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Auditors' judgments and decisions under time pressure: an illustration and agenda for research

Ira Solomon

Clifton Brown

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Auditors' Judgments and Decisions Under Time Pressure: An Illustration and Agenda For Research[1]

Ira Solomon
Clifton Brown
University of Illinois-Urbana

Time limitation when acquiring and processing information (i.e., time pressure) is a structural feature of many judgments and decision contexts. In emergency situations, for example, physicians must process a variety of information within critically small time spans to make diagnoses and identify appropriate courses of treatment. Similarly, after leaving a huddle, a football quarterback must appraise the formation of the defensive team within no more than thirty seconds to determine if a change in the planned offensive play is warranted. Likewise, traders working within investment banking houses often must decide within a highly constrained period of time whether to buy, sell or hold specific securities based on a variety of data about economic and political events.

Various types of time constraints are present in auditing contexts [AICPA, 1978]. For example, auditors are required to perform audit procedures within prescribed time limits (e.g., vouch a specified number of transactions to supporting documents within a given period of time). Consistently, auditors must meet various client-imposed (e.g., allow earnings to be released within six weeks of the client's year end) and non-client-imposed deadlines (e.g., file a 10-K with the SEC by a specified date). Although such time constraints have always been present within the audit context, it has been argued that recently they have increased as competition in the market for audit services has increased [National Commission on Fraudulent Financial Reporting, 1987].

While often identified as deleterious [AICPA, 1978; Alderman and Deitrick, 1982; Kelly and Margheim, 1990], very little actually is known about the judgment and decision effects of time pressure in audit and other applied contexts. Interestingly, in non-audit contexts, time constraints in the form of time budgets sometimes have been found to enhance efficiency [Pachella, 1974] Although it has been argued that some time pressure may stimulate auditors to work harder and otherwise strive for efficiencies [Kelly and Seiler, 1982; Kermis and Mahapatra, 1985], no systematic evidence exists on functional consequences of time pressure in auditing. Rather extant audit studies almost exclusively have

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addressed "audit quality" reductions as a consequence of time pressure using one of two research methods.

In particular, surveys have been used by various researchers [Alderman and Deitrick, 1982; Kelly and Margheim, 1990] who primarily have focussed on *extreme* time pressure and attendant auditor responses. Laboratory experimentation has been used by other researchers [McDaniel, 1990; 1992; Choo and Firth, 1992] and, because auditor-subjects and audit tasks were employed, the experimental studies have greater potential to elucidate audit time pressure effects than psychology studies which primarily have employed student subjects performing "generic" tasks. Experimental studies also have the usual advantage (*vis-à-vis* audit time pressure survey studies) of greater control and the concomitant advantage of enhanced power. Unfortunately, as is argued below, common features of the experimental studies limit what actually can be discerned about time pressure effects in natural audit settings. As discussed later, the primary feature of concern is the restrictive way in which the experimental tasks have been defined which, in turn, has restricted opportunities for experimental subjects to *adapt* strategically to time pressures. In our view, this characteristic of prior research has constrained the experienced auditor from demonstrating an ability to cope with time pressure and, in turn, may have resulted in an overstatement of the deleterious effects of audit time pressure.

The purpose of the present paper is to describe how research efforts devoted to elucidating the effects of time pressure can be more profitably spent. This objective is accomplished by describing the results of an illustrative time pressure experiment designed to mimic the features of the aforementioned experimental studies, developing a taxonomy for analyzing audit time pressure effects, and based on that taxonomy, describing an embryonic agenda for future research on time pressure in audit contexts. We begin by describing the results of the illustrative experiment which is focused on the effects of time pressure on auditors' judgment policies. This experimental study is described first so that it can serve as a vehicle for highlighting the shortcomings of extant audit time pressure research. In the subsequent section, using psychology research on adaptive judgment formulation and decision making [Payne, Bettman and Johnson, 1988; 1990], we present and discuss a rudimentary taxonomy of time pressure effects in audit contexts. This taxonomy then is used to characterize extant research and, in the next section, to suggest how future audit time pressure research efforts profitably could be redirected. Following presentation of the resultant research agenda, concluding remarks complete the paper.

An Experimental Illustration

To illustrate how time pressure has been investigated in prior audit studies, we introduced time pressure into the experimental setting of a recently published paper [Brown and Solomon, 1990]. The focus of Brown and Solomon was auditor patterned (configural) information processing while assessing internal control risk. Introducing time pressure into such a study might be motivated by the simple recognition that time pressure is present in auditing and has been shown in psychology studies to cause judges and decision makers to: 1) be more erratic in usage of their judgment policies [Rothstein, 1986], 2) restrict their focus to a subset of available information cues [Wallsten and Barton, 1982; Wright, 1974; and Christensen-Szalanski, 1980], 3) alter global judgment and decision policies [Billings and Scherer, 1988], 4) access less relevant informa-

tion [Bowden, 1985] and 5) make less risky choices [Ben Zur and Brenitz, 1981]. To facilitate comparison with non-time pressured results, the same mode of analysis, analysis of variance (ANOVA), is used to represent each auditor-subject's information-processing strategy. The specific research question to be investigated is:

> Time pressure will have an inverse impact on the extent of auditors' configural information processing. That is, the proportion of judgment variance attributable by an ANOVA judgment model to expected interactions will decrease (increase) as time pressure increases (decreases).

