

CAATs in the Classroom

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Abstract

This paper reviews literature related to Computer Assisted Auditing Techniques (CAATs) to document the experience of academics of using Generalized Audit Software (GAS) within the classroom. Both academic and practitioner-oriented publications were reviewed to obtain an understanding of the current state of computer-assisted audit techniques in both academe and industry. Based on the review, a variety of resources available to instructors are summarized.

Introduction

The importance of technology is a given within the world of business. Technology continually presents a challenge to assurance professionals as technology is utilized in unique ways to generate commercial activity. Moreover, the need for technology-literate assurance professionals is accelerating. With the shifts in the regulatory landscape (e.g. Sarbanes-Oxley in the US, MI-52-109 in Canada, etc.), there has been a greater emphasis placed on understanding controls, and in particular, controls around information processed by IT-based financial reporting systems. In the US, the Public Oversight Board's Panel on Audit Effectiveness recommended that auditing firms provide IT oriented training to their staff (O'Donnell and Moore, 2005). Albrecht and Sack (2000) reported that:

- IT ranked 2nd in terms of importance of study amongst accounting faculty and accounting professionals
- IT skills ranked 4th after analytical and critical thinking, written communication, and oral communication.

One way of developing practical IT skills is through incorporating the use of computer-assisted audit techniques (CAATs) in the accounting curriculum. The most important of these techniques is generalized audit software (GAS), which has become synonymous with the term CAATs. Professional associations, such as the Information Systems Audit and Control Association (ISACA), the Canadian Institute of Chartered Accountants (CICA), and the American Institute of Certified Public Accountants (AICPA) recognize the importance of CAATs either by addressing CAATs explicitly or recognizing the critical role of CAATs in delivering services such as continuous assurance (Weidenmier and Herron, 2004). Greenstein and McKee (2004) found that knowledge of generalized audit software was one of 36 key-critical IT skill sets. This knowledge is not only important in its own right, but as a means of conveying concepts regarding assurance, technological risk, and controls to future assurance professionals.

Why is it Important to Have CAATs in the Classroom?

Experience with CAATs is an important and valuable skill-set in its own right. Such skills enable students to present unique skill sets to professional service firms, and can provide professionals a way to distinguish themselves (Weidenmier and Herron, 2004) and secure a competitive advantage (Gelinas et al., 2001). However, the potential value of CAATs extends to other areas beyond technical know-how and familiarity with current practice. CAATs allow students the opportunity of applying auditing concepts in a practical manner (Nieschwietz et al., 2002). This in turn enables students to develop high-order cognitive skills as their understanding is not limited to theory, but encompasses practical aspects of an assurance engagement (Weidenmier and Herron, 2004). CAATs also facilitate the development of technological adeptness (i.e. deployment of technology in a value-added manner) and strategic and critical thinking skills (i.e. provide insight into strategic issues through the analysis of information) (Gelinas et al., 2001). In addition to technological adeptness, the use of CAATs not only reinforces understanding

of Information System (IS) concepts but also demystifies the level of technological know-how necessary to audit information systems (Nieschwietz et al., 2002).

How is Generalized Audit Software used in the Classroom?

In contrast to academically-oriented subjects in technology assurance, teaching CAATs can be a daunting task for both the instructor and the students. Instructors need to secure appropriate facilities and licenses in order to provide such type of instruction in class. Students can sometimes fail to see the value of such assignments in the class. This is especially the case if the CAATs component of the course is viewed as an “add-on” to the course (Gelinias et al., 2001). However, such obstacles have been successfully overcome as academics are finding positive feedback from students who use generalized audit software (GAS) within the curriculum.

Weidenmier and Herron (2004) investigated how GAS is used in the classroom and reported that:

- GAS is used in both undergraduate and graduate courses (among their survey respondents, IDEA was more often used in undergraduate classes and ACL was more often used in graduate classes)
- GAS is used primarily within assurance courses
- On average, CAATs assignments constitute between 13-14% of the course time
- Schools have used GAS in the classroom between 2.7-2.8 years

Faculty have found that students respond positively to the integration of CAATs in assurance courses. For example, Gelinias et al. (2001), reported on students’ feedback regarding CAATs oriented cases as follows:

- 72% of students agreed that the use of GAS supplemented their understanding of risk and audit procedures
- 91% of students felt the use of GAS aided in their understanding of technology within an assurance setting
- 82% of students recommended the continued use of GAS within the course.

