989; Bedard 1989; Colbert 1989; Davis and Solomon 1989; Bonner and Pennington 1991; Bedard and Chi 1993; Arnold 1997). Choo's (1989) review focused on the expert-novice research in accounting (auditing) and in psychology. In comparing these two bodies of research, Choo (1989) noted that the accounting/auditing literature is preoccupied with the input, process, and output model, which is in marked contrast to psychology studies where the focus is on underlying differences in experienced and novices' knowledge structures. Choo (1989, 125) suggested that, ''expertise may be broadly defined as superior schemas (in amount and organization) developed through a gradual process of abstracting domain-specific knowledge on the basis of experience.''

To date, most of the studies in psychology and accounting testing the expert-novice paradigm examine differences between experts and novices. Some exceptions in the accounting literature include Christ (1993), Choo and Trotman (1991), and Moeckel (1990), where three or more (Moeckel 1990) experience levels were evaluated. Expertise development researchers such as Willson (1990, 1994) propose that a novice progresses toward

some level of competence (not necessarily an expert level), suggesting that intermediate levels of development should also be examined. Willson and researchers in medicine have advanced a stream of research incorporating a stage theory of development from the novice to the intermediate levels, and culminating at the expert level (e.g., Schmidt and Boshuizen 1993a, 1993b; Rickers et al. 2000; Van de Wiel et al. 2000). These researchers provide evidence that analysis of the intermediate level of experience (in addition to the novice and expert levels) is important to understand the process of becoming an expert.

Consideration of the Intermediate Level

The extant body of research in the medical field offers a paradigm to describe expertise development (Clinical Case Representation Paradigm). For more than two decades, medical researchers have been examining the assumption of a developmental process (i.e., progression from novice to intermediate to expert) rather than a dichotomy (e.g., novice versus expert). Examples of this work include Patel et al. (1989), Patel et al. (1988), Patel and Groen (1986), Schmidt and Boshuizen (1993a, 1993b). and Bordage (1994).

Transitioning from a textbook-based curriculum to ''clinical'' (or client) experience is an important issue. Studies in the medical literature have attempted to identify and map the ''intermediate effect.'' Theory indicates that a shift from the use of biomedical knowledge to clinical knowledge in diagnosis occurs as soon as students begin to work with patients (Schmidt et al. 1990). Consequently, intermediates begin to recall (unaided) more specific case facts than novices or experts, and their pathophysiological explanations include both biomedical and clinical information. Experienced physicians represent their diagnosis of a patient's condition in terms of relationships and conditions that relate to a specific previous encounter, thereby allowing them to quickly diagnose and concisely represent the case (Schmidt et al. 1990).

Early studies in the medical literature indicated that the number of case items recalled peaks at the intermediate level (e.g., Patel et al. 1988; Schmidt and Boshuizen 1993b), which suggests that intermediates require both biomedical and clinical knowledge to develop and confirm their diagnosis (Schmidt et al. 1990; Schmidt and Boshuizen 1993a; Bordage 1994). Some studies such as Van de Wiel et al. (2000), Rickers et al. (2000), Schmidt and Boshuizen (1993b), and Boshuizen and Schmidt (1992) provide evidence of a peak in the number of concepts, links, and detailed concepts listed at the intermediate level. However, other studies, such as Van de Wiel et. al (1998) and Van de Wiel (1999), find no such effect.

Knowledge Encapsulation

The progression from the intermediate level to higher levels of experience in medicine includes evidence of the ''filtering'' of information. This affects problem representation by allowing experienced physicians to ''package'' (or encapsulate) details (e.g., Patel et al. 1988; Schmidt and Boshuizen 1993b; Willson 1994; Van de Wiel et al. 2000). This encapsulation results in pattern recognition, allowing experienced physicians to move quickly to a correct diagnosis (Norman et al. 1989). The use of illness scripts based on previous patient encounters and on clinically relevant information, rather than the pathophysiological causes to recognize symptom patterns, characterizes how experienced physicians make clinical diagnoses (Schmidt et al. 1990; Bordage 1994). In the accounting literature, pattern recognition has also been found to affect judgment/performance (Bedard and Biggs 1991; Vera-Muñoz et al. 2001) and problem representation (Bierstaker et al. 1999). Choo (1989, 1996) provided evidence of cognitive scripts in auditor decision making. In other words,

experts focus on recognizing characteristics similar to analogous situations, and use that information to organize their solution to the current problem.

In the medical literature, the knowledge structure of physicians is measured in terms of knowledge encapsulation (i.e., biomedical and clinical knowledge integrated into one knowledge base). Knowledge encapsulation is measured in studies such as Schmidt and Boshuizen (1993b) by reviewing the number of concepts included in the individual's problem representations that are inferences of two or more case propositions (''summaries'').