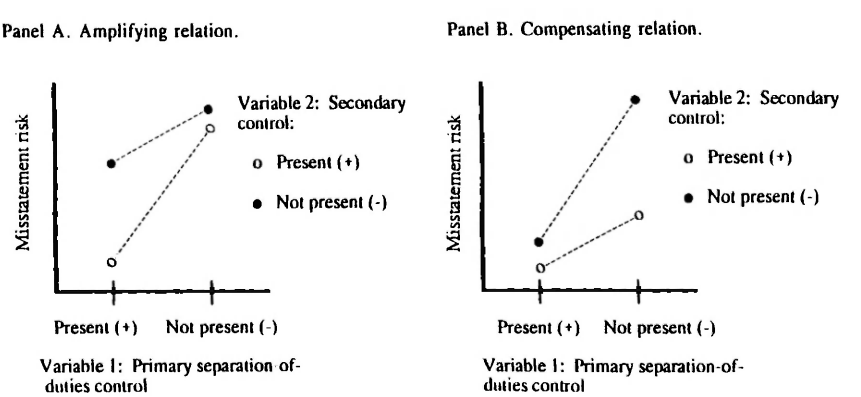
The Audit Judgment Task

The experimental task, more fully described in Brown and Solomon [1990], is assessment of interrelated internal controls in clients' information and business control systems. The specific control system component is cash disbursements and, in particular, assessment of the risk that cash disbursements are materially misstated as a result of checks being written and/or disbursed for improper (unauthorized/invalid) purposes. Within control systems, a weakness (i.e, increased risk of misstated financial statements) caused by the absence of a control (e.g., separation of duties such as check signing and cash disbursement processing/recording) may be at least partially offset by the presence of another control (e.g., an independent, second check signer). Further, strengths due to the presence of a control (e.g., the separation of cash disbursements duties) may be amplified by the addition of another control (e.g., internal audit of payments).

The information-processing strategies appropriate for evaluating such an internal control system component is configural in nature (also see Hitt and Barr, [1989]). In particular, this strategy involves the fully conditional question, "Is the primary separation-of-cash-disbursements-duties control present?" When the auditor's answer to this question is "yes," another question must be

Figure 1

Information Processing Strategies: Expected Interactions.



asked: "Are other controls present that amplify the primary control's effectiveness?" When the auditor's answer to this other question is "yes," the risk of improper cash disbursements is lower than when the answer is "no." However, when the auditor's answer to the first question is "no," a different question must be asked: "Are other controls present that compensate for the weakness caused by the primary control's absence?" When the auditor's answer to this question is "no," the risk of improper cash disbursements should be judged to be higher than when the answer is "yes" (when the answer is "yes," the risk could be as low as when the separation-of-cash-disbursements-duties control is present).

When this judgment strategy is modeled using ANOVA, a significant portion of improper-cash-disbursement-risk judgment variance will be accounted for by ordinal interactions between the primary and secondary internal controls (see Panels A and B in Figure 1 for graphic representations), as well as by the main effects for the controls that are involved in those interactions. Further, these interactions, because of their ordinal forms, will account for less judgment variation within the described judgment strategies than the main effects for the interactions' component controls.

Subjects

The initial subject pool consisted of seventy-four CPAs with three to four years of experience in financial-statement auditing (in addition to having college degrees with majors in accounting), and were employed by the same large, international CPA firm. Auditors with three-four years of experience have performed as part of actual audits the task employed in this study. Further, drawing the subjects from those with similar extent of experience should, at least in part, control for differences in task knowledge between subjects.

The subjects participated either in one of the firm's offices (twelve subjects) or while attending a technical training school run by the firm (sixty-two subjects). Based upon a pre-test (described below), twenty-three of these subjects participated in the current study.

Variables

The research design was a completely randomized one-factor design involving a pre- and a post-test. The single factor was time pressure which was manipulated at two levels: self-regulated (i.e., no time pressure) and a per-judgment time limit (i.e., time pressure). Because other constructs can differ between subjects that could affect information processing abilities (e.g., reading comprehension of task materials and task familiarity), time pressure was defined relative to each individual. Under time pressure, therefore, a subject's per-judgment time limit was defined to be one-half of the average per-judgment time taken for his (her) last eight pre-test judgments (see below).[2]

Nested within both the pre- and post-test is a within-subjects one-half fractional replication of a 2^5 factorial manipulation of task information cues. This factorial manipulation involved five information cues specific to the internal control assessment task, each cue at two levels. An example of the task stimuli is presented in Exhibit 1. One control question (D) contains three related sepa-

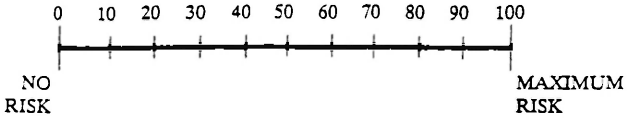
[2] A number of time-pressure "fractions were examined in a pilot test using CPAs. The fraction "one-half" was selected based on a desire to induce an effect but to not overwhelm the subject's ability to perform meaningfully the task.

Exhibit 1

An Example of a Cash Disbursement Internal Controls Questionnaire

	Control Question	Yes	No
A.	Are protective writing devices used to inscribe amounts on checks?		X
B.	Are properly approved vouchers required for check preparation?	X	
C.	Are all check signers designated by the Board of Directors?	X	
D.	Are the primary check signers independent of:		
	1. Purchasing and those requesting expenditures?	X	
	2. Persons approving vouchers?	X	
	3. Persons processing and recording cash disbursements?	X	
E.	Is an independent second check signer required who carefully scrutinizes the supporting documentation?	X	
F.	Does internal audit investigate payments made to payees not on an independently approved payee listing?		X

Given the controls as represented above, assess the RISK that cash disbursements could be materially misstated AS A RESULT OF checks being written and/or disbursed for improper (unauthorized and/or invalid) purposes.



ration-of-cash-disbursements-duties controls. Another control question (E) is a preventive cash disbursements control, and still another control question (F) is a detective cash disbursements control. The remainder of the control questions (A through C) were intended to be cash disbursements controls not highly related to the stated cash disbursements control objective. Five of the six control questions (A, C, D2 and D3 jointly, E and F) were factorially manipulated at two levels each (Yes or No), and two questions (B and D1) were held constant (Yes). Subjects were asked to assess the risk of a material misstatement in cash disbursement accounts. The risk assessments were elicited on a 100-point scale, where zero was no risk and 100 was maximum risk. Consistent with Brown and Solomon [1990], the predicted effects are interactions involving two pairs of control questions (D2/D3 and E; and D2/D3 and F).