Wiedenmaier and Herron (2004) found that 66% of students polled felt that the use of GAS (in this case, IDEA) aided them in understanding “*what* audit tests might be done and *why* audit tests might be done.” Also, 57% of students polled noted that they wanted to spend more time using IDEA in the current class, as well as other classes (Weidenmier and Herron, 2004).

These studies should dispel some academics’ concern about students’ acceptance of CAATs in the classroom. However, successful implementation is contingent on course instructors effectively integrating the CAATs component into the overall course.

Pedagogical Considerations re: CAATs

Instructors who attempt to integrate CAATs within their courses will find that there is a meager amount of material available from either vendors or academics (Weidenmier and

Herron, 2004). In the last five years, only two major CAATs oriented cases were published in academic journals. Although vendors do provide training manuals, course instructors need additional materials such as “discussion questions, additional exercises/problems, or conceptual material” (Weidenmier and Herron, 2004). However, it should be emphasized that the vendor-provided training manuals are an essential and integral part of the course delivery. Instructors report that the “detailed-style” of the training material aids students in learning the software independently and prepares them to complete the conceptually-oriented components of the assignments (Nieschwietz et al., 2001).

Gelinas et al. (2001) who authored one of the cases provide the following advice on how instructors should integrate CAATs into their course:

- Discuss the learning objectives of the assignment in terms of assertions, objectives, evidence, tests, and procedures
- Understand the functionality of the software
- Assess audit and business risks of the case scenario, and apply CAATs to address the risks identified
- Develop strategic and critical thinking skills
- Emphasize the importance of risk in driving audit procedures and understanding the connection between “risk, objectives, and tests”. The study elaborates as follows: “...what is the potential misstatement, omission, or error? Why is the misstatement, omission, or error undesirable; that is, what business/operational or financial statement objective is met by avoiding this misstatement, omission, or error? How can the auditor determine if the objective is being met? What tests can he or she perform to determine that an objective has been met?”
- Demonstrate how CAATs are used to perform audit procedures
- Interpret audit results

In Appendix I, the published cases identified by our literature search have been summarized in terms of the audit objectives and types of tests that were used in the material.

Appendix II reviews the “ACL and IDEA Information Resources” web site¹.

Appendix III provides a summary of the textbooks that incorporate the use of ACL and IDEA, respectively.

Appendix IV provides a summary of the type of tests that have been discussed in both academic and professional literature regarding the use of CAATs in practice.

¹ Website address: http://www.business.umt.edu/faculty/herron/acl_idea/home.htm

Conclusion

Based on our review of the literature, two issues are apparent. First, instructors rely upon vendors to provide detailed instructional material to guide students through the software in advance of assigning their own tasks. Thus, accessible and high quality vendor-supplied material is essential to ensure that instructors can use the limited class time and resources available to them to integrate the conceptually oriented components of the assignment in the class. Second, there is a need for cases and related material that will aid instructors in conveying the conceptual aspects of assurance. Both vendors and academics should provide such cases to promote the use of CAATs within the classroom.

Appendix I: Analysis of Published CAATs-Oriented Cases

Case 1: “Norwood Office Supplies, Inc.: A teaching case to integrate computer-assisted auditing techniques into the auditing course” (Gelinis et al., 2001)

The assignment was specifically designed to work in conjunction with ACL. The case is broken down into three assignments:

- Assignment#1 walks students through the basic features of ACL and allows them to become familiar with the software itself.
- Assignment#2 requires students to provide a memo to the audit manager discussing operational and financial reporting issues and a list that details three operational risks as well as three audit risks. For each risk the student is required to state the risk, the audit/business objective, and the audit procedure that would address the risk. The procedures identified by the students must be completed in conjunction with at least one of the four data files provided by the assignment.
- Assignment#3 leverages the work done in assignment #2. Students select three computer-assisted audit tests. Based on the results of these tests, students prepare a report that details the tests used, relevance to audit objective(s), results of the tests and the conclusion that can be drawn from the tests.