Van de Wiel et al. (1999) and Van de Wiel et al. (2000) both examine knowledge encapsulation among physicians. In the 1999 study, encapsulation was measured through the elaborateness, quality, and fluency of the explanation given. The results suggested that expert physicians had more elaborate, fluent, and higher quality explanations of the concepts tested than did the students or clerks in the study. The 2000 study found that the subjects categorized as ''experts'' explained the case information at a more summarized level, skipping parts of the lines of reasoning. This is consistent with Anderson's (1995) discussion of the ACT-R theory, which suggests that experienced individuals create production rules once a skill becomes more automatic, appearing to ''skip steps'' when explaining how they know how to do a task for which they are considered an expert.

Problem Representation Hypothesis

Research in accounting/auditing suggests differences exist in problem representation at different levels of experience. Vera-Muñoz et al. (2001) found that the choice of analysis (i.e., future cash flow versus historical cost) and domain experience improved problem representation (i.e., the future cash flow representation) and information development in a task requiring identification of opportunity costs in a disinvestment decision. In that study, experience in either public accounting or management accounting (the proxies for domain knowledge) was associated with an appropriate problem representation choice. Similarly, in the medical studies, the expertise of physicians is ''generic'' in the sense that once a physician gains experience in any specialty, his/her pathological explanation for a diagnosis in a subspecialty (outside their normal specialty) does not differ from that of a specialist in that field (Rickers et al. 2000; Rickers et al. 2002; Rickers et al. 2003).

Boshuizen and Schmidt (1992) propose that auditors diagnose a company's financial condition and make recommendations in a manner similar to that of physicians' diagnoses of health issues. This implies that while there may be some variation in the auditing domain (e.g., auditing a few firms per year rather than several per day), theory developed in medicine related to problem representation can be applied to auditing. For example, in the medical literature, experienced physicians identify common traits in the list of symptoms given by the patient and attempt to associate them with a previous patient encounter. They quickly narrow the possible diagnosis of the patient by asking direct questions that help focus the diagnosis on a specific previous experience with similar circumstances. The explanations of the diagnoses usually represent an encapsulation of the condition of the patient in terms of combinations of elements of the symptoms or complaints of the patient (e.g., Schmidt and Boshuizen 1993a, 1993b; Bordage 1994; Van de Wiel et al. 2000). Consequently, when asked to justify or explain a diagnosis, experienced physicians give a concise explanation identifying the information they used in their decision (i.e., including fewer concepts, relationships, and specifications in their explanation than either intermediates or novices). Auditing research, such as Libby and Frederick (1990) and Kaplan et al. (1992) discuss the auditors' diagnostic processes, suggesting that experience plays a role in error recognition and hypothesis generation. Because of similarities to the medical diagnosis task

(i.e., taking many pieces of information and concisely representing them), we contend that more experienced auditors will have more concise problem representations in an evaluation of financial condition.

The difference between the results from the medical literature and accounting studies such as Christ (1993) suggest that the elaborateness or conciseness of the problem representation is a function of the nature of the task, as well as the level of experience. Christ (1993) found a positive relationship between experience and both the total number of case items recalled and the number of ''abstract knowledge'' items listed, which is consistent with the nature of the audit-planning task.[2] Since the nature of our study's task (as explained below) is different than that of the Christ (1993) study (i.e., a going-concern task), we expect the relationship between experience and the number of facts (concepts), numerical quotes (specifications), and relationships and abstract knowledge items (summaries) will be negative, rather than positive as in Christ's study.

In a going-concern evaluation, auditors must take into consideration specific financial information from all of the details gathered in the audit examination. Hence, auditors will collect specific pieces of information from the audit examination to evaluate financial health. The experienced auditors are expected to identify the information most relevant to this analysis, while novices are expected to include more disjointed information in their evaluation. Intermediates are expected to be able to focus on relevant issues more than will the novices, due to their exposure to previous clients, but will not have the experience to be able to encapsulate the information like the experts.

Thus, experience level should influence conciseness of the problem representation produced, within the context of the task involved (moving from large amounts of information to a specific decision). Therefore, we test the following hypothesis:

H1: Experienced auditing professionals will have less elaborate (i.e., more concise) problem representations than will intermediates or novices—that is, the experienced group will list fewer concepts, specific numeric items, causation links, and summaries than will either the intermediates or the novices.