An ANOVA judgment-model was computed for each auditor's risk assessments. Although each auditor judgment-model estimated all main effects (5) and two-way interactions (10), the higher-order (three, four and five-way) interactions were aliases of the estimated effects and thus, were assumed to be negligible. In addition, because each auditor-model has only one observation per cell, such models are determined fully and no error estimate exists. The judgment variance attributed to each term within an auditor-model, therefore, was computed by dividing the sum of squares for the term by the total sum of

squares for the model. Further, an arbitrary criterion of greater than or equal to four percent of total judgement variance was used to determine significance (i.e., terms with less than four percent of total judgment variance are assumed to have been caused by random variation rather than systematic effects).[3]

The following dependent measures were determined for each individual:

$$M_{ij1} = V_{ij2} - V_{ij1},$$

where V_{ijn} is the proportion of judgment variance that the ith individual's model attributed to the jth dependent variable of interest determined both from the pre-test (n=1) and the experiment (n=2). The dependent variable (M_{ij1}) is further categorized into each individual's random assignment to the time pressure (l=1,2) variable. The dependent variables of interest were expected interactions, main effects of expected interaction component controls, all above-criterion main effects, all above-criterion interactions, and below-criterion judgment variance.

Procedures

The laboratory session consisted of three sections: training, pre-testing and testing. All sections were presented on personal computers, and subjects completed the sections at their own pace (other than the time-pressured condition in the testing section). The training section began with brief instructions on the personal computer, and was followed by a practice case involving the general task but set in a context different from the pre-testing/testing case. The practice case was intended to allow subjects to gain familiarity with the response scale and the decisions aids available in the subsequent sections. The decision aids were intended to reduce subject memory load and to control extraneous variance.[4] The training section continued with presentation of the internal control case, and was followed by a blank copy of the task stimuli and additional instructions (see Appendix A).[5] The subjects then responded to a series of questions designed to stimulate prior thought about each item listed in their stimuli and its relation to the specific audit objective for which they were being asked to make risk assessments.

In the pre-testing section, the subjects were presented sequentially with the sixteen judgment trials (internal control questionnaires) from one of the half-replications (randomized over subjects). The order of the judgment trials (i.e., information combinations) within each half-replication was randomized for each subject. In addition, the order of the stimuli items in the judgment trials was counter-balanced; one-half of the subjects received one order and the other one-half received a second order. Upon completion of the pre-test half-replica-

[3] Results of a pilot study (n=12) employing a full twenty-five factorial design and earlier versions of the cases, indicated that effects > 2 percent of total risk assessment variation were significant when using the higher-order (three-, four-, and five-way) interactions as error estimates.

[4] The two decision aids were an electronic file and a logical consistency checker. When assessing risk, the subject had access to an electronic file of judgement trials that he or she had already evaluated (previous evaluations could not be changed). As the subject worked through the judgment trials, the computer reviewed their assessments for logical consistency (i.e., dominance conditions). If the computer detected an apparent logical inconsistency, that fact was displayed, and the subject had the option of either changing or maintaining his or her assessment of the current judgement trial.

[5] The subjects were instructed 1) to ignore the temporal sequence of the judgement trials and 2) that the trials would represent a mixture of possible situations. Further, the subjects were told that, although some situations may occur less frequently than others in practice, they should not allow such frequency to affect their risk assessments.

Table 1

Mean Risk Assessments Over Levels o Expected Interaction Terms Wi hin Judgment Models

Interaction Form	Time Pressure	n	Pre-Test Expected Interaction Levels* (+,+)	(+,-)	(-,+)	(-,-)	Post-Test Expected Interaction Levels* (+,+)	(+,-)	(-,+)	(-,-)
Amplifying	Yes	7	32.20	52.00	54.30	60.70	30.40	42.10	49.80	58.20
Amplifying	No	5	13.50	49.80	64.00	70.50	15.00	48.50	62.00	73.50
Compensating	Yes	8	20.10	27.10	38.10	68.70	20.40	28.00	49.90	63.30
Compensating	No	6	16.40	26.70	31.20	62.30	15.70	28.50	32.90	60.20

*The expected interaction levels are labeled as follows variable 1 (variable 2) is the first (second) element in a label, and "+" and "-" is he variable level. Both the variable and variable levels are the same as iden i ed in Figure 1.

tion, the percent of judgment variance attributable to the appropriate interaction was calculated for each subject.[6] When this percent was less than the four percent of total judgment variance criterion, the subject's participation in the experiment was ended. Alternatively, when this percent was greater than the criterion, the subject continued to the testing section of the experiment. Using this pre-test to filter those subjects who had not yet learned the appropriate judgment strategy should at least partially control for task knowledge differences between subjects.

Continuing subjects next were randomly assigned to one of the two levels of the time pressure variable (i.e., either no time pressure or time pressure). Subjects assigned to the time pressure condition were informed of their per-judgment time limit (as well as the basis for determining such limit). Following this, subjects were presented sequentially with the sixteen judgment trials from the other half-replication. Procedures for these trials were the same as for the pre-test, except for those subjects with judgment time limits. After completing these judgment trials, the subjects responded to a post-experimental questionnaire.