The following table summarizes the solution for assignment 2, listing the learning objective and procedures that were expected in the course.

Key Learning Objective(s)	Proposed audit procedures to be performed using GAS
From a business perspective, ensure that sufficient stock to complete orders is kept on hand.	<ol style="list-style-type: none"> 1. Ensure items have been ordered for items where on-hand balance < than the order point 2. For items on order, ensure amount ordered = order quantity
<p>From a business perspective, ensure that an optimal level of inventory is kept (i.e. enough to meet the demand but not too much</p> <p>From an audit perspective, identify obsolete inventory.</p>	<ol style="list-style-type: none"> 1. Identify orders where quantities on order > the order quantity 2. Identify items where the quantity on hand > the order and for which there are goods on hand 3. Identify items where Quantity on hand + on order > order point
<p>From a business perspective, ensure that items have a reasonable markup and are not sold below cost</p> <p>From an audit perspective, ensure that reasonable revenue will be recognized</p>	<ol style="list-style-type: none"> 1. Identify items where selling price < cost 2. Identify items where selling price < 110% X Cost
From a business perspective, ensure that customer support and inventory	<ol style="list-style-type: none"> 1. Ensure customers are assigned to the correct territory

management is facilitated through the maintenance of quality data.	<ol style="list-style-type: none"> 2. Ensure sales reps are assigned to correct territories 3. Ensure products are assigned to the correct product groups 4. Ensure customers have the correct credit limit
From an audit perspective, ensure that inventory is valued at the lesser of cost or market to ensure.	<ol style="list-style-type: none"> 1. Identify items where sales price < cost 2. Reconcile sum of inventory master file to GL balance
From an audit perspective, ensure that sales are made to authorized customers and extend credit only to the credit limit. This will ensure that sales revenue is materially correct.	<ol style="list-style-type: none"> 1. Identify customers where AR Balance > credit limit 2. Reconcile total AR balance to GL Balance 3. Reconcile total sales balance to GL Balance
From an audit perspective, identify if AR may be overstated or is uncollectible.	<ol style="list-style-type: none"> 1. Examine for credit limit

Case 2: “Auditing with technology: Using generalized audit software in the classroom”.
Nieschwietz et al., (2002)

The case was specifically designed around IDEA. According to the authors of the case, the case is consistent with Case 1, but has a more structured approach that ties in directly to the revenue and conversion cycles. The case is broken down into several assignments, where each assignment is increasingly complex. The assignments are organized as follows:

- Assignment #1 allows students to get familiar with IDEA. This component of the case relies on the training materials provided by Caseware.
- Assignment #2 focuses on attribute sampling for the revenue cycle. Students apply their knowledge of statistical sampling and how the software can be used to accomplish this type of testing.
- Assignment #3 walks students through substantive testing of the revenue cycle.
- Assignment #4 requires students to use monetary unit sampling.
- Assignment #5 walks students through substantive testing of the inventory cycle.
- Assignment #6 requires students to perform analysis on a relational database.
- Assignment #7 looks at testing for fraud.

Key Learning Objective(s)	Proposed audit procedures to be performed using GAS
Application of attribute sampling methods allowing students to get a more thorough understanding of sampling risk	The three basic tests associated with this assignment include: <ol style="list-style-type: none"> 1. Testing for duplicate invoices 2. Testing for gaps in the invoice number sequence 3. Verifying accuracy of invoices
Identify which accounts should be written off	Using the aging function, analyze the AR accounts and identify accounts that are older than 180 days. Produce a report that will assist in creating the adjusting entry.
Generating samples to confirm the accounts receivables.	Using monetary unit sampling to confirm account receivable <ol style="list-style-type: none"> 1. Determine the test objective. 2. Define the population and sampling unit. 3. Choose the audit sampling technique. 4. Determine the sample size. 5. Select the sample. 6. Test the sample items. 7. Evaluate the sample results. 8. Document the sampling procedure.
Substantive testing for inventory and linking them to relevant audit assertions	Assurance over inventory is gained as follows: <ol style="list-style-type: none"> 1. Use of field statistics to allow the student to gain an overview of the data and possibly identify issues to follow-up on (e.g. negative balances in the inventory file)

