Audit Techniques & Inventory Fraud Detection In Accounting Information Systems

Dr. Glen D. Moyes, (gdmoyes@erols.com), Morgan State University

Abstract

The purpose of this study was to investigate the effectiveness of audit techniques in detecting fraud. Eighty-six auditors evaluated each of 56 audit techniques in the Inventory and Warehousing Cycle as being "more", "average", or "less" effective in detecting management fraud in accounting information systems. These 56 audit techniques are used to collect evidence regarding inventory which provides, in part, the basis of the auditor's reports. This study surveyed three different types of auditors. The perceptions of fraud detection effectiveness of five specific audit techniques varied among the different types of auditors.

Introduction

The primary objective of this study is to explore the degree of effectiveness of inventory and Warehousing Cycle audit techniques to detect fraud in accounting information systems. Audits of publicly held corporations that fail to detect fraud generally result in financial losses for investors and creditors as well as in lawsuits and sometimes large settlements against the independent auditors. Statement of Financial Accounting Standard No. 53 (AICPA, 1996) states that the auditor should design the audit to provide reasonable assurance of detecting fraud which causes material misrepresentations in the financial statements. To provide information on this critical issue, eighty-six auditors were asked to evaluate the effectiveness of 56 standard audit techniques (listed in Tables 2, 3 and 4) in the Inventory and Warehousing Cycle in detecting management fraud.

A second objective of this study is to determine if the type of auditor (i.e., external or internal auditor) influences the degree of effectiveness of any given audit technique to detect fraud. For example, the fraud detecting effectiveness of a particular audit technique may vary based on the type of auditor. To examine this issue, questionnaires were mailed to these different auditor groups: (1) Certified Public Accountants (External auditors) specializing in auditing publicly held corporations; (2) Certified Public Accountants (Governmental auditors) specializing in auditing governmental entities; and (3) Internal auditors specializing in auditing publicly held corporations.

Prior Studies

Previous research concerning fraud detec-

tion has focused primarily on so called "red flags" which are defined as conditions or circumstances that indicate potential fraud. In a study conducted by Albrecht and Romney (1986), 87 red flags were evaluated as being predictors of fraud. Questionnaires were sent to CPA firms which were divided into two groups. The control group consisted of 10 partners who had not detected fraud, and the experimental group comprised of 10 partners that had detected fraud. Out of a list of 87 red flags, 31 were found to be significant as predictors of management fraud.

Loebbecke, Eining, and Willingham (1989) also used a red flags approach to develop a conceptual model to assess the probability of the occurrence of material management fraud. They surveyed 277 audit partners at KPMG Peat Marwick. In the Loebbecke-Willingham risk assessment model, the dependent variable was the probability of material irregularity. The three independent variables of the model were grouped into three categories as follows: (1) the conditions under which material management fraud could occur; (2) the motivation of individuals to commit management fraud; and (3) the attitudes of individuals that permit themselves to commit management fraud. Loebbecke et. al. concluded that the auditor's evaluation of the client's control environment is important in order to assess the likelihood of material misstatements during the planning of the audit. For example, weak controls create a significant condition that would allow management fraud, defalcation, or an error to occur.

In a follow-up study, Bell, Szykowny, and Willingham (1991) investigated 305 non-fraud cases and 77 fraud cases using bivariate analysis. The authors changed the Loebbecke-Willingham conceptual model into a cascaded logit model in which the auditor assigned weights to the component risk factors. In this cascaded logit model, the overall risk assessment was determined by combining the Conditions Risk assessment, the Motivation Risk assessment, and the Attitude Risk assessment. The cascaded logit model estimated the probability of fraud occurring based upon the auditor's judgments concerning the cli-

ent conditions. The fraud predictive ability of the Bell-Szykowny-Willingham model may be useful to assist auditors in planning audits. They also indicated analytical review as planning procedures may contribute to the auditor's assessment of the risk of material misstatements. In addition, when client's controls are determined to be weak, management integrity becomes a more critical consideration.

In a field experiment conducted by Pincus (1989), 137 mid-level accountants of a large CPA firm evaluated the possibility of assessing fraud during the planning of the audit. In this experiment, the subjects were divided into two groups: (1) 68 accountants who used red flags questionnaires, and (2) 69 accountants who did not use the questionnaires. Pincus concluded that the use of red flags questionnaire caused increased auditor comprehension and uniformity in data collection as well as assisted auditors in assessing the risk of fraud during the planning stage of the audits.

Albrecht (1994) summarized the causes of why people commit fraud. These interacting factors are as follows: (1) situational pressures originating from management and/or corporate environment that cause managers/employees to commit fraud, (2) opportunities that permit and/or encourage fraud to be committed, and (3) management justifies unethical conduct as acceptable with plausible but untrue reasons.