Results

As a validity check, each subject's expected pre-test interaction was inspected. Table 1 presents the mean risk assessments across the levels of the expected interactions for each level of time pressure. Since two possible ordinal interaction forms (compensating and amplifying) were expected for the internal control evaluation task, the means for both forms are presented. The inspections disclose that each subject's pre-test interaction was in a form consistent with the expectation (see Figure 1 for the expected forms).

Time pressure had a significant effect on changes in proportion of judgment variance attributed to the expected interactions. The proportions of judgment variance attributed to the expected interactions exhibited greater changes from a non-time pressured pre-test to a post-test when subjects' post-tests were time pressured. When the post-test was not time pressured, the mean change (from pre-test to post-test) in the proportion of judgment variance attributed to the expected interactions was -1.56 (from 8.68 to 7.12 percent of judgment variance, see Table 2). When the post-test was time pressured, however, the mean change was -5.76 (from 8.13 to 2.46 percent of judgment variance, see Table 2). The decline in judgment variance attributed to the expected interactions was

[6] This procedure was performed automatically by the computer.

Table 2

Effects of Time Pressure on Changes in Proportions of Judgment Variance Attributed to Various Judgment Model Terms: Descriptive Statistics

	Time Pressure						No Time Pressure					
	Unpressured Pre-Test		Pressured Post-Test		Difference		Unpressured Pre-Test		Unpressured Post-Test		Difference	
	Mean	S.d. Dev.	Mean	S.d. Dev.	Mean	S.d. Dev.	Mean	S.d. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Above-criterion:												
Main effects	82.31	5.23	86.57	5.51	4.25*	6.06	81.26	5.05	84.36	5.12	3.10	5.93
Interactions	11.19	6.80	2.50	3.47	-8.70	4.38	9.47	5.30	7.07	3.96	-2.40*	3.75
Below criterion	6.49	2.71	10.94	4.79	4.44	3.32	9.28	4.90	8.57	2.70	-0.71	5.51
Expected:												
Interactions	8.13	3.40	2.46	2.11	-5.67*	3.55	8.68	4.01	7.12	4.42	-1.56*	2.45
Main effects**	63.86	16.93	63.25	20.61	-0.61	8.34	70.86	9.99	75.18	7.82	4.53	8.83
N	13		13		13		10		10		10	

*p < 0.05

**0 controls involved in the expected interactions.

significantly greater when the post-test was time pressured than when it was not time pressured ($t(21) = 2.85$; $p<0.002$).

Time pressure also had significant effects on changes in the amount of below-criterion judgment variance (i.e., judgment error). The proportions of below-criterion judgment variance exhibited greater changes from a non-time pressured pre-test to a post-test when subjects' post-tests were time pressured. When the post-test was not time pressured, the mean change (from pre-test to post-test) was -0.71 decreasing from 9.28 to 8.57 percent of judgment variance. When the post-test was time pressured, however, the mean change was 4.44 increasing from 6.49 to 10.94 percent of judgment variance.

In sum, auditor-subjects' information processing strategies as captured by ANOVA judgment models were affected significantly by the imposition of time pressure. Generally, time pressure resulted in a decrease in configural information processing (as captured by the sum of all above-criterion interaction terms as well as the expected interaction terms). Furthermore, this decrease in configural information processing was accompanied by an increase in both non-configural processing (as captured by the sum of all above-criterion main effects) and in judgment instability (as captured by the sum of below-criterion terms).

Discussion

To the extent that configural information processing is believed to be appropriate in connection with the experimental task, time pressure would be viewed as having had a deleterious effect on the auditor-subjects' performance. Such a conclusion would be consistent with expectations based on: 1) audit studies reporting survey data concerned with pathological time-pressure responses such as premature sign-off [Kelly and Margheim, 1990; Alderman and Deitrick, 1982], 2) psychology studies using student subjects who generally would be expected to have little knowledge of, or experience in, managing the time pressures created in their experimental tasks [e.g., Rothstein, 1986; Wright, 1974], and 3) the few extant experimental studies using auditor subjects.

Elaborating on the experimental auditing studies, Choo and Firth [1992] described a study in which auditor-subjects assessed the risk that recorded accounts receivable did not exist under one of three levels of time pressure. The auditor subjects were given evidence from specified audit procedures (e.g., con-

firmation, inspection of subsequent collections, etc.) as the basis for their risk assessments.[7] This task is the same as that of experiment one in Brown and Solomon [1991], and although both studies were focussed on configural processing, Choo and Firth introduced time pressure in an effort to increase external validity. The results of Choo and Firth were consistent with those of the experimental illustration—configural processing was reduced by time pressure.

Other recent experimental studies of time pressure effects in audit settings include the two related studies by McDaniel [1990; 1992] In these studies, auditor-subjects performed an experimental task related to the year-end inventory audit procedures for a hypothetical auditee. Her subjects, assigned to one of two levels of time pressure in McDaniel [1990] and one of four levels of time pressure in McDaniel [1992], were required to identify and document seeded pricing and omission errors relevant to finished goods inventory and the related reserve account. For each of four objectives (completeness and valuation for the inventory asset and reserve accounts), the auditor-subjects determined which audit procedure to apply, the sample selection method and sample size to employ, and the conclusions to be reached based on the resultant evidence. McDaniel's [1990] results were that time pressure decreased audit effectiveness, enhanced audit efficiency only when the time pressure manipulation was extreme, and had enhanced auditor consistency by eliminating overly large sample sizes. Although McDaniel [1992] used the same task as McDaniel [1990], the focus of the later study was different. For present purposes, the most germane of her results was that when faced with time pressure, auditors may change the decision-making strategy they employ.