	<ol style="list-style-type: none"> 2. Creation of virtual fields to manipulate the data as required; for example, identifying inventory items that are the lower of cost or market. 3. Segmenting and extracting a portion of the data (i.e. through the use of the GAS functionality) for further analysis; for example, identifying significantly large or negative amounts 4. Identification of other tests on inventory that would enable the testing of specific audit assertions.
<p>Understanding how to deploy CAATs in a relational database environment.</p> <p>Integrating IS knowledge with auditing knowledge</p> <p>Ethical responsibilities of an auditor</p>	<p>Relating the sales amounts per the client to the sales amount per the auditor and identifying any discrepancies. The discrepancies are then reported to the American taxation authority(s).</p>
<p>Identifying fraud and understanding the complexity of identifying fraud.</p>	<p>Students devise CAATs for fraud based on knowledge gained from previous assignments, supplemented by the instructor to assist with the construction of such tests.</p>

Case 3: “The Collapse of Barings Bank”. Gray, Robert P. (2005)

The case is oriented to covering the overall information technology audit engagement. A significant portion of the case is spent on describing the actual environment that ultimately led to the bank’s collapse.

The case does not require the analysis of specific data sets; no data is provided. Instead the case provides the following five discussion questions:

1. Complete a system flowchart, analysis of the narrative, and a data flow diagram.
2. Complete a “control matrix”
3. Map controls points identified in the control matrix on the control map and analyze the control weaknesses.
4. Complete additional details in the control matrix
5. Develop an audit plan, including computerized tests and how the tests would be conducted.

The case includes the following non-CAAT learning objectives:

- Ensuring that non-compatible functions are separated.
- Authority levels are adhered to
- Transactions are conducted in accordance with policy
- Sufficient oversight is provided by management
- Compliance with regulators is achieved
- Assets are safeguarded.

Key Learning Objective(s)	Proposed audit procedures to be performed using GAS
CAATs are effective and efficient means of obtaining assurance.	<ol style="list-style-type: none">1. Duties are adequately separated between the front office and the back office.2. Records from the exchange are reconciled to the internal records maintained by the company Testing for gaps in the invoice number sequence3. Reconciliation of cash between the head office and the branch office4. Ensuring that arbitrage positions are adequately hedged5. Proprietary trading is adequately monitored

Case 4: “Information Systems Controls and Auditing: Mathra Tool Inc.” Spletstoesser, Ingrid B. (1999)

Mathra Tool, Inc. (MTI) is a small business manufacturing case. It can be used by undergraduate or graduate students studying management controls and auditing in a computerized setting. Students integrate accounting, auditing, and information systems concepts. The case is broken down into four assignments related to the following requests by the engagement partner.

1. A preliminary audit plan assessing internal control risk and providing preliminary judgment for detection risk.
2. A description of specific computer-assisted audit tests that could be conducted for the WIP inventory using generalized audit software. The case provides an extract of the data file in a spreadsheet format and does not require the analysis of specific data sets; however, a data set containing 200 records is available from the author.² This file has errors that could be detected and analyzed by students conducting generalized audit software tests. This assignment was specifically designed to work in conjunction with IDEA.
3. A draft of reportable conditions to be provided to management prior to fieldwork completion.
4. A draft management letter to be provided to management containing any additional weaknesses and recommendations for improvement.

The following table summarizes the solution for assignment 2, listing the learning objective and procedures that were expected in the course.