In most cases, the previous literature has suggested a red-flag approach to estimate the possibility of potential fraud in accounting information system. This paper extends the literature by suggesting that ordinary audit techniques may improve the detection of fraud. Evaluations by practicing auditors can develop an general understanding of which specific audit techniques are considered relatively more effective in detecting fraud.

Statement Of Auditing Standard No. 53

Statement of Auditing Standard (AICPA, 1996) *The Auditor's Responsibility to Detect and*

Report Errors and Irregularities states that auditors should exercise due care in planning, performing, and evaluating the results of audit procedures and maintain the proper degree of professional skepticism to achieve reasonable assurance that material errors and irregularities will be detected. SAS No. 53 (1989) also defines errors as "unintentional misstatements or omissions of amounts or disclosures in financial statements." Furthermore, it defines irregularities as "intentional misstatements or omissions of amounts or disclosures in financial statements," which are referred to as management fraud. Detection of both errors and irregularities should be part of an effective audit plan for an accounting information system. New knowledge obtained from this study that pertains to the effectiveness of the Inventory and Warehousing Cycle audit techniques may improve the actual fraud detection by auditors.

Research Design

A Likert scale on the questionnaires measured the auditors' perceptions of the degree of effectiveness of audit techniques in detecting fraud. The Likert rating scale was established from 5 to 1 as follows:

Extremely effective in detecting fraud	5
Effective at detecting fraud	4
Moderately effective in detecting fraud	3
Slightly effective in detecting fraud	2
Not effective in detecting fraud	1

From mailing lists provided by professional accounting organizations, 459 respondents were selected by systematic random sample, and 153 questionnaires were mailed to each of three auditor groups (External, Governmental and Internal). A total of 86 usable questionnaires were returned which represents a 19 percent response rate. The Internal auditor group returned more completed questionnaires than the External and Governmental auditor groups. The higher response rate of the Internal auditors may be a result of the cover letter which stated that the research study was supported by the Institute of Internal Auditors.

Auditors' Background

Table 1 summarizes selected demographic information about the auditors. In analyzing the demographic information, all the External and Governmental auditors were Certified Public Accountants (CPAs), whereas only 52 percent of the Internal auditors were certified. Also, 35 percent of the Internal auditors and 7 percent of the External auditors were Certified Internal Auditors. Most (92 percent) of all the respondents held some type of accounting certification which implies a minimum level of professional and technical competence.

Based on the total number of employees, the average size of organizations employing Internal auditors was 7.8 times larger than CPA firms auditing Government entities and 5.2 times larger than other CPA firms (External) auditing publicly held corporations.

Auditors' Fraud Detection Rates

In Table 1, reference to the length of auditors' experience and the percentages of auditors and their organizations which have detected fraud indicate that CPA's (External and Governmental auditors) with more years of auditing experience achieved higher fraud detection rates than Internal auditors. In comparison, publicly held corporations that experienced the highest fraud detection rate of 96 percent employed Internal auditors with less auditing experience than the CPA's (External and Governmental auditors).

In contrast to the findings of this study, another study conducted by Loebbecke, Eining and Willingham (1989) found only 50 percent of the audit partners had experience in encountering or detecting material irregularity. The 50 percent of audit partners in the Loebbecke study who had detected fraud is relatively close to the 57 percent of External auditors in our study who have detected fraud in accounting information systems.

Table 1
Demographic Information Concerning Auditors

	Combined	Three Auditor Groups		
		External	Governmental	Internal
Number of Respondents	86	14	24	48
Auditors' Experience (Mean)	15.4 Years	15.8 Years	21.8 Years	12.1 Years
Size of Auditing Organizations (Mean)	4,554 Employees	1,396 Employees	928 Employees	7,269 Employees
Number Who Are CPAs	63 (73%)	14 (100%)	24 (100%)	25 (52%)
Length of Time as CPAs (Mean)	13.8 Years	14.9 Years	19.1 Years	8.2 Years
Number Who Are CMAs	1 (1%)	0 (0%)	0 (0%)	1 (2%)
Length of Time as CMAs (Mean)	12 Years	0 Years	0 Years	12 Years
Number Who Are CIAs	18 (21%)	1 (7%)	0 (0%)	17 (35%)
Length of Years as CIAs (Mean)	11.8 Years	8 Years	0 Years	12 Years
Auditors Who Detected Fraud	64 (74%)	8 (57%)	20 (83%)	36 (75%)
Organizations That Have Detected Fraud	76 (88%)	9 (64%)	21 (88%)	46 (96%)

Research Methodology

Data from the returned questionnaires consisted of the auditors' responses concerning the fraud detecting effectiveness of the 56 audit techniques. Means were computed from the 86 auditor responses for each of the 56 audit techniques evaluated from each of the three auditor groups individually and also from the three auditor groups combined. The mean represented how effective each technique is in detecting fraud as perceived by the auditors.