The Relationship between Problem Representation and Judgment

Studies such as Balla et al. (1990) found that a clinical interpretation (or representation) was necessary to make a correct diagnosis. Consequently, we suggest that judgment may be a function of problem representation, not just experience. Specifically, the types of concepts noted in the problem representation are expected to be related to both the assessment of client survival and the report recommended. Studies in accounting have suggested the choice of the correct problem representation is associated with correct judgment (e.g., Vera-Muñoz et al. 2001; Bierstaker et al. 1999; Bedard and Biggs 1991). Vera-Muñoz et al. (2001) showed that the number of opportunity costs listed in a disinvestment decision was associated with the future accounting earnings problem representation choice. Choo's (1996) study found the atypical (negative) actions and events listed by the participants contributed more to auditor judgment than typical actions. The listing of the atypical actions was associated with a decrease in the auditor's confidence in the company's continued survival, while Bierstaker et al. (1999) found certain prompts were helpful in moving toward

[2] Christ's (1993) results suggest that more experienced auditors add evaluative information when representing the revenue cycle audit-planning task. Because of their experience with previous audit-planning tasks, managers and partners are able to identify and to summarize relevant information more effectively than those with less experience.

''productive'' problem representations, since all 12 of the senior-level auditors in Bierstaker et al. (1999) initially had incorrect verbal representations of the misallocated overhead cost problem.

In analyzing the viability of a client, auditing textbooks such as Arens and Loebbecke (2000) reference the auditing standards that suggest that certain issues/concepts such as ''significant recurring operating losses ... inability of the company to pay its obligations as they come due ... unusual labor difficulties ... [L]egal proceedings, legislation, or similar matters that have occurred ... might jeopardize the entity's ability to operate'' (Arens and Loebbecke 2000, 48–49). The case company in the current study was experiencing many of these problems, specifically persistent negative operating cash flows, a fully used line of credit, large upcoming purchase commitments with limited resources to finance the purchases, recurring operating losses, potential lawsuits from a recent accident, and upcoming labor negotiations.

The impact of the issues leading to a going-concern modification is typically taught in introductory auditing classes. Therefore, experience level may not be related to the assessment of survival and the type of audit report recommended when these concepts are identified. In the following research question, we suggest that an analysis of the different types of concepts noted in the problem representations might be related to differences in the assessment of a company's ability to continue as a going-concern and the audit report recommendation.

RQ1: Are the types of concepts listed by the participants (specifically related to cash flows, liquidity, line of credit issues, debt commitments, recurring losses, pending lawsuits, and upcoming labor negotiations) associated with the likelihood assessment of firm survival and the type of audit report chosen?

METHOD

Sample

One hundred sixteen graduate auditing students and professionals participated in the study. The participation of the graduate students (65) and staff-level professionals (12) in the study was considered valuable to providing a ''novice'' perspective of the problem representation and judgment in a going-concern evaluation. The graduate students had recently completed a going-concern case in their auditing class, and had completed an internship with a public accounting firm. The 51 professionals (including staff-level employees) from the Seattle area had experience with private companies (13) or government auditing agencies (1), with Big 5 firms (11), or with large regional/local firms (26).

Procedures and Task for the Experiment

Although no time constraints were imposed, most participants completed the experiment in an hour. Students completed the experiment in a classroom,[3] while the professionals were visited at their places of employment. One of the authors was present for all sessions. First, subjects read the general instructions that indicated the phases of the experiment and the expected time to complete each phase. Phase 1 included several psychological measures (goal orientation, personality factors, and ability), and Phase 2 of the experiment included the case materials (available from the first author).

[3] Students completing the experiment received extra credit for their participation.

The case developed by the authors was based on data from an actual company. The materials provided background on the industry and financial information from the 1996 Management Discussion and Analysis in the 10-K of an actual airline. This company had several problems, including negative cash flows from operations, excessive leverage and capital commitments, with significant competitive industry pressures. Each participant was asked to summarize the financial condition (including reasons for their assessment), assess survival prospects, and determine the type of audit report recommended for the case company. Although oral protocols have been used in many studies (e.g., Bordage and Lemieux 1991; Boshuizen and Schmidt 1992; Bedard and Biggs 1991; Bouwman et al. 1987), we chose to use written protocols based on the nature of the task, similar to those in Choo (1996), Christ (1993), and Rickers et al. (2000). Specifically, participants were asked to write a summary to describe the case company's financial condition to a supervisor and explain their reasoning, which was used to measure the problem representation dependent variables (H1). The respondent's prediction regarding ability to continue as a going concern for at least the next 12 months (scale: 0 percent chance to 100 percent chance of continuing operations) and the type of audit report they would issue (options: unqualified report, report with going-concern modification, disclaimer) were used as the dependent variables to test RQ1.

Measurement of Dependent Variables

To test H1, we measured the conciseness (or, conversely, the elaborateness) of the problem representation by counting the number of concepts (propositions/nouns), specifications (numeric information from the case information), relationships (links between concepts), and summaries (the combination of two or more inferences) listed in the participants' written summarization of the financial condition of the case company.