Key Learning Objective(s)	Proposed audit procedures to be performed using GAS
How to obtain and overview of a file.	<ol style="list-style-type: none"> 1. Compute a control total for the extended Work-in-Progress (WIP) value to ensure the auditor has the entire data file. 2. Use field statistics to obtain a “feel” for the data in key fields.
How to test mechanical accuracy/data entry accuracy.	<ol style="list-style-type: none"> 1. Recalculate the extended value of inventory. 2. Check the calculation method used for WIP balances.. 3. Test for duplicate job numbers. 4. Test for duplicate part numbers
How to test classification of WIP.	<ol style="list-style-type: none"> 5. Use percentage of completion data to identify WIP where: <ol style="list-style-type: none"> a. % complete = 100%; this is WIP that has not been transferred to finished goods but should have

² Ingrid Spletstoesser has also developed three additional unpublished cases of a similar style, including both CAAT and non-CAAT assignments. The CAAT assignments were designed for use with IDEA and come with data files and detailed solutions.

	<p>been.</p> <p>b. % complete = 0%; this is inventory that has been transferred to WIP prematurely but should not have been.</p>
How to perform various valuation tests.	<ol style="list-style-type: none"> 1. Perform various calculations to determine whether net realizable value is below cost; i.e., <ol style="list-style-type: none"> a. Gross margin low b. Sales price lower than cost c. List price higher than quoted price d. Actual cost lower than quoted cost 2. Check for obsolescence by checking WIP due dates against production dates; i.e., <ol style="list-style-type: none"> a. Due date is earlier than scheduled completion date b. Due date is prior to the year end
How to select a sample, including both statistical and non-statistical criteria	<ol style="list-style-type: none"> 3. Select all high value items plus a statistical sample of items for pricing tests.
How to assess disclosure of economic dependency	<ol style="list-style-type: none"> 4. Summarize WIP by customer to identify whether any significant concentrations exist that would need to be disclosed.

Case 5: “Detecting Shell Companies with Dynamic Text Comparisons” by Lehman, Mark and Watson, Marcia Weidenmier, *Journal of Forensic Accounting*, forthcoming 2007.

Internal audit of Integrity Company have engaged external auditors to identify the possibility that employees are engaging in fraud to support their extravagant lifestyles. The lack of segregation of duties permits employees to set-up vendors and make payments to the vendors. The focus of the testing is to identify matches between the employee address and the vendor address using dynamic text comparisons (JOIN, SOUNDEX, SPLIT, REPLACE) with the assistance of ACL or IDEA. The case is based on ACL, but provides an appendix to modify the case for IDEA.

The following table summarizes the solution for assignment 2, listing the learning objective and procedures that were expected in the course.

Key Learning Objective(s)	Proposed audit procedures to be performed using GAS
Lack of segregation of duties in the vendor/ payable cycle	Understanding the implications of fraud to design tests.
Understanding the need for dynamic text comparisons	Understand the limitation of using a simple JOIN command to identify matches in the context of a fraud investigation (i.e. where the perpetrators are trying to hide their acts).
How to perform the following dynamic text comparison functions to increase the probability of identifying a match in the context of a fraud: <ol style="list-style-type: none"> 1. JOIN 2. SOUNDEX 3. SPLIT 4. REPLACE 	<ol style="list-style-type: none"> 1. Use of the JOIN command to identify matches between the employees addresses and addresses in the vendor master file. However, this test will only identify exact matches and therefore will not identify all the matches. 2. Use of SOUNDEX to identify matches. SOUNDEX uses a hashing system designed in 1918 to index the word on how it sounds instead of how it is spelled. By using SOUNDEX on the addresses a greater number of matches should result. 3. Use of SPLIT to isolate components of the address (i.e. street number) to match the addresses in the two master files. 4. Use of REPLACE to eliminate the direction (e.g. North, South, etc) listed in the street.
Advanced use of scripts	Requires the individual application of dynamic text comparisons, as well as the use of advanced scripting technique to integrate functions into a single test.