The results of these studies generally are consistent–time pressure had a largely deleterious effect on auditor judgment and decision making. Before etching this general proposition in stone, however, it is instructive to consider some of the features of the experimental illustration and the other experimental studies of auditor judgments and decisions under time pressure. In particular, notice that in both the illustrative experiment and Choo and Firth [1992], time pressure was unknown to the auditor until he/she was to perform a specific task. Further, these tasks were rather rigidly defined such that the auditor could only adopt limited tactical measures (e.g., work faster). Specifically precluded, therefore, were strategic measures to negate the effects of time pressure, such as bringing more resources to bear on the task, altering the audit strategy, and redefining the scope of the task.[8]

While some additional tactical measures could be adopted, constraints on strategic responses also were effectively imposed on the auditor-subjects in the

[7] Choo and Eggleton [1982] also investigated time-pressure effects using auditor-subjects. The results of that study are similar to that of the present illustrative study with the exception that configural processing seemed to be greater under time pressure than under no time pressure. This result should be interpreted with caution, however, because configural processing was measured on an ex post basis as the sum of all two- and three-way interactions rather than on an ex ante basis for predicted interactions. In addition, the time pressure manipulation in Choo and Eggleton was between-subjects and there only were five subjects in each condition.

[8] In this paper strategic responses are considered to be the establishment of audit goals and objectives as well as management control required to implement such goals and policies (e.g., audit program planning, audit work assignments, and review of audit work). Tactical responses, on the other hand, are considered to be the methods and procedures employed to effectively and efficiently perform the planned audit tasks. These definitions are similar to those employed by the management control literature [Anthony, Dearden and Govidarajan, 1992].

McDaniel [1990; 1992] studies. Nevertheless, McDaniel [1992], did report some evidence that auditors' behavior may be contingent upon task and context features such as time pressure. Consistently, a study by Kermis and Mahapatra [1985] also reported evidence suggesting that auditors take various tactical steps to cope with time pressure depending upon its severity. For example, it was reported by Kermis and Mahapatra that the amount of time devoted to some audit procedures may be reduced while the time allocated to other procedures may be increased.[9] Although some audit time pressure studies have permitted limited tactical responses to audit time pressure, no study has investigated strategic responses. Because various strategic options are available to auditors in the field, this is a serious limitation of audit time pressure research which may have caused both an overstatement of the deleterious effects of time pressure on auditor judgments and decisions and constrained the experienced auditor from demonstrating a superior ability (e.g., relative to students) to cope with such pressure.

The Adaptive Audit Decision Maker: A Time-Pressure Taxonomy

For many years, psychology researchers have argued that judgment and decision processes as well as the judgments and decisions themselves are influenced by a variety of considerations. More recently, psychology researchers began to recognize that judgment formulation and decision making may be characterized by a two-stage process in which the goal of the first stage is "deciding how to decide" while the second stage goal is to execute the chosen judgment and decision process [Payne, Bettman, and Johnson, 1988; 1990]. The conventional wisdom has become that during the first stage of this process (deciding how to decide), the judge/decision maker selects an approach which he or she perceives to be most appropriate for the task at hand [Beach and Mitchell, 1978; Payne, 1982] Perceptions of the appropriateness of judgment and decision strategies have been shown to be influenced by a variety of factors including justifiability [Tversky, 1972] and cognitive effort considerations [Simon, 1955] Since time pressure can be directly related to cognitive effort (i.e., constrained time generally requires increased cognitive effort), the perspective of people as strategic and adaptive decision makers has important, but heretofore largely unrecognized, implications for investigating time pressure effects in audit settings.

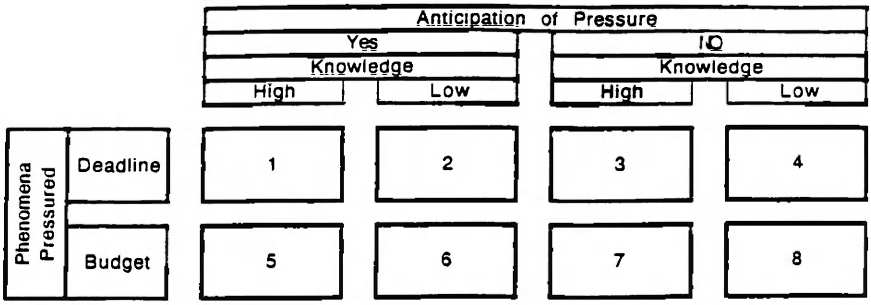
In considering potential time pressure effects within the auditing environment it is useful to employ the taxonomy shown in Figure 2. This taxonomy is structured around three variables: whether time pressure was anticipated by the decision maker (operationalized as either "yes" or "no"); the extent of the decision maker's knowledge about the potential time- pressure effects within the specific tasks being performed (operationalized as either "high" or "low"); and the nature of the time-pressure phenomena (either deadline or budget).

A structural feature of audit-engagement time pressure is the nature of the phenomena. That is, time pressure can be manifest either as "deadline" or as

[9] Kermis and Mahapatra [1985] was an experimental investigation in which time pressure was manipulated bewteen-subjects at four levels (ranging from no pressure to a 30% reduction from prior year's actual hours). The experimental materials, however, were mailed to the subjects. This procedural dimension differentiates the Kermis and Mahapatra study from the laboratory experiments mentioned earlier.

