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Vicky Arnold
University of Massachusetts Dartmouth

Stephen C. Hayne
Arizona State University

Steve Sutton
Bryant College

C.A.P. Smith
University of Montana

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Vicky Arnold, University of Massachusetts Dartmouth
Stephen C. Hayne, Arizona State University West
Steve Sutton, KPMG Peat Marwick Distinguished Professor, Bryant College
C.A.P. Smith, University of Montana

For close to two decades concerns regarding the increasing time pressure faced by public accountants have been voiced. The Committee on Auditors Responsibilities [1979] noted time pressure as one of the major concerns facing auditors in fulfilling their responsibilities. These concerns were raised in part due to a supporting study for the committee that found 60% of survey respondents admitted prematurely signing off on an audit due to time pressure [Rhode 1978]. Less than ten years later, these issues were raised by a second commission investigating auditors' detection of fraudulent financial reporting. The Treadway report [NCFFR 1987] noted that intense competition may lead to audit budget pressure, reduced scopes, use of lower quality audit evidence, and/or omission of specific audit procedures.

Several studies have reported such premature sign-off behavior. Alderman and Deitrick [1982] surveyed 274 staff auditors and found that time budget pressure was a major cause of substandard audit performance. The effects of time budget pressure frequently included premature sign-off and omission of audit steps perceived as unnecessary. Margheim and Pany [1988] also found that audit steps perceived as unnecessary were likely to be omitted in the face of time pressure. Kelly and Margheim [1990] found that audit weaknesses evolving from time pressure included premature sign-off, reduced work on certain audit procedures, failure to research accounting principles, and superficial reviews of client documentation or weak client explanations.

Ashton et al. [1988] note, however, that little is known about the effect of time pressure on audit judgments and decision-making. While concerns related to omitted tasks and premature sign-off are critical, it is generally recognized that auditors spend significant unrecorded hours on completing tasks that can not be finished within the constraints of the audit time budget. Thus, the perception could be that in most cases the work will be fully completed despite the restrictive time budgets. Such a perception ignores, however, the potentially negative impact that time pressure may have on auditors' decisions in gathering and evaluating audit evidence. If time pressure does indeed effect the quality of decision making processes and the resulting decision, the concerns regarding omitted tasks and premature sign-ffs may under emphasized.

Audit Decision Making Under Time Pressure

A large portion of the research in auditing related to the effects of time pressure have focused on premature sign-off behavior [Rhode 1978; NCFFR 1987; Alderman and Dietrick 1982; Margheim and Pany 1988; Kelly and Margheim 1990]. Several of these studies have also noted other time pressure induced problems such as reduced work on certain audit procedures, failure to research accounting principles, substitution of weaker evidence, acceptance of weak client explanations of exceptions, and/or superficial reviews of client documentation. However, while these studies have documented several self-reported instances of occasional highly negative behavior, little understanding has been gained regarding the systematic effect of time pressure on day-to-day audit decision making.

Two studies in auditing did attempt to gain some understanding of the time pressure effects on auditors' time allocation processes in audit planning. Bamber and Bylinski [1987] focused on the effect of time pressure on auditors' time allocations in audit planning. They found that in allocating time for the review process that auditors effectively ignored whether the cases noted that the audit was in a tight time crunch or if time pressure was not an issue. Kermis and Mahaptra [1985] found that if case subjects were told that they needed to cut time budgets by a certain percentage, they would in fact revise their audit time budgets accordingly. These studies provide some evidence regarding time pressure on audit planning but do not focus on outcomes from time pressured decisions.

There have been several studies that have experimentally observed the outcome effects of increased time pressure within the audit context. These early studies generally focused on the relationship between increased time pressure and performance outcomes. Ronen and Livingstone [1975] suggest that time pressure, if rewarded, will induce auditors to simply perform their work faster. This is consistent with Cherrington and Cherrington's [1973] experimental findings that performance did in fact increase under time pressure. However, further work by Rockness [1977] indicated that the increases in outcome performance occurred during periods of moderate pressure where the auditor could achieve time budget objectives; but after pressure became high, performance actually decreased significantly. It should be noted, however, that there have been inconsistent results in the management and psychology literature regarding this relationship between time pressure and performance [e.g., Rothstein 1986; Payne et al. 1988]. Of further note is the minimal evidence in this literature regarding the impact of time pressure on the decision processes leading to decision outcomes [e.g., Ben Zur and Breznitz 1981; Rothstein 1986; Payne et al. 1988].