Appendix II: Review of “ACL and IDEA Information Resources” Website

The “ACL and IDEA Information Resources” Website³ summarizes some of the cases identified in this paper and identifies additional resources, including instructor-prepared materials, slide presentations, and links to other sites (such as ACL, IDEA, other universities, etc). The contents of the three major sections of the site (ACL, IDEA, General GAS Resources) are detailed under the headings below.

ACL Resources:

1. Cases, Datasets, Textbooks: The site lists textbooks that include ACL as a part of the teaching material within the text. Some textbooks include various versions of the CD. (See Appendix IV; for a list of textbooks that refer to ACL).

The website identifies the text entitled “Computerized Auditing Using ACL Software” by Alvin Arens as “exclusively focused on learning and applying ACL” in contrast to other texts that “incorporate ACL in a more minor way”.

In terms of cases, the site summarizes the Norwood case and offers a link to the site (note: the link is broken). The site also highlights the following instructor prepared material⁴:

University of Miami:

- “LoCo Inventory Due-Diligence CAATTs Case” which requires the student to design six tests (using ACL) documenting what tests were involved, ACL functions used, and purpose of the tests. The case requires presentation of the findings and their conclusions.

University of Southern California (USC); each of the pages below include screen shots of ACL to assist students in using ACL:

- ACL Basic Navigation and Features. As per the title, the link gives users an overview of the features and functionality of ACL.
- ACCT 371B ACL Assignment: The assignment requires students to analyze three data files extracted from three different systems to identify the underlying system issues. The analysis is done in the context of preparation for an external audit.
- ACCT 471B ACL Assignment: The assignment requires students to import files and identify/isolate errors within these files.

³ www.business.umt.edu/faculty/herron/acl_idea/home.htm

⁴ The instructor of each of the courses must be contacted to obtain the files necessary to complete each of these cases.

University of Texas

- **ACL Assignment:** Students are required to run basic ACL functions to obtain an understanding of the underlying population and identify any anomalies.

2. Classroom Assignments. This lists the assignment developed by Terri Herron from the University of Montana. The page includes the following:

- **ACL Assignment and Overview:** The assignment refers to grading guidelines, basic information on using ACL, importing files, and other instructional information.
- **Practice exercises;** which require the use basic ACL functions to identify characteristics within the data.
- **Training exercises;** requires the student to work with the ACL provided material.
- **Application exercises;** requiring the application of ACL functions to identify reports on payroll, accounts payable, accounts receivable, and sales. Examples of functions include identifying employees paid over a certain threshold, creating a monetary-unit sample, and generation of other similar types of reports through the use of ACL functions.

The “Classroom Assignment” page also includes links to answer keys, grading sheets and review questions.

3. Classroom Slides. Includes PowerPoint slides that provides an overview of the features of ACL.

4. Workbook Errata/Clarifications. Lists clarifications and errors identified in the texts.

5. Exam Questions; includes a “hands-on” exam, multiple-choice exam, and the answer keys. (Note: the multiple choice exam requires a password to access).

6. Sample Syllabi. The page provides links to courses taught at universities that include ACL within their respective courses.

IDEA Resources:

1. Cases, Datasets, Textbooks: The site lists the text that uses IDEA and the Audimation website, which provides self-study, Quick Start guide, case study, and data files, to assist students and users to get familiar with IDEA. (See Appendix IV; for a list of textbooks that refer to IDEA).

In terms of cases, the site summarizes the “Auditing with technology: Using generalized audit software in the classroom” and offers a link to the site (note: the link is no longer available). The site also highlights the following instructor-prepared material⁵:

⁵ The instructor of each of the courses must be contacted to obtain the files necessary to complete each of these cases.

Bowling Green State University:

- “Notes for Using IDEA”; a 16 page pdf document with screen shots on using IDEA.
- “Accounts Payable Project”; requires the use of Benford’s Analysis and other procedures to identify irregularities within the accounts payable file.
- “Inventory Project”: requires the application of basic IDEA functions to interrogate the inventory data and identify total inventory, aging of inventory, and other similar types of functions.