Figure 2

Time Pressures in Auditing: A Taxonomy



"budgetary" pressure. The increasing levels of competition within public auditing has resulted in substantial pressure to perform within increasingly stricter limits on audit resources allocated to an engagement. The most significant (costly) audit resource is auditor labor. Auditors, therefore, are not only given constrained amounts of time to perform tasks but are required to account on a task-by-task basis for the amount of time they actually take to complete each major portion of a task. Thus, budgetary pressure may arise because of constraints on the resources to be allocated in accomplishing particular tasks. For example, a requirement that a client's annual audit engagement be completed using no more than 200 staff hours would represent a budgetary pressure. On the other hand, deadline pressure may arise when there is a particular point in time by which specific tasks must be complete. For example, a requirement by the client that the annual audit opinion be delivered within six weeks of the fiscal year-end may create deadline pressure. These two time-pressure manifestations, however, may not be entirely independent. For example, one strategy for dealing with an unanticipated deadline would be to bring additional audit resources to bear in completing the required tasks which, in turn, may create a budgetary pressure.

Within the auditing environment, the extent to which time pressure can be anticipated is a critical feature that separates coping mechanisms into strategic and tactical responses. That is, when they are able to anticipate time pressure, auditors can strategically modify the planned audit program to cope with such pressure. For example, an expected budgetary pressure could be met with a reduction of substantive tests-of-details in favor of analytical procedures within certain areas (e.g., a retailer's fixed assets) such that sufficient resources are maintained for other areas (e.g., the retailer's cash receipts and inventories). On the other hand, when the time pressure has not been anticipated, many strategic responses are precluded and coping may be restricted to tactical responses of a more immediate nature. In the previous illustration, for example, having performed planned substantive procedures in a given area precludes reduction of such procedures to cope with an unanticipated pressure that arises during the execution of the audit program. When such pressure is an unanticipated deadline (e.g., the underwriter of an IPO wanting the stock issue to be effective a

month earlier than planned) the only effective response may be to bring additional audit resources to bear (again, potentially inducing unanticipated budgetary pressure).

Another feature critical in determining the extent and nature of time-pressure effects is the auditor's knowledge concerning the dysfunctional effects that can be caused by the pressure and his or her knowledge of effective strategies and tactical responses that can be employed to mitigate such effects. Such knowledge may be more affective in nature, learned through abstraction and generalization of audit experiences, than learned as a set of principles within a structured educational environment. If so, practicing auditors who have more experience with audit engagement time pressures should have greater knowledge of both time-pressure effects and coping strategies and tactics. Audit situations in which auditors' time pressure-related knowledge was low, therefore, would not be expected to occur frequently. It is true that junior-level auditors may not have acquired sufficient knowledge with which to understand fully potential time-pressure dysfunctionalities and to know appropriate responses for coping with such problems. However, viewing audit planning and performance as a team-based technology, senior-level members of the audit team should have sufficient knowledge (although some audit failures may have been due, in part, to a lack of such knowledge within the team-as-a-whole). Thus, adequate supervision should facilitate appropriate responses to all but the most rapidly occurring time pressures. The inclusion of "low" knowledge cells in the taxonomy is to facilitate discussion of extant academic research involving time pressure. Such research largely has employed subjects who, arguably, had low knowledge concerning time pressure effects and appropriate coping mechanisms within the experimental tasks in which they were required to perform.

Analyzing the earlier experiment and Choo and Firth [1992] in terms of the taxonomy presented above, the nature of the time pressure was budgetary. In particular, the amount of time that could be allocated to making the judgments required by the experimental task was limited physically. Since the possibility of time pressure was not known by the subjects until it was imposed, these experiments involved unanticipated time-pressure. Additionally, the subjects were audit seniors with significant auditing experience. Given the pre-test in which such subjects were filtered based on their ability to configurally process the information, all subjects in the illustrative experiment could be assumed to have high knowledge of the underlying phenomena (i.e., controls effective in ensuring that the objectives of cash disbursements authorization and validity are being met). In Choo and Firth, no such pre-test was employed. With respect to the subjects' knowledge about appropriate mechanisms for coping with the specific form of budgetary pressure employed in the experiment, neither study provided any evidence. Consequently, we consider the illustrative experiment and Choo and Firth to fall in cell No.7 of Figure 2, although we acknowledge that a case could be made for cell No. 8.

In the McDaniel [1990; 1991] studies, the time pressure was budgetary and the subjects were audit seniors who should be experienced at performing the experimental tasks. While not specifically tested in the studies, it is reasonable to assume that subjects had sufficient knowledge of the underlying phenomenon (i.e., substantive testing in connection with the inventory asset and reserve accounts) as well as limited experience in coping with the budgetary pressure introduced into the experiment. In these respects the McDaniel studies were

similar to the illustrative study and to a somewhat lesser extent, Choo and Firth [1992]. Also similar, time pressure was not known by the subjects until it was imposed. In one important respect, however, the McDaniel studies were different from the other studies. That is, the auditor-subjects were given a little more opportunity to use tactical measures to cope with time pressure than in the other studies. For example, in the McDaniel studies, the auditors could elect to perform procedures in a specified order or adjust the order in which they were performed so that those procedures thought to be more important could be accomplished within the allotted time. Nevertheless, the best placement of the McDaniel studies would seem to be cell No. 7 of Figure 2.