Utilizing a scorecard to measure the dependent variables, our analysis of the participant responses is similar to that used in Patel and Groen (1986), Schmidt and Boshuizen (1993b), and Van de Wiel et al. (2000).[4] The protocol analysis was performed by one of the authors, while a random sample of ten cases was independently evaluated by a colleague not involved with the study (as suggested in Willson [1980]) to test inter-rater reliability. During the analysis, neither of the coders had access to any demographic information. Cohen's kappa calculations (Cohen 1960; Bishop et al. 1975) indicated that the coders agreed to a sufficient extent and more than they would have by chance regarding number of concepts, specifications, relationships, and summaries in the problem representations.[5]

[4] The scorecard was used by the coders to record the number of concepts, relationships, specifications, and summaries listed in the participant's summarization of the financial condition. Responses to the likelihood percentage (0 percent–100 percent) were recorded, as well as a ''score'' for the report choice (1 for choosing to modify the audit report, 0 for choosing either an unqualified report or disclaimer). The choice of a modified report was considered ''correct,'' as the auditor for the real company issued a going-concern modification. A copy of the scorecard is available from the first author.

[5] Cohen's kappa was used as a measure of agreement and was calculated as suggested in Cohen (1960) and Bishop et al. (1975). The *intra-rater* agreement was 100 percent. For the *inter-rater* calculation of Cohen's kappa, each of the dependent variables' calculations indicated that the raters agreed to a sufficient extent (i.e., the Cohen's kappa fell within the 95 percent confidence interval) and more than they would have by chance.

Example of *CONCEPTS*: discussing *profitability* or *cash flow problems*. Example of *CAUSATION* (relationship links): *Operating loss* is due to *inability to cover the interest expense*. Example of *SPECIFICATIONS*: *Operating loss* of $274,000. Example of a *SUMMARY*: ''Purchase commitment with heavy leverage'' (combination of inferences about the purchase commitments spelled out in the case with the inference regarding the company's high leverage, based on review of the debt ratio).

Due to the open-ended nature of the request for a summarization of financial condition, we categorized the concepts listed in the subjects' problem representations (i.e., summarization of financial condition) into the following categories: cash flows (*CFS*), line of credit (*LOC*), losses (*LOSSES*), accidents/lawsuits (*ACCIDENT*), financial conditions (*FIN'L COND*), regulations (*REGULATION*), debt level (*DEBT LEVEL*), industry/competitor (*INDUSTRY*), reorganization/Chapter 11 (*REORG*), labor issues (*LABOR*), and liquidity issues (*LIQUIDITY*).[6] If the summarization of financial condition was judged to include a concept that fell into one of these categories, it was coded as 1. Statements related to any specific category were counted only once. One of the authors coded the concepts, while a master's-level research assistant independently categorized the concepts of a random sample of 13 of the case responses (different from the sample above), using the Concept Scorecard developed by the authors to score the categories of concepts in each of the responses. As a measure of inter-rater reliability, the Cohen's kappa calculation (Cohen's kappa = 0.7146) and the asymptotic variance (95 percent confidence interval) implied that the raters agreed to a sufficient degree and more than they would by chance (Willson 1980; Cohen 1960). These results from the categorization of concepts were then used in the analysis to determine their relationship to the survival assessment (*LIKELIHOOD*) or whether a modified opinion was recommended (*REPORTSCORE*).

RESULTS

Descriptive Statistics of Subjects

Table 1 reports the experience, age, and gender of the participants in this study. To determine how to divide the experience groups, we consulted both the medical and accounting literature. Bonner and Pennington (1991) identified the number of years of experience typically required to perform certain audit tasks (for example, choosing an audit opinion requires approximately 8.5 years of experience). Abdolmohammadi (1999) suggests that most of the procedures associated with rendering an opinion require a manager-level professional (experienced level), while more structured tasks, such as comparative analysis of indebtedness to the industry, require only staff-level experience (novice). Although the actual decision to qualify an audit opinion is made at the manager/partner level, an examination of both intermediate and novice responses provide insight into the changes in problem representation and its effects on judgment along the experience continuum.

Based on Abdolmohammadi's (1999) recommendation, we use the following groups for our analysis (Table 1):

- Novice Group (*NOVICES*): Graduate students who had completed public accounting internships and professionals with fewer than 12 months of experience (graduate students/staff)—a total of 77 subjects (average experience of 3.3 months).
- Mid-Level Experience Group (*INTERMEDIATES*): 24 professionals with more than 12 months and less than 72 months of professional experience (seniors/supervisors with an average of about three years of experience).

[6] The classifications of the concepts were developed through discussion of the responses by the authors. After determining the types of concepts we expected to see in the protocol and reviewing the responses by the participants, we determined the types of concepts and listed examples of each category. We then developed a Concept Scorecard (available from the first author) and instructions for the research assistant who scored the verification sample.