2. Classroom Assignments. This lists the assignment developed by Terri Herron from the University of Montana. The page includes the following:

- Assignment based on the 2001 IDEA Workbook: walks the student through:
 - Familiarization with IDEA
 - Accounts Receivable Audit
 - Accounts Payable audit and a fraud investigation
 - Inventory special audit
- Assignment 1; based on the 2002 IDEA Workbook, which requires:
 - Assessment of students understanding of basic IDEA functionality, application to audits, and relationship of using IDEA with audit objectives
 - Accounts receivable audit; relationship to audit assertions to AR, file import issues, other IDEA functionality (e.g. data interrogation, preservation of audit evidence, etc)
 - Accounts payable and fraud investigation; using fraud investigation skills in conjunction with IDEA, Benford’s Analysis, other AP related data interrogations.
- Assignment 2; based on the 2002 IDEA Workbook, which requires:
 - Special audit of inventory: identification and implication of negative inventory values, testing of inventory obsolescence, and other inventory oriented tests.
 - Review questions addressing AR, AP, and inventory.
- Review questions; a total of 22 review questions assessing the students understanding of IDEA and its application within the above assignments.

3. Classroom Slides. This leads to a broken link

4. Workbook Errata/Clarifications. Lists clarifications and errors identified in the texts.

5. Exam Questions; includes a multiple-choice exam, and the answer key.

6. Sample Syllabi. The page provides links to courses taught at universities that include IDEA within their respective courses.

General GAS Resources:

1. Cases, Datasets, Textbooks: Provides a link to data files for the case by Borthick, A. F., Jones, D. R., and Kim, R. 2001. Developing database query proficiency: Assuring compliance for responses to Web site referrals. *Journal of Information Systems* 15(1): 35-56. This case does not refer to ACL or IDEA, but provides data that could be adapted for an IDEA or ACL case.

A link is also provided to Leonard, J., T. Louwers, and A. Rieffel. 1999. Integrating computer-assisted audit tools in your audit course. *The Auditor's Report*, V22, N3 (Summer), which looks at teaching issues related to CAATs in the classroom.

2. Classroom slides. The following PowerPoint presentation slides are available for download:

- Introduction to auditing and CAATs
- Financial Fraudulent Reporting
- Fraud
- Presentation on the state of the audit profession and Sarbanes-Oxley Act.

3. Fraud resources. Provides a list of websites that address fraud including; AICPA, Certified Fraud Examiners, and others. Also, the page includes a sample fraud syllabus, and a link to an ethics page.

4. Other websites, including ISACA, Auditnet, and others.

Appendix III – List of Textbooks that use ACL or IDEA

Texts that use ACL

As per the ACL website⁶, the following texts mention or include ACL:

- **Auditing: Concepts for a Changing Environment** by Rittenberg and Schwieger. South-Western 2005.
- **Core Concepts of Information Technology Auditing** by Hunton, Bryant and Bagranoff. Wiley 2004.
- **Information Systems Auditing and Assurance**, by Hall and Singleton. South-Western 2005.
- **Accounting and Auditing Research** by Weirich, Pearson, and Reinstein. South-Western 2005.
- **Auditing and Assurance Services: A Systematic Approach** by Messier. McGraw-Hill/Irwin 2005.

The following text was identified in the “ACL and IDEA Information Resources” but was not listed on the ACL site⁷:

- ***Computerized Auditing Using ACL Software***, by Alvin Arens, Armond Dalton, 2004

Texts that use IDEA

The following texts mention or include IDEA:

- ***Auditing: An International Approach***, Smieliauskas, Wally and Bewley, Kate, McGraw-Hill, 2007.
- To be included in the 2007 revision of: ***Auditing & Assurance Services***, Messier, William and Emby, Craig, McGraw-Hill, 2005.
- ***Auditor's Guide to Information Systems Auditing***, Cascarino, Richard E., Wiley 2007.
- ***Auditing and Other Assurance Services, Ninth Canadian Edition***, Arens, Alvin A., Elder, Randal J., Beasley, Mark S., and Splettstoesser-Hogeterp, Ingrid, Pearson, 2002.