In addition, one overall mean of 3.2308 was calculated for the total 56 techniques based on the responses from all three auditor groups combined (all 86 auditors). This overall mean represented the perceived fraud detecting effectiveness of the hypothetical average audit technique in the Inventory and Warehousing Cycle. To analyze the data, the overall mean was used as the criteria to determine the degree of effec-

tiveness in detecting fraud for each audit technique. The Student's t-tests were used to determine if differences between the overall mean as the criteria and the mean response of each technique were significant or not at a 5 percent significant level. As a result, each audit technique was classified into one of three categories: "more", "average", or "less", and each category represented a varying degree of effectiveness in detecting fraud. If the mean of a technique exceeded the overall mean by a significant difference, that technique was evaluated as "more" effective than the average technique in detecting fraud. Conversely, if the mean of a technique was below the overall mean by a significant difference, that technique was evaluated as "less" effective than the average technique in detecting fraud. Finally, no significant difference between the overall mean and the mean of a given technique indicated that the technique was evaluated as having "average" effectiveness in detecting fraud.

Results

In the Inventory and Warehousing Cycle, the degree of effectiveness of each of the 56 standard audit techniques for detecting fraud was classified into one of three categories: "**more**", "**average**" or "**less**" as illustrated in Tables 2, 3 and 4. The audit techniques appear in the descending order of their statistical significance but not in the order that the auditors would use the techniques in audits of accounting information systems. The particular order that auditors actually use the techniques vary among CPA firms.

Audit Techniques Evaluated as More Effective in Detecting Fraud

Out of the 56 techniques in the Inventory and Warehousing Cycle, 14 audit techniques were evaluated by all 86 auditors as being "**more**" effective than the average technique in detecting fraud in accounting information systems. In fact, the average of the responses of all 86 auditors for each of the 14 "**more**" effective audits techniques came out to be greater than the 3.2308 overall mean which represents the effectiveness of an average audit technique in detecting fraud. Statistically, the mean values of these 14 audit techniques exceeded the overall mean by approximately one standard deviation (t values were greater than 2). Table 2 summarizes the auditors' responses for each of the 14 "**more**" effective audit techniques within the Inventory and Warehousing Cycle. In Table 2, each mean score represents the auditors' estimated effectiveness of one audit technique to detect fraud.

The 14 "**more**" effective techniques generally involve procedures such as reviewing, tracing, computations, and auditors' confirmations. The interpretations of using these techniques in the audits of accounting information systems are summarized in the following: (1) identify related party purchase and sale transactions and verify these transactions do not depart from Generally Accepted Accounting Principles; (2) verify the existence and accurate physical counts of inventory goods in all locations, including public

warehouses; (3) confirm the physical security and protectiveness of the inventory goods; (4) determine that the access to inventory goods is limited only to authorized personnel; (5) trace to verify price and quantity agreement of inventory purchase transactions among documents such as purchase orders, receiving reports, purchase invoices, purchase journal entries and inventory records; (6) trace to verify price and quantity agreement of inventory sales transactions among documents such as customer sales orders, bills of lading, sales invoices, sales journal entries and inventory records; (7) reconcile quantity differences between physical inventory counts and perpetual inventory records; and (8) verify the monitoring procedures of inventory goods received, shipped or in transit. These particular techniques are used to collect audit evidence such as to discover any fraudulent shortage of inventory goods in stock and falsification of inventory records. Also, these techniques are involved in the direct collection of evidence. Thus, those audit techniques that directly collect evidence are considered "**more**" effective for detecting management fraud.

The 14 "**more**" effective fraud detecting audit techniques should be extensively utilized in the beginning of the audit of accounting information systems. The most appropriate time to use these techniques is the planning stage of the audits where the preliminary evaluation and compliance testing of internal controls are performed. This practice would provide auditors with the earliest possible indications of potential fraud during the planning of the audit and the compliance testing of the internal controls. Earlier indications of potential fraud would allow more time for auditors to re-plan and expand the scope of the audit examination as well as to concentrate the application of "**more**" effective audit techniques in the areas, where the occurrence of fraud is suspected in order to increase the actual detection of fraud.