TABLE 1
Descriptive Statistics of Participants
(by Experience Group)

	Novices (n = 77)	Intermediates (n = 24)	Experienced (n = 15)
Months Experience			
Mean	3.3	36.8	159.4
(Std. Dev.)	−0.8	−16.1	−99
Total Exposures to Going-Concern Evaluation Task (self-report)			
Mean	1.1	4.5	30.1
(Std. Dev.)	−1.2	−6.9	−66.6
Age			
Mean	23.4	29	42.4
(Std. Dev.)	−0.9	−4.6	−8.5
Gender			
# Females	54	14	6
# Males	23	10	9

Novices = graduate students who had completed public accounting internships and professionals with fewer than 12 months of experience (i.e., staff level);
Intermediates = professionals with more than 12 months but less than 72 months of professional experience (i.e., senior/supervisor level); and
Experienced = professionals with 72 or more months of professional experience (i.e., managers and partners).

- Experienced Group (*EXPERIENCED*): 15 subjects with 72 or more months of professional experience (managers/partners with an average of 13.3 years of experience).[7]

Descriptive Statistics for Dependent Variables

Table 2 reports descriptive statistics for the dependent variables, where Panel A depicts the problem representation variables (*CONCEPTS*, *CAUSATION*, *SPECIFICATIONS*, *SUMMARIES*). Panel B reports descriptive statistics for the dependent variables measuring judgment (*LIKELIHOOD* and *REPORTSCORE*).

Tests of the Problem Representation Hypothesis

Spearman correlation analysis revealed that the number of concepts (*CONCEPTS*), relationships (*CAUSATION*), and summaries (*SUMMARIES*) included in the problem representation were significantly correlated ($p < 0.000$), with correlation coefficients ranging from 0.62 (between the *CAUSATION* and *CONCEPTS* variables) and 0.78 (between the *SUMMARIES* and *CONCEPTS* variables). This suggested that an analysis of variance (ANOVA) be performed to examine whether experience level was significantly related to the problem representation variables (*CONCEPTS*, *CAUSATION*, and *SUMMARIES*). Experience group (*EXPGRP*) was the fixed factor in the analysis. The results in Table 3 indicate

[7] We also collected data on the number of times each participant had worked on a going-concern evaluation (*TOTAL EXPOSURES*). This self-reported number (Table 1, Panel A) was considered a measure of domain experience and was significantly correlated with months of experience ($p < 0.001$). When the number of exposures was used in the analysis as a covariate instead of the fixed factor for experience (i.e., level of professional experience), the number of exposures to a going-concern evaluation was not significantly associated with any of the dependent variables.

TABLE 2
Dependent Variables
(by Experience Group)

Dependent Variables	Novices (n = 77)	Intermediates (n = 24)	Experienced (n = 15)
Panel A: Problem Representation Dependent Variables			
CONCEPTS			
Mean (Std. Dev.)	14.7 (5.1)	14.5 (5.1)	12.0 (5.9)
CAUSATION			
Mean (Std. Dev.)	7.5 (2.8)**	5.6 (2.2)	3.7 (2.2)
SPECIFICATIONS			
Mean (Std. Dev.)	1.1 (1.7)	1.2 (1.5)	1.3 (2.5)
SUMMARIES			
Mean (Std. Dev.)	5.4 (2.1)*	5.0 (2.1)	3.7 (1.9)
Panel B: Judgment Dependent Variables			
LIKELIHOOD			
Mean (Std. Dev.)	47.9 (21.4)	44.6 (24.3)	48.0 (28.6)
REPORTSCORE			
Number indicating modified opinion (% of group)	56 (73%)	18 (75%)	11 (73%)

* , ** Significant at $p < 0.05$ and between novices and experts; and $p < 0.01$ between novices and the other two groups, respectively.

CONCEPTS = number of concepts listed in the summarization of the financial condition of the company;
CAUSATION = number of links listed in the summarization of the financial condition of the company;
SPECIFICATIONS = number of numeric values from the case listed in the summarization of financial condition;
SUMMARIES = number of summaries (combination of two or more inferences) listed in the summarization of financial condition;
LIKELIHOOD = assessment of company survival (0% = imminent failure, 100% = certain survival); and
REPORTSCORE = recommended report: 1 = modified opinion, 0 = other report.

Refer to Table 1 for descriptions of novice, intermediate, and experienced participants.

the experience level was significant for the number of causation links ($\alpha < 0.001$) and the number of summaries listed ($\alpha < 0.05$), but was not significant for the number of concepts ($\alpha < 0.18$) listed.