One possible source of conflict in studies that have examined the impact of time pressure on performance outcome is the cognitive processes underlying alternative decision types. One way of classifying decision types is to dichotomize decisions by whether they require a *judgment* or a *choice*. A judgment task requires the decision maker to assess the data and make a conclusion about the *goodness* of a potential outcome, while a choice task requires the decision maker to assess which of a set of outcomes is *better* than others. In auditing, a judgment task would include such things as assessing the results of testing on a judgmental sample, while a choice task would include such things as conducting an analytical procedure where current year financial ratios are compared with prior year numbers or industry averages. Judgment and choice are intimately connected, but the cognitive processes by which they are made are very distinct [Hogarth 1981; Yates 1990]. These differences in underlying cognitive processes are proposed in this study as a likely source of the differentiating effects of time pressure on decision outcomes.

A recent study by Rothstein [1986] illustrates the decision processes used by judgment decision makers. A multiple cue probability learning (MCPL) task was given to a group of subjects requiring them to assimilate information from several cues to derive a conclusion. The subject's decision strategies are assumed to follow a fixed combination strategy whereby weights are assigned to each cue--e.g. a weighted average decision (WADD) micro-strategy. Subjects were trained using an instantaneous feedback system that allowed each subject to adjust the weights until they attained an optimal strategy. Rothstein's [1986] findings found that under time pressure, subjects maintained their decision strategy, but were unable to continue consistently applying the weightings and their accuracy likewise dropped significantly. These results were consistent across all levels of increasing time pressure.

An interesting facet of Rothstein's results is the steady decline of accuracy with each increase in the level of time pressure. Most prior research (including Cherrington and Cherrington's [1973] and Rockness's [1977] work in auditing) have found that *acceleration* is the first macro-strategy implemented and accuracy does not normally decline under moderate time pressure, but rather will usually rise slightly [Janis and Mann 1977]. Under high time pressure, the results are predictable given that *acceleration* is normally not effective and subjects are expected to continue to attempt to use a WADD strategy, but the time pressure diminishes their consistency in applying weights and results in poorer accuracy. One possible explanation for the inconsistent results could be the perceived time pressure by subjects. It is possible for instance that Rothstein's [1986] subjects actually incurred moderate, high and even higher levels of time pressure--hence the steady decrease in performance.

In this study, a common accounting task is used to test for the expected differences in decision quality. Time pressure will be induced by a straight-line payoff function. Since this is a task implementation requiring *judgment* decision processes, based on the underlying theories and results of prior studies using judgment tasks, it is hypothesized (in the alternative hypothesis form) that:

H1: Under time pressure, subject achievement will decline.

Research Method

In order to examine the effects on individual decision making under time pressure, an experiment was conducted in a controlled environment under which the subjects could be monitored and their information processing recorded. The information was provided through a software system that automatically recorded data related to the three dependent variables of interest: (1) decision quality, (2) time spent viewing information cues, and (3) number of redundant accesses to information cues.

The experimental task consisted of deriving the overall materiality level that should be assessed for a given client. For each case, six different information cues were provided: (1) income statement, (2) balance sheet, (3) statement of cash flows, (4) financial ratios, (5) client history, and (6) management's intended use of the audit report. The client history included information such as the length and nature of the auditor/client relationship, changes in the client's business operations, and changes in key management personnel. Management's intended use included such information as whether or not the company was public (all were), if a new stock release was planned, or other non-normal activities that would dictate greater or lesser auditor exposure when issuing the audit opinion. Materiality judgment was selected for the experiment based on the students' training in the area during course completion and because this task is one that is specifically noted by Ashton et al. [1988] as a task that is commonly completed by audit groups.