Audit Time Pressure: An Agenda For Research

In the preceding section, because the auditor-subjects in each of the experimental studies reviewed were unaware of the time pressure until it was imposed, it was argued that they were able to adopt some tactical measures (e.g., accelerate decision-making, filter information, reduce or eliminate more complex, and thus more time consuming, configural cue processing), but were effectively precluded from employing virtually all strategic mechanisms for coping with the pressure. It is our contention that while such situations may be of interest (especially to those interested in applying theories of harassed decision making in the audit setting; see Wright, [1974]), to the extent that the goal is to paint an objective picture of the affect of time pressure on audit judgments and decisions, audit researchers would seem to have over-invested in these types of studies. Further, we contend that one potential consequence of such over-investment is that little presently is known about *how and how well auditors use strategic measures in situations for which time pressures are anticipated.* A second-order consequence, therefore, as noted earlier, is that audit research may have overstated the negative consequences of time pressure.

Our agenda for audit time pressure research has both descriptive and evaluative foci and thus, will address the following general questions:

1. What strategies are adopted by knowledgeable auditors to cope with anticipated budgetary time pressures?
2. In what situations do knowledgeable auditors consider these potential strategies to be more or less appropriate?
   a. How are such strategies related, if at all, to the nature and timing of the tasks being performed (e.g., planning audit procedures versus executing planned procedures)?
   b. How effective and efficient are these strategies (i.e., what are their relative costs and benefits)?
3. To what extent do knowledgeable auditors, when they anticipate budgetary time pressure, select the most appropriate strategies?

To illustrate how these general questions might be operationalized within specific audit contexts, in the remainder of this section, we identify select examples from the perspective of cell No. 5 of Figure 2. Importantly, we also will argue that different research methods (e.g., laboratory experiments, field experiments, fields studies) should be employed depending upon the question to be addressed and the current state of knowledge with respect to that question. We have selected cell No. 5 because it provides a striking contrast with the cell (No. 7) in which the extant research would appear and because it represents

frequently occurring circumstances. Cell No. 5 would arise, for example, if an audit firm were to secure a new or continuing engagement through a competitive bidding process which resulted in a relatively low audit fee. In turn, this low audit fee, is assumed to create budgetary time pressure which is known at the onset. Additionally, the auditors are assumed to have the requisite minimum task knowledge and are assumed to be experienced in such task performance under time pressure.

An interesting starting point is to consider that if time pressure were anticipated early in the audit, it may be possible for the auditor to deal with it during audit planning by making *strategic administrative assignments.* That is, in assigning auditors to the engagement, it may be possible to substitute more experienced and knowledgeable auditors for less experience/knowledgeable auditors in various facets of the engagement. Such substitution would seem to have at least two potential benefits. First, to the extent that more experienced/knowledgeable auditors take less time to perform audit procedures, a direct time savings may result. Second, to the extent that more experienced/knowledgeable auditors perform more effectively, it may be possible to subject their work to a somewhat less exhaustive review process. Consistently, even if the review process itself were not modified, it would seem reasonable to expect that more experienced/knowledgeable auditors would spend less time clearing review notes etc. Although strategic administrative choices would seem to be an obvious mechanism for coping with audit time pressure, little presently is known about the staff assignment process within audit organizations either in the absence or presence of time pressure. Both descriptive and evaluative research of this type, therefore, would seem to be of value.

Another strategic aspect of audit planning and administration concerns the extent to which audit technology is to be used on an engagement. For example, it may be possible to cope, at least partially, with anticipated budgetary time pressure by using sophisticated technology such as expert systems. It also may be possible to use technology to perform more extensive and powerful analytical procedures [Bailey, Graham and Hansen, 1988]. Closely related to such technological options is the choice among the various approaches to producing sufficient, competent audit evidence. That is, as is well known, audit evidence may be produced using various mixes of audit procedures. For example, under anticipated budgetary time pressure, auditors may be less likely to plan to perform extensive tests-of-details or more or less likely to attempt to rely on the client's control structure. Auditors also may be more or less likely to use statistical approaches to planning audit sampling. While descriptive research on these potential time pressure coping mechanisms would be of considerable value, it also should be obvious that there are attendant audit effectiveness implications.

We next shift our focus from strategic planning and administration to *strategic execution* of audit activities. For reasons of expositional parsimony, we restrict our focus to one class of audit procedures— analytical procedures. This class was chosen because performing analytical procedures requires the auditor to perform the various component judgment and decision activities (i.e., problem representation, hypothesis formulation, information search, information processing and hypothesis testing, action choice) found elsewhere in the audit. Consequently, much of what is presented may be readily generalized to other procedure classes.

The shift from planning to an execution perspective, makes salient a variety

of fundamental questions. In particular, descriptive research on the impact of time pressure on each of the component judgment and decision activities would seem to be of value. For example, how does anticipated budgetary time pressure impact auditors' information search activities and hypothesis-testing strategies? At a more basic level, questions like the following might be posed about auditor behavior when faced with anticipated budgetary time pressure relative to non-pressured situations: (1) Are auditors more or less pre-disposed to employ statistical approaches to analytical review? (2) Are auditors more or less pre-disposed to employ decision aids to facilitate hypothesis formulation? (3) Do auditors plan to test hypothesis sets which are truncated to a greater or lesser extent? (4) Do auditors plan to sequentially test hypotheses and are they predisposed to focus first on those hypotheses which are more favorable to the client (e.g., non-error explanations for analytical review fluctuations)? (5) Do auditors make greater use of positive-test strategies? and (6) To what extent are the answers to questions like those just posed dependent upon client-specific factors (e.g., industry, risk level etc.)? Again, these are but a few of the questions which might be addressed to shed light on strategic audit execution under time pressure.