Discovery of related party transactions was one of the 14 techniques perceived by the 86 auditors as having "**more**" fraud detecting effectiveness. The existence of related party transac-

Table 2
14 Audit Techniques Evaluated As "More" Effective In Detecting Fraud

Audit Techniques		Mean	Std. Dev.	t Value
1.	Discover related party transactions.	4.0385	.918	7.77**
2.	Follow up all exceptions to make sure they are resolved.	3.9740	1.000	6.52**
3.	Review major adjustments for propriety.	3.9474	.951	6.57**
4.	Review inventory count procedures: 1. Accounting for items in transit (in and out); 2. Comparison of counts with inventory records; and 3. Reconciliation of differences between counts and inventory records.	3.8312	.909	5.80**
5.	Review adequacy of physical security for the entire inventory.	3.8052	.859	5.87**
6.	Confirm inventories in public warehouses.	3.8052	.918	5.49**
7.	Review procedures for receiving, inspecting, and storing incoming items and for shipments out of the warehouse.	3.7922	.908	5.42**
8.	Trace shipments to sales records, inventory records, and bills of lading (shipping documents).	3.6486	.913	3.94**
9.	Determine if access to inventory area is limited to approved personnel.	3.5867	.887	3.48**
10.	Observe the physical count of the inventory at all locations.	3.5714	1.081	2.76**
11.	Recount a sample of client's counts to make sure the recorded counts are accurate on the tags (also check descriptions and unit of count, such as dozen or gross).	3.5200	1.057	2.37*
12.	Trace inventory listed in the schedule to inventory tags and auditor's recorded counts for existence, description, and quantity.	3.4868	1.000	2.23*
13.	Trace shipments to sales journals.	3.4459	.924	2.00*
14.	Perform compilation tests to insure that inventory in the inventory listing schedule agrees with the physical inventory counts.	3.4416	.896	2.06*
Overall Combined Group Mean = 3.2308; * = 5 % Significance Level; ** = 1 % Significance Level				

tions is usually considered a red flag that has been found in previous literature to be an indication of possible fraud. Loebbecke, Eining and Willingham (1989) reported various red flags that existed in the management fraud cases as discussed in Securities and Exchange Commission Accounting Series Releases. They concluded the presence of related party transactions was a potential condition for management fraud to occur.

Audit Techniques Evaluated as Having Average Effectiveness To Detect Fraud

In Table 3, 27 audit techniques were evaluated by all 86 auditors as having "average" effectiveness to detect fraud since no significant

differences existed between the mean values of these 27 audit techniques and the 3.2308 overall mean which represents the average effectiveness of a technique to detect fraud within the Inventory and Warehousing Cycle in accounting information systems.

Most of the 27 audit techniques evaluated as having "average" effectiveness in detecting fraud involve procedures such as comparisons, examinations, observations, identifications, and inquiries. The interpretations of using these techniques in the audits of accounting information systems are summarized in the following: (1) verify descriptions of the inventory goods as being accurate and complete; (2) document inventory internal controls by flow charting; (3) per-

Table 3
27 Audit Techniques Evaluated as Having "Average" Effectiveness To Detect Fraud

Audit Techniques				
1.	Account for all used and unused tags to make sure none are lost, added or intentionally omitted (record tag numbers for those used and unused for subsequent follow-up).	3.4286	.979	1.77
2.	Trace from inventory tags to the inventory listing schedules and make sure inventory on tags are included.	3.4079	.969	1.59
3.	Verify that inventory balances on inventory listing schedules agree with perpetual records (inventory subsidiary ledger).	3.4026	.963	1.56
4.	Examine inventory descriptions on the tags and compare to the actual inventory for raw materials, work in process, and finished goods.	3.3816	1.006	1.31
5.	Send confirmations to lenders for pertinent details about warehouse receipts pledged as collateral for liabilities.	3.3733	1.148	1.08
6.	Record client's counts for subsequent testing.	3.3684	.978	1.23
7.	Flow chart internal controls and compare with written policies.	3.3506	1.073	.98
8.	Trace inventory tags identified as non-owned during the physical observation to the inventory listing schedule to make sure that they have not been included.	3.3289	1.025	.83
9.	Test pricing by tracing unit costs from vendors' invoices to the perpetual inventory records.	3.3288	.958	.87
10.	Inquire as to inventory in other locations and as to consigned inventory or customer inventory included on client premises.	3.3247	.910	.91
11.	Examine shipping area for inventory set aside for shipment, but not counted.	3.3158	.836	.89
12.	Examine receiving area for inventory that should be included in the physical count.	3.2857	.886	.54
13.	Identify slow-moving, obsolete, or damaged items within the inventory.	3.2800	1.122	.38
14.	Tour warehouse facilities and become familiar with storage, marking, and location procedures.	3.2468	.962	.15
15.	Observe that damaged or obsolete goods are valued at net realizable value.	3.2368	1.094	.05
16.	Review warehouse records for duplicate locations for the same items.	3.2338	.841	.03
17.	Review policies regarding returns.	3.2237	1.028	-.06
18.	Perform analytical procedures by computing the ratios and comparing them with previous years.	3.2078	1.017	-.20
19.	Trace balances of inventory listing schedules to the general ledger.	3.1974	1.071	-.27
20.	Review the last receiving report used at year-end to make sure the inventory for that item is included in the physical inventory.	3.1818	1.010	-.43