The information was presented using a Windows 95 software program developed specifically for the experiment. The software provides the user with seven large on-screen buttons--one each for the six information cues and one to be used when ready to enter a final materiality assessment. While the materiality button remains centered at the bottom of the screen, the remaining buttons are randomly ordered into two rows of three buttons to assure the order of the buttons will not effect the results of the experiment. When a button is selected using the mouse, information is displayed in a window and the user can scroll up and down through the information. After 15 seconds of inactivity on the keyboard, the screen closes down and the buttons are re-displayed (the user also has a button that can be selected to close the display when they are done with the information). This feature is important in that the time viewing the information is monitored by the system and this minimizes the potential error in the time measure for viewing of the information. If the user was not finished examining the information cue, the button can be pressed again and the information re-displayed. This is also true if after examining other information cues the user wishes to re-examine information that was previously viewed. Once the subject has come to a conclusion on materiality, they select the button for materiality, the system prompts the user to make sure they wish to enter their decision at this point, and upon affirmation the system prompts them for their materiality assessment. The system then calculates the payoff based on their answer and displays the payoff on the screen for the user.

Data was provided for five cases. The first case was for a practice session to allow the users to become familiar with the system before beginning the experiment. The subjects could re-do this practice case as often as they wished, and then proceed to the experiment cases when they were ready. The practice case was the same for all. The remaining four cases were completed in a pre-set order for each subject. These cases could only be executed once, and the pay-off represented the actual dollar amount they would receive. The time to completion was monitored based on the time registered by the computer when a given case was started and again when the final materiality assessment had been entered. The system maintains a log file of all activities to assure the users did not cheat by trying to re-enter a given case.

In order to increase the realism of the task, subjects were motivated toward the experiment through financial incentives. The intent was to create behavior similar to that "as if" they were making real audit decisions [Cox et al. 1982]. Accordingly, a financial incentive was used that was directly related to a subject's decision quality as measured by the comparison of their materiality assessment with the predetermined assessment. The payoff function was:

quality payoff ($) *= $15 - (%variance from ideal x $50) (for 0-30%),$0 (for 30-50%), or*
$0 - ((%variance - .50) x $50) (for greater than 50%)

Subjects were informed of this function and told that the money would be paid to them **in cash** at the end of the experiment. To help assure trust, $500 in reward money was displayed prior to the experiment. If a subject earned negative payoffs during a given case, they received $0 payment. Cases were independent observations and losses were not rolled over into the next case to avoid subjects falling so far behind they would quit trying.

Time pressure was induced as a positive reinforcement mechanism. To induce subjects to experience time pressure during the selected treatments, another monetary payoff function based on a group's time to decision was instituted:

group time payoff ($) *= $15 - (minutes of decision time)*

Each subject would earn $15 (per time pressure case) if they submitted their decisions immediately, but for every minute they used to make their decision, they lost $1. If they used more than 15 minutes they started losing money from what they may have earned through decision quality for that case. Likewise, if they made the decision too fast, they would likely lose enough money from decision quality to negate the money earned from making a fast decision (i.e., payoff for time pressure is a combination of decision quality and time to decision). Subjects were also informed of this function before beginning the experiment. The payoffs seemed sufficient for the desired effect as students were quite pleased with the payoffs received.

RESULTS

A total of 20 subjects completed the experiment; each was randomly assigned to a computer. Half of the computers were designated an order of two time pressure cases to be followed by two no time pressure cases, and the other half were assigned the reverse (i.e., two no pressure followed by two time pressured cases). Completion of the experiment resulted in 40 observations each for the time pressure and no time pressure treatments. However, three subjects made mistakes on data entry for a case (not the same cases) so those observations was thrown out.

There was indeed a time pressure effect; subjects took less time when motivated to ($p < .0014$). Hypothesis 1 predicted that the quality of the decisions derived by the subjects would diminish under time pressure. The mean values for the percentage error from the target materiality assessment became worse when the subjects were performing under time pressure, increasing from 24.8% error to 32.0% error. This difference is significant at a .05 level ($p = .047$). Accordingly, the null form of Hypothesis 1 was rejected. In-depth analysis of decision process will be presented at the conference.

There have been widespread concerns voiced regarding the impact of an increasingly competitive audit market, and the time pressure that accompanies this market, on auditors' audit decisions. Little is known about the effect of time pressure on audit judgments and decision making. This study was designed to provide insights into the human decision processes underlying decision making under varying levels of time pressure.

References available upon request from second author.