The Scheffé multiple comparison procedure was used to compare the mean responses for the experts versus intermediates versus novices for both sets of dependent variables. For *CAUSATION*, we found significant differences between the novices and each of the other two groups ($p < 0.01$). For *SUMMARIES*, we found significant differences between the novice and the experienced groups ($p < 0.03$). The number of *CONCEPTS* differed marginally ($p < 0.06$) between the novice group and the experienced group. For *SPECIFICATIONS*, *LIKELIHOOD*, and *REPORTSCORE*, we found no significant differences between any of the experience groups.

Review of the means of the number of *CONCEPTS*, *CAUSATION*, and *SUMMARIES* (Table 2, Panel A) suggest that the overall relationship between problem representation and experience level is negative. These findings lend limited support to H1.

Additional Analysis

Consistent with research on the expert-novice paradigm (two group comparisons), we collapsed the two less-experienced groups (novices and intermediates) and compared their

TABLE 3
Tests of H1: Problem Representation
Dependent Variables: Concepts, Causation, Summaries
Fixed Factor: Experience Group

ANOVA Results for Problem Representation variables (*CONCEPTS*, *CAUSATION*, *SUMMARIES*)

		Sum of Squares	df	Mean Square	F	Sig.
CONCEPTS	Between Groups	95.08	2	47.54	1.74	0.18
	Within Groups	3082.81	113	27.28		
	Total	3177.89	115			
CAUSATION	Between Groups	209.83	2	104.91	15.43	.00**
	Within Groups	768.13	113	6.80		
	Total	977.96	115			
SUMMARIES	Between Groups	34.13	2	17.06	3.93	.02*
	Within Groups	491.01	113	4.35		
	Total	525.14	115			

*, ** Significant at the 0.05 and 0.01 levels, respectively.
Wilks Lambda significant at $\alpha \leq 0.001$
See Table 2 for descriptions of the dependent variables.

problem representation outcomes to those of the experienced group. The polynomial contrasts indicate that results are similar to those using the three experience groups: the number of causation links and summaries listed differ significantly ($\alpha \leq 0.02$) between the experienced group (more than 72 months of professional experience) and the less-experienced group (subjects with less than 72 months of professional experienced). However, collapsing the two less-experienced groups into one group obscures interesting information about differences between not only the novices and intermediates, but also differences between the intermediates and the experienced groups.

For example, results from *a priori* contrasts in the ANOVA analysis (with three experience groups) indicate a marginally significant difference between the novice and expert groups for the number of concepts ($\alpha < 0.07$) and a significant difference between the novice and each of the other two groups for the number of causation links ($\alpha < 0.003$). These contrasts also indicate that the number of summaries listed differ significantly between the novice and experienced groups ($\alpha < 0.01$), but differ marginally between the intermediate and expert groups ($\alpha < 0.07$). The marginal difference between the intermediate and experienced groups in the number of summaries listed could suggest that the intermediates are beginning to encapsulate knowledge—i.e., the difference between the less-experienced group (novices and intermediates) and the experienced groups noted in the previous paragraph appears to be driven by the differences between the novice and the experienced groups.

Tests of the Effect of Problem Representation on Judgment

Research Question 1 asks whether the types of concepts listed are associated with the assessment of company survival and the type of audit report recommended. Since there was very little difference among the groups' mean assessment percentages (Table 2, Panel B), and since at least 73 percent of subjects in each group recommended modifying the opinion, we performed a correlation analysis to determine if the different types of concepts listed were statistically related to either the assessment percentage and/or the type of report

recommended. The correlation matrix, found in Table 4, Panel A, suggests that mention of line of credit issues (*LOC*) is associated with a lower assessment of survival, while the mention of cash flow issues (*CFS*) is associated with modifying the audit opinion. In contrast, mention of regulatory issues related to the airline industry (e.g., taxes, noise abatement compliance) is significantly correlated ($\alpha \leq 0.00$) with a higher assessment of survival. This may indicate recognition of potential government bailouts or other assistance to maintain the safe operation of the airline. In addition, mention of the industry (e.g., its competitiveness) is also associated with a higher assessment of company survival ($\alpha \leq 0.05$).

To further analyze the effects of problem representation on judgment, we performed a stepwise regression using survival assessment variable (*LIKELIHOOD*) as the dependent variable. Similar to the correlation analysis, the results suggest that mention of the line of credit issues ($\alpha \leq 0.01$) were associated with a lower survival assessment, while mention of the regulatory issues ($\alpha \leq 0.02$) and industry issues ($\alpha \leq 0.10$) were associated with a higher survival assessment. None of the other variables were significantly associated with the survival assessment variable. We then developed a generalized linear model including those variables (*LOC*, *REGULATION*, *INDUSTRY*) and controlled for experience level (*EXPGRP*).