Table 3 Continued

21.	Perform purchases cutoff test to insure that goods in transit on F.O.B. shipping point basis are recorded as purchases and included in inventory.	3.1622	1.060	-.56
22.	Review the last shipping document used at year-end and make sure the inventory for that item was excluded from the physical count.	3.1558	1.027	-.64
23.	Observe that non-owned goods are either identified or segregated.	3.1316	.838	-1.03
24.	Compare the count of larger items stated on the tags to the counts in the prior year and the perpetual inventory records.	3.0909	.948	-1.29
25.	Review contracts with suppliers and customers and inquire with management for the possibility of the inclusion of consigned or other non-owned inventory, or of owned inventory that is not included.	3.0779	.823	-1.63
26.	Compare the classification of raw materials, work in process, and finished goods by comparing the descriptions on inventory tags and the auditor's recorded test counts to the inventory listing schedule.	3.0658	1.181	-1.22
27.	Evaluate whether the percent of completion recorded on the tags for work in process is reasonable.	3.0132	.986	-1.92

form analytical procedures to determine mathematical ratios and identify deviations from the prior year; (4) verify that all current year's inventory purchase and sale transactions are recorded in the same period; (5) verify that any inventory purchase and sale transactions from the next year are not recorded at the end of the current period; (6) insure that by year-end, purchased goods in transit as F.O.B. shipping point are included in inventory records and as F.O.B. destination are excluded from inventory records; (7) verify that goods consigned at other locations are included in inventory records at the end of the period; (8) identify slow-moving, obsolete or damaged goods in inventory and record these goods at net realizable value; (9) send confirmations to lenders to verify inventory pledged as collateral for liabilities; (10) compare vendors' invoice costs of goods purchased with perpetual inventory records; and (11) review the policies concerning consumers' returns of goods previously sold. These 27 "average" effective techniques primarily test either the application of important Generally Accepted Accounting Principles or the existence and operational functioning of relevant internal controls. As a result, audi-

tors using these techniques can identify missing or weak internal controls which could allow fraud to occur. Used in the following prescribed procedure, these techniques can possibly detect the occurrence of future fraud. If internal controls are identified by these techniques as missing, such internal controls should be recommended for implementation after the completion of audits. Provided the operational effectiveness of internal controls are identified by these techniques as weak, the operational effectiveness of the such weak controls should be recommended for improvement after the audit completion.

The 27 "average" effective audit techniques should be extensively utilized as substantive testing during the audit of the financial statements. This practice will enhance the actual detection of management fraud throughout the duration of the audit examination. Such indications of potential fraud occurrence resulting from using these "average" effective techniques allows the auditors time to re-plan the audit process by extending the substantive testing and increasing the length of the audit.

The audit technique regarding the performance of analytical procedures by computing ratios and comparing with prior years' ratios was evaluated as having "average" effectiveness in detecting fraud. This finding differs from the recommendations of Generally Accepted Auditing Standards. Statement of Auditing Standard No. 56 (AICPA, 1996), *Analytical Procedures*, requires the use of analytical procedures in the planning stage, field work, and the final review stage of financial statement audits. SAS No. 53 (AICPA, 1996), *The Auditor's Responsibility to Detect and Report Errors and Irregularities*, recommends performing analytical procedures to gather evidence as indicators of material misstatements that include irregularities. Based on the expectations implied in the auditing standards, the fraud detecting effectiveness of analytical procedures should be evaluated at a higher level.

Audit Techniques Evaluated as "Less" Effective for Detecting Fraud

Table 4 presents the remaining 15 audit techniques evaluated by all 86 auditors as being "less" effective than the average technique for detecting fraud in accounting information systems. In fact, the average of the responses from all 86 auditors for each of the 15 "less" effective audit techniques came out to be smaller than the 3.2308 overall mean which represents the effectiveness of an average audit technique in detecting fraud. Statistically, the mean values of these 15 audit techniques are below the overall mean by approximately one standard deviation (t values were less than -2).