Shifting from execution to the perspective of a *strategic audit review process*, illustrative research questions would seem to be manyfold, but two are most salient. First, how and to what extent do auditors vary the nature and extent of their review activities as a consequence of time-pressured audit planning and execution? To elaborate, as previously noted, if especially experienced/knowledgeable auditors were assigned to the engagement because of the anticipation of budgetary time pressure, a strategic reviewer might perform a less exhaustive analysis of portions of the working papers. In such situations, descriptive research documenting the nature of the strategic review process modifications would seem to be of value. Second, to what extent does the audit review process result in the addition of audit procedures etc., which may have been trimmed during initial execution due to time pressure?

Before concluding this section, a few comments are in order about research methods for investigating questions like those just described and motivations for incorporating time pressure into research contexts. With respect to the former issue, because different research methods have different comparative advantages, it would seem to be a mistake to rely to the same extent as prior audit time-pressure research on surveys and laboratory experiments. Rather, we believe that field surveys and experiments are appropriate methods to use during theory building to investigate many of the descriptive questions just specified. As is the case for research focussed on other issues, such methods would seem to have the comparative advantage of facilitating identification of relevant variables. In addition, when investigating the audit effectiveness implications of identified time-pressure coping mechanisms, field studies would seem to be invaluable. For example, field studies could be conducted to determine the frequency with which audit failures arise from time-pressured audit engagements as well as the strategic actions taken, if any, which failed to effectively overcome the time pressure. Only after the resultant theory has been sufficiently developed would laboratory experimentation be efficient.

Lastly, it recently has been argued that greater representation within research contexts of important audit contextual features will be critical to the next generation of audit judgment and decision research studies [Solomon and Shields, 1993]. Because time pressure is an ubiquitous feature of audit contexts which

can have a pervasive impact on auditor judgment and decision making, researchers may want to incorporate time pressure into studies designed to investigate other audit-judgment and decision-making issues. To illustrate, considerable research has been reported in which the focus was auditor expertise and/or experience effects [e.g., Davis and Solomon, 1989]. With a few exceptions, those studies have been unable to identify systematic experience or expertise effects. But the contexts of these studies have been rather undeveloped, generally not incorporating features like multi-person interaction, review process feedback, accountability, and time pressure which, in concert, distinguish auditing from other judgment and decision making contexts. One possibility is that contextual features like time pressure interact with other aspects of judgment and decision making such that the presence of time pressure is a necessary (or sufficient) condition for such aspects to be revealed. Thus, it may be that in the presence of time pressure experienced auditors' judgment and decision making will exhibit some characteristics often associated with expertise but not (or less so) when time pressure is absent. For example, auditors under time pressure may exhibit some parallel information search and processing strategies whereas only serial strategies may be evident when time pressure is absent.

Concluding Remarks

In this paper, we have reviewed extant judgment and decision research on the effects of time pressure in auditing, described a representative time-pressure experimental study, critically analyzed the extant research (including our illustrative study), provided a taxonomy for investigating audit time-pressure effects and, based on the taxonomy, described an embryonic agenda for redirecting audit research efforts. While this agenda was fleshed out on an illustrative, but not exhaustive, basis only for one of the cells in the taxonomy, generalization to other issues and other cells should be facilitated. Critical themes in our discussion have been that extant research has not done a good job of depicting how and how well auditors cope with time-pressure effects in natural settings. This critical conclusion rests on the argument that most extant research has precluded the auditor from taking any strategic actions in the presence of time pressure and many tactical actions also have been precluded. Often, the only available options have been to work faster and when extreme time pressure has been introduced, the predictable deleterious effects were discerned.

Our approach has been to assume that although in concept extreme time pressure may be present, it may be precluded by the various audit organization controls. In addition, we have noted that extant research has already documented the obvious—when given no other options except to work harder and when this is not enough, work less is what auditors do. However, we also have argued that such research can tell us very little about the more common and interesting situation in which time pressure is present but less extreme and such time pressure has been anticipated by a knowledgeable and experienced auditor (or audit team). Focussing on such situations amounts to a re-direction of audit time-pressure research to how and the extent *to which the auditor works smarter in the presence of time pressure?*

Appendix A

Cash Disbursements Internal Control Case

Assume you are a senior-level auditor and that one of your clients is Nortack, Inc. Nortack, a large processor and merchandiser of agricultural commodities, is a privately-held company that has debt covenants requiring audited financial statements prepared in accordance with GAAP. The company has not presented significant auditing problems during your firm's five-year tenure as its public auditor. Nortack's management is actively involved both in designing the company's internal controls, as well as reviewing existing internal controls. The employees who administer Nortack's internal controls are well trained and supervised, with clearly defined responsibilities. Nortack has relatively autonomous internal audit department that is adequately staffed and supervised; the department head was a manager for a Big Eight CPA firm, and most of the internal auditors have CPA certificates. During the past five years, Nortack has been computerizing its accounting and information systems.

Currently, you are planning Nortack's 1988 audit engagement and are evaluating its internal controls to determine the extent to which you will rely on them in planning the year-end audit work. For sixteen randomly ordered cases, you will be presented with a portion of a cash disbursement internal control questionnaire completed by an auditor on your staff. For each case, you will be asked to assess the risk that the specified controls could give rise to a material misstatement of cash disbursements as a result of checks being written and/or disbursed for improper (unauthorized and/or invalid) purposes. Additional cash disbursement controls information:

A. The authorization for approving expenditure requests has been designated by the Board of Directors at various management levels, depending upon the nature and amount of the request. Expenditure authorization is indicated on purchase orders.

B. The cash disbursement department has the responsibility for verifying the propriety of expenditures and for recording them in the voucher register. The original copy of the voucher has a copy of the vendor's invoice, receiving report and purchase order attached.

C. Primary check signers carefully scrutinize vouchers and supporting documentation at the time checks are signed.

D. When they exist, second check signers are independent of all other expenditure and cash disbursement functions.

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