Analysis of the model including the interactions with experience level (*EXPGRP* $\times$ *LOC*, *EXPGRP* $\times$ *REGULATION*, and *EXPGRP* $\times$ *INDUSTRY*) indicated that none of the interactions were significant. The results of the reduced model (main effects only), shown in Panel B of Table 4, indicate that even when controlling for experience, the results do not change. In other words, regardless of experience level, mention of the line of credit problems is negatively associated with survival assessment, while mention of the regulatory issues faced by the company and the industry in which the company operates is associated with a higher survival assessment. Perhaps recognition of the airline industry's sensitivity to changes in fuel prices and economic conditions, which are out of the control of management, suggests a more lenient assessment of company survival, while as recommended in any auditing book, line of credit problems suggest a potential going-concern problem.

Since the *REPORTSCORE* variable is a 0,1 variable, we performed a binary logistic analysis. The Wald Chi-square statistic indicated that the mention of cash flow problems (*CFS*) was positively associated with choosing to modify the audit opinion (Panel C, Table 4). Even when controlling for experience level, the results are the same. This suggests that mention of the cash flow problems is associated with modification of the audit opinion, regardless of the experience level of the analyst.[8]

These results suggest that some of the types of concepts mentioned in the problem representation are associated with the judgment variables, and these results hold regardless of experience level (RQ1).

CONCLUSIONS, LIMITATIONS, AND EXTENSIONS

The purpose of this study was to observe changes in the problem representation and judgment in a going-concern task in participants ranging from internship-level graduate students to partner/shareholders. We extended studies such as Christ (1993) and Ashton and Kramer (1980) analyzing the problem representations and judgments of both students and auditors so that the progression of development could be observed as one advances from the student/staff level (''novice'') to the supervisory level (''intermediate'') and, finally, to the manager/partner level (''experienced''). Analysis of the intermediate level has

[8] The interaction term (*EXPGRP* $\times$ *CFS*) was not significant, so the model shown in Table 4, Panel C shows the model without the interaction term.

TABLE 4
Tests of RQ1

Panel A: Pearson Correlation Analysis (All Experience Groups Combined)

	LIKELIHOOD[a]	*REPORTSCORE*[a]
CFS	−0.09	0.21
Sig. (two-tailed)	0.35	0.02*
LOC	−0.26	−0.11
Sig. (two-tailed)	0.00**	0.23
LOSSES	0.01	−0.13
Sig. (two-tailed)	0.91	0.16
ACCIDENT	0.17	−0.09
Sig. (two-tailed)	0.08	0.34
FIN'L COND	0.07	0.11
Sig. (two-tailed)	0.46	0.25
REGULATION	0.26	−0.09
Sig. (two-tailed)	0.00**	0.34
DEBT LEVEL	0.07	0.07
Sig. (two-tailed)	0.44	0.44
INDUSTRY	0.22	0.10
Sig. (two-tailed)	0.02*	0.28
REORG	0.04	−0.02
Sig. (two-tailed)	0.65	0.10
LABOR	0.06	−0.05
Sig. (two-tailed)	0.57	0.59
LIQUIDITY	−0.01	−0.08
Sig. (two-tailed)	0.90	0.41

Panel B: GLM Results

Dependent Variable: *LIKELIHOOD*
Factors: *LOC*, *REGULATION*, *INDUSTRY*, *EXPGRP*

Source	Type III SS	Mean Square	df	F	Sig.
LOC	3136.75	3136.75	1	6.83	0.01**
REGULATION	2551.88	2551.88	1	5.55	0.02*
INDUSTRY	1266.33	1266.33	1	2.76	0.10***
EXPGRP	3.44	3.44	1	0.01	0.93

Panel C: Binary Logit Results

Dependent Variable: *REPORTSCORE*
Independent Variables: *CFS*, *EXPGRP*

Model 1 Parameters	df	Estimate	Std. Error	Wald Chi-Square	Sig.
Intercept	1	0.44	0.53	0.69	0.41
CFS	1	0.96	0.43	4.97	0.03*
EXPGRP	1	0.01	0.3	0	0.96

(*continued on next page*)

TABLE 4 (Continued)

*, **, *** Significant at the 0.05, 0.01, and 0.10 levels, respectively.
[a] Refer to Table 2 for a description of these variables.

ACCIDENT = issues related to accidents or lawsuits;
CFS = issues related to cash flows;
LOC = discussion of the line of credit;
LOSSES = financial losses;
FIN'L COND = financial condition of the company;
REGULATION = issues related to regulatory conditions;
DEBT LEVEL = issues related to high debt levels in the company;
INDUSTRY = issues related to the airline industry (e.g., highly competitive, comparisons, etc.);
REORG = mention of the previous reorganization/Chapter 11 issues;
LABOR = issues related to labor unions, employees;
LIQUIDITY = issues related to liquidity (or lack thereof);
LIKELIHOOD = assessment of company survival (0% = imminent failure, 100% = certain survival);
REPORTSCORE = recommended report: 1 = modified opinion, 0 = other report; and
EXPGRP = experience group (i.e., novice, intermediate, experienced).

been included in medical research for almost two decades and provides evidence that intermediates include textbook and clinical knowledge in their explanation of a medical diagnosis. We believe the paradigm developed in medicine can provide useful insights and can inform behavioral research in accounting. By including the intermediate level in the study of expertise development in auditors, we have an opportunity to contribute to our current understanding of how individuals' problem representations and judgment change as they move from the classroom to the boardroom, within the context of specific tasks and at various stages of experience.