Most of the 15 techniques evaluated as having "less" fraud detecting effectiveness involve procedures in which auditors discuss with client managers, account for the collected evidence, verify the facts, and consider the situation/circumstance. The interpretations of using these techniques in the audits of accounting information systems are summarized in the following: (1) inquire with managers to gather general information; (2) examine financial statements to verify full and adequate disclosure con-

cerning inventory; (3) determine if inventory valuation methods such as FIFO or LIFO are applied correctly and consistently; (4) verify the costing/pricing of purchased inventory by tracing to invoices; (5) re-compute inventory by multiplying physical counts by unit costs/prices; (6) account for direct labor cost, direct material cost, and overhead cost components involved in the valuation of manufactured inventory; and (7) analyze the variances originating from a standard cost system. Most of the 15 audit techniques relate in different ways to the valuation of inventory and are evaluated by auditors as being "less" effective in detecting fraud. In fact, these techniques seem to indirectly collect evidence. Therefore, those audit techniques that both indirectly collect evidence and test inventory valuation are considered "less" effective in detecting management fraud.

These 15 "less" effective techniques should not be used extensively in the audit process, if the auditors suspect the possibility of irregularities (management fraud) occurring. In such audit cases, the auditors should use other techniques evaluated as having "more" or "average" effectiveness to detect fraud.

Several audit techniques which perform simple analytical procedures were evaluated as being "less" effective in detecting fraud. Again, these findings contradict recommendations of Generally Accepted Auditing Standards. SAS No. 56 (AICPA, 1996), *Analytical Procedures*, requires the use of analytical procedures in the planning stage, field work, and the final review stage of financial statement audits. SAS No. 53 (AICPA, 1996), *The Auditor's Responsibility to Detect and Report Errors and Irregularities*, recommends performing analytical procedures to gather evidence as indicators of material misstatements that include irregularities. It seems that practicing auditors' perceptions of the fraud detecting effectiveness of analytical procedures are less than the expectations of the auditing standards.

Table 4
15 Audit Techniques Evaluated as Less Effective in Detecting Fraud

Audit Techniques		Mean	Std. Dev.	t Value
1.	Compare current inventory levels and values with previous years and evaluate.	3.0260	.873	-2.06*
2.	Verify pricing by locating the appropriate and sufficient invoices to account for the entire quantity of inventory for the particular item being tested, especially for FIFO valuation method.	2.9868	.986	-2.16*
3.	Account for the direct material costs, direct labor costs, and overhead costs involved in the valuation of manufactured inventories.	2.9737	.993	-2.26*
4.	Determine whether costs should be included in the valuation of a particular item of purchased inventory such as freight, storage, discounts, and other costs and compare the findings with the prior year's audit working papers to make sure the valuation methods are consistent.	2.9211	1.030	-2.62*
5.	If a standard cost system is used, determine if the valuation method is efficient and useful by review and analysis of the variances.	2.9079	1.048	-2.69**
6.	Discuss with managers the inventory and warehousing cycle.	2.908	.996	-2.83**
7.	Compare current year and previous year manufacturing costs.	2.882	1.006	-3.03**
8.	Test direct labor costs by comparing with labor payroll or union contracts.	2.8784	.964	-3.14**
9.	Foot the inventory listing schedules for raw materials, work in process, and finished goods.	2.868	1.037	-3.05**
10.	Extend the physical inventory counts times the price on selected items on the inventory summaries.	2.803	.980	-3.81**
11.	Compare extended inventory value with previous years.	2.779	.927	-4.28**
12.	Examine financial statements for proper separate disclosure of raw materials, work in process and finished goods, proper description of the inventory costing method, and inclusion of significant sales and purchase commitments, and proper description of pledged inventory.	2.7403	1.140	-3.78**
13.	Test number of hours needed to manufacture the product by comparing with engineering specifications.	2.7067	.912	-4.98**
14.	Compare unit costs of inventory determined from either FIFO or LIFO valuation methods with previous years.	2.6883	1.029	-4.62**
15.	In pricing inventory, consider whether historical or replacement cost is lower.	2.4474	.958	-7.13**
Overall combined group mean = 3.2308; * = 5 % Significance level; ** = 1 % Significance level				

Disagreements Between Different Types of Auditors

In some cases, the fraud detecting effectiveness of 5 out of the 56 audit techniques was perceived **differently** among the three auditor groups. The perceptions of External auditors (CPAs auditing corporations), Governmental auditors (CPAs auditing governments) and Internal auditors auditing corporations were determined significantly different using both the Student's test and the one-way Analysis of Variance with the Scheffe test. These 5 techniques are presented in Table 5.

The Internal auditors evaluated the first two of these five techniques as relatively more effective for detecting fraud than Governmental auditors. These techniques review both major inventory adjustments and inventory count procedures. The Internal auditors seem to view major

inventory adjustments and inventory count procedures as being more indicative of potential fraud than Governmental auditors. Inventory is vital for the financial survival of corporations but not governments. The sale of inventory represents the primary source of cash for corporations from the customers. In contrast, inventory has a lower priority for governments since their primary source of cash is the taxpayers. The concealment of inventory theft could be discovered by using techniques that examine major inventory adjustments and reconcile differences between the physical inventory counts and the perpetual inventory records. Such inventory shortage may be falsified as an inventory adjustment. An actual inventory shortage would be indicated by a difference in which the dollar amounts from perpetual inventory records exceeded those resulting from the physical inventory counts. For these reasons, Internal auditors consider these two audit techniques as being relatively more ef-

Table 5
Differences in the Effectiveness To Detect Fraud Between External, Government and Internal Auditors for 5 Audit Techniques

Audit Techniques		External Auditor Means	Governmental Auditor Means	Internal Auditor Means
1.	Review major adjustments for propriety.	N/A	3.8421*	4.4211*
2.	Review inventory count procedures: 1 Accounting for items in transit (in and out); 2 Comparison of counts with inventory records; and 3 Reconciliation of differences between counts and inventory records.	N/A	3.5455*	4.0233*
3.	Discover related party transactions.	N/A	3.7273*	4.2045*
4.	Perform analytical procedures by computing the ratios and comparing with previous years.	N/A	3.5500*	3.0000*
5.	Compare the classification of raw materials, work in process, and finished goods by comparing the descriptions on inventory tags and the auditor's recorded test counts to the inventory listing schedule.	2.4167*	N/A	3.2619*
* = 5 % Significance Level				

fective to detect fraud than the Governmental auditors.

The Internal auditors evaluated the third of these five techniques as relatively more effective for detecting fraud than the Governmental auditors. This audit technique tests for related party transactions. Related party transactions involving inventory are more prevalent with corporations than with governments. Hence, inventories are generally maintained by corporations more frequently than by governments. Internal auditors maintain a more skeptical attitude to verify that related party transactions involving inventory occur at an arm's length than Governmental auditors. In comparison, inter-fund transactions represent the only related party transactions for governments. Thus, Governmental auditors have only minimal concern pertaining to inventory related party transactions. For these reasons, it is only logical that Internal auditors consider the audit technique which discovers related party transactions to be relatively more effective to detect inventory fraud than the Governmental auditors.

The fourth technique that performs analytical procedures evaluated by the Governmental auditors as relatively more effective in detecting fraud than by the Internal Auditors. According to Generally Accepted Government Auditing Standards, if specific information comes to the attention of the Governmental auditors concerning the existence of irregularities (management fraud) that could have material effects on the financial statements, then the Governmental auditors should use audit techniques such as analytical procedures specifically to ascertain whether irregularities (management fraud) have occurred (GAO, 1994). In contrast, according to the Internal Auditing Standard No. 3 (IIA, 1985), the only responsibility of Internal auditors is to investigate and identify weak internal controls that could allow fraud to occur. No standard exists that requires Internal auditors to use techniques such as analytical procedures in the audit process for detecting fraud.

As far as the fifth and final technique (the

classification, descriptions, and physical counts of the different types of inventories), it was considered to be relatively more effective in detecting fraud by Internal auditors than by Governmental auditors. Corporations tend to maintain inventories and governmental entities do not. Governments collect revenue from their taxpayers, where corporations generate revenue by selling inventory to their customers. Inventory is critical to the financial existence of corporations but not governments. Thus, Internal auditors are more concerned about detecting inventory fraud for corporations than CPAs, as auditors, are for governmental entities.

In addition, different professional standards may partially explain the different perceptions of the three types of auditors concerning the effectiveness of these five audit techniques in detecting fraud. For example, Internal auditors comply with the Internal Auditing Standards that are issued by the Professional Standards Committee of the Institute of Internal Auditors. The External auditors comply with both Generally Accepted Auditing Standards issued by the Auditing Standards Board (ASB) and also with Generally Accepted Accounting Standards issued by the Financial Accounting Standards Board (FASB). The ASB is part of the American Institute of Certified Public Accountants (AICPA), but the FASB is only affiliated with the AICPA. Finally, the Government auditors comply with both Generally Accepted Auditing Standards and Generally Accepted Accounting Standards as well as Government Auditing Standards issued by the Comptroller General of the United States. In addition, Governmental auditors comply with federal legislation such as the Single Audit Act of 1984 and federal regulation by the Office of Management and Budget. In comparing the three types of auditors, different standards may partially explain why only five out of the 56 Inventory and Warehousing techniques were perceived differently among the three types of auditors concerning this effectiveness to detect fraud. Since the three different types of auditors varied in their perceptions concerning only five of the 56 audit techniques, different standards evidently did not cause the perceptions of the

three types of auditors to vary regarding the remaining 51 audit techniques. Furthermore, the types of auditors (External, Governmental, and Internal) surveyed generally did not influence the perception level of effectiveness of each audit technique.