Similar to the medical expertise development literature, the results of our study suggest that more experienced professionals have more concise problem representations. Experience was negatively related to the number of links made between the concepts in the representation, and was also negatively related to the number of inferences combined in the discussion of the company's financial condition. Our results regarding the problem representation of different experience groups extend the results of studies such as those of Christ (1993). Although our results differ from Christ's (1993) study, we believe the measure of problem representation used in both studies (i.e., measuring the number of concepts, causation links, and summaries) implies a measure that is sensitive to both differences in experience level and differences in the task performed.

Medical practitioners assess symptoms or clues to diagnose human illnesses. Similarly, auditing practitioners consider a variety of symptoms to discern the financial health of a client. The auditor must recognize the appropriate warning signs indicating potential financial problems. The participants in this study were asked to summarize the financial condition of a company that was experiencing a number of problems that would suggest a going-concern modification to the audit report (e.g., negative cash flows, line of credit problems, and recurring losses).

Judgment was measured in our study by participants' assessments of the case company's survival prospects (Choo and Trotman 1991), as well as by the type of audit report recommended. By observing the effects of problem representations on judgment of graduate students (novices), intermediates (less-experienced professionals), and experienced professionals, we contribute to the body of literature in accounting studying the expert-novice paradigm. Our results suggest that, regardless of experience level, mention of line of credit problems was associated with a lower survival assessment, while mention of regulatory or

industry issues was associated with a higher survival assessment. Our analysis also found that mention of cash flow problems was associated with choosing to modify the audit opinion, regardless of experience level. These results are consistent with the issues recognized in professional training and auditing textbooks as issues to be considered when performing a going-concern evaluation of a client company.

The fact that most of our participants (including the graduate students) recommended a modified audit report suggests that accountants are trained to recognize problems important to judging a company's ability to continue as a going concern. This is similar to Choo and Trotman's (1991) results suggesting that more experienced auditors noted more atypical items. The graduate students in our study had recently completed a going-concern case in their classes and were familiar with some of the ''warning signs.'' Although their problem representations were more elaborate than the experts, they chose to pay attention to some of the issues mentioned by the more experienced participants. While these ''expert-like'' novices and intermediates were able to correctly assess the important issues when making a judgment, the elaborateness of their problem representations suggest they have not yet made the transition to ''encapsulate'' their factual knowledge into relationships or cognitive scripts. Evidence of this process was observed in the intermediate group, where problem representations were less elaborate than the novices, but still were not as precise as the experts in summarizing the financial condition of the case company.

The implications of our results extend to education and training. The mapping of problem representation differences between experience groups might help educators adapt curricula to teach a problem-solving approach that mirrors that of more experienced professionals (seniors and manager/partners). For example, if we know what differences exist between seniors and manager/partners, then in the interests of efficacy, firms might choose to develop two ''expert systems''—one to move novices to the intermediate level of knowledge more quickly, and another to move intermediates to a more expert level in a shorter period of time. Therefore, our current thinking about expert systems may not be as efficient for learning as a ''stage'' approach might be.

Limitations and Extensions

The limitations in this study are related to quasi-experiments in general. For example, there may be a selection bias, as we solicited only volunteers from the membership of the Washington Society of CPAs, many of whom were in the middle of tax season. This undoubtedly impacted the number and experience level of individuals who were available to participate. The case dealt with an industry sensitive to economic conditions, fuel prices, etc., and has been subjected to publicity related to its deregulation. This may limit the generalizability of our results to other industries. In addition, no independent variable was manipulated, and the subjects analyzed only one case, so the results should not be generalized to other types of complex problem-solving tasks. The rationale for using only one case in this study was primarily due to time constraints.

Future studies might have participants review more than one case (Van de Wiel et al. 2000) to allow analysis of within-person variability. This would provide an opportunity to study whether the results from the current study hold across cases. It might be interesting to examine intermediate effects for a variety of different auditing and accounting tasks, and to test the sensitivity of the problem representation measures identified in this study. Another extension might include reviewing the effects of problem representation on audit judgment by reviewing the process used by different experience levels when developing their ''diagnosis'' on other more structured judgments, which could aid in training and in the development of expert systems.

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