Conclusions

In conclusion, techniques that directly collect evidence in the audits of accounting information systems seem to be **"more"** effective for detecting management fraud. These 14 audit techniques evaluated by all the 86 auditors surveyed as being **"more"** effective in detecting fraud should be used extensively by auditors early in the planning stage of the audit examination. This practice would provide auditors with the earliest possible indications of potential fraud during the planning of the audit and compliance testing of the internal controls. As a result, this earlier indication of potential fraud would give auditors a longer time to re-plan the audit examinations. Such re-planning would result in extending the length of the audit and concentrating the application of **"more"** effective audit techniques in the areas where the occurrence of fraud is suspected.

In addition, the 27 audit techniques evaluated as having **"average"** effectiveness to detect fraud should be used extensively to collect evidence throughout the field work of the audit examination, such as performing substantive tests. This practice too will enhance the actual detection of management fraud throughout the duration of the audit process. Such indications of potential fraud occurrence resulting from using these **"average"** effective techniques allow the auditors time to re-plan the audit examination by extending the substantive tests and increasing the length of the audit, in order to improve the actual detection of fraud.

In contrast, techniques that both indirectly collect evidence and test inventory valuation seem to be evaluated as **"less"** effective in detecting fraud. These 15 **"less"** effective fraud

detecting techniques should not be utilized extensively in audit examinations, especially if one of the goals of the audit is to detect fraud.

CPA's (External and Governmental auditors) with more years of auditing experience achieved higher fraud detection rates than Internal auditors. In comparison, publicly held corporations that experienced the highest fraud detection rate of 96 percent employed Internal auditors with less auditing experience than the CPA's (External and Governmental auditors).

Considerable agreement existed among the three auditor groups pertaining to the fraud detecting effectiveness of most of the techniques in the Inventory and Warehousing Cycle. The types of auditors (External, Governmental, and Internal) surveyed generally did not influence the perceived level of effectiveness of each audit technique. In the study, the three different types of auditors agreed on the same levels of effectiveness to detect fraud (**"more"**, **"average"** or **"less"**) for each of the 51 out of the total 56 audit techniques in the Inventory and Warehousing Cycle. The different types of auditors represented a variable that caused disagreement concerning the fraud detecting effectiveness of the other remaining five audit techniques. Different auditing standards may contribute to the three types of auditors expressing different levels of the effectiveness to detect fraud for each of the five remaining audit techniques in the Inventory and Warehousing Cycle.

Implications for Future Research

The inventory represents the largest single current asset. Since inventory is many times subjected to fraudulent activities, any method developed to detect inventory fraud can control and reduce inventory fraud. Improved fraud detection can decrease financial losses from inventory shortages which are caused by employees, customers and third parties. Also, public knowledge of increased detection can serve as a deterrent for potential perpetrators and prevent them from committing fraud in the future.

References

1. Albrecht, S, "How to Recognize the Red Flags of Business Fraud," *The Practical Accountant* (July), pp. 35-40, 1983.
2. Albrecht, S., E. McDermott, and T. Williams, "Reducing the Cost of Fraud," *Internal Auditor* (February), pp. 28-34, 1994.
3. Albrecht, S. and M. Romney, "Red-flagging Management Fraud: a Validation," *Advances in Accounting*, pp. 323-333, 1986.
4. American Institute of Certified Public Accountants, *Codification of Statements on Auditing Standards*, 1996.
5. Arens, A. and J. Loebbecke, *Auditing - An Integrated Approach*, Englewood Cliffs, NJ: Prentice-Hall, 1992.
6. Bell, T., S. Szykowny, and J. Willingham, "Assessing the Likelihood of Fraudulent Financial Reporting: a Cascaded Logit Approach," *KPMG Peat Marwick* (December), pp. 1-23, 1991.
7. Comptrollers General of the United States, "Government Auditing Standards," *United States General Accounting Office* (June), 1994.
8. Institute of Internal Auditors, "Statement of Internal Auditing Standards No. 3," *Professional Standards Committee* (May), 1985.
9. Loebbecke, J., M. Eining, and J. Willingham, "Auditor's Experience with Material Irregularities: Frequency, Nature, and Detectability," *Auditing: A Journal of Practice and Theory* (Fall), pp. 1-28, 1989.
10. Pincus, K, "The Efficacy of a Red Flags Questionnaire for Assessing the Possibility of Fraud," *Accounting, Organizations and Society*, pp. 153-163, 1989.