⁶ http://www.acl.com/company/education_partners_resources.aspx?bhcp=1

⁷ http://www.business.umt.edu/faculty/herron/acl_idea/home.htm

Appendix IV – CAATS in Practice

The following table identifies the CAATs that have been identified in professional publications as relevant and useful to practitioners.

Category	Technique or test	Source (see Notes)
Audit Automation	Selection and generation of accounts receivable confirmation letters	9
	Recalculating files to verify accuracy of information	9
	Use of analytical procedures such as analysis and identification of irregular account balances	9
	Identifying transactions that have occurred without management approval, e.g. payroll, journal entries, etc	9
	Reconciling the general ledger to sub-ledgers;	9
	Identify records that should be rejected based on a specific criteria	9
	Identify relationships between accounts, assets, expenses, etc and determine if expectation holds true	9
	Reconciling the general ledger to sub-ledgers;	9
	Reasonability testing	9
	Testing for inactivity (e.g. inventory)	9
	Identify irregular record codes.	9
	Conversion testing; detailed testing (e.g. record-by-record) comparison of pre- converted data with post-converted data.	9
Ageing of inventory, A/R or other amounts	9	
Analytical Procedures	Use a model to determine expectation of profit, determine if return on investment is reasonable	7
Revenue	Select a statistical sample for compliance testing of attributes such as approvals, supporting documents, etc.	1
	Total, sub-total and summarize sales by period, category, division, etc.	1
	Summarize sales returns. Check cut-off by checking shipment date and/or in put date.	1
	Check discounts offered for adherence to company policy.	1
	Check sales tax treatment.	1
	Check commission sales for compliance with company policy.	1
	Analyze sales stream, isolating unusual transactions for audit review.	1

Category	Technique or test	Source (see Notes)
Revenue	Reconciliation of sales invoices, customer orders, and shipping notes.	9
	Identifying goods shipped, but not invoiced. This can be achieved by a 3-way match using the common key between the documents (e.g. PO number)	9
Health Care Billings Revenue	Identification of invalid fee codes	9
	Identification of mutually exclusive services; i.e. billing for the same item under two different categories	9
Disbursements Stream (excluding payroll)	Segment and summarize disbursements into purchases, fixed as set additions, pre paid expenses, period expenses, etc.	1
	Analyze and summarize segment characteristics, isolating unusual items for audit review.	1
	Select a statistical sample of disbursements for compliance verification (e.g., approvals, supporting documentation) and/or substantive verification (e.g., vouching of fixed asset additions).	1
	Check cut-off by extracting and summarizing disbursements subsequent to the year end.	1
Disbursements	Summarizing cash disbursements by vendor to identify fraudulent vendors	9
Cash	Reconciling cash amounts at disparate locations with consolidated cash balance	9
Accounts Receivable	Assessing credit awarded to high-risk customers, e.g. ensuring credit limits are not exceeded.	9
	Re-performing the AR aging to assess the adequacy of the doubtful accounts provision.	9
Accounts Receivable	Segment population between parent and subsidiary or between divisions, applying different statistical selection criteria to the segments.	1
	Extract a top stratum for 100% confirmation and other verification.	1
	Select a statistical sample based on account balances for confirmation and other verification.	1
	Print confirmation letters (positive, negative, bilingual).	1, 7
	Analyze accounts of open items based on age.	1
	Test provision for bad and doubtful accounts or open items.	1
	Extract and summarize key items (e.g., based on a particular credit branch or category, items in excess of predefined credit limits, items over a given number of days, etc.)	1
	Total and/or subtotal the accounts receivable file.	1
	Check cut-off by checking shipment and/or input date.	1
	Roll forward from confirmation date to year end of selected items and compare to client records.	1
	Perform subsequent payments verification through the application of cash receipts subsequent to the year end to assess collectibility of accounts receivable. (e.g., revolving credit receivable account sizes).	1

Category	Technique or test	Source (see Notes)
	Perform year-to-year or confirmation date to year-end comparison of accounts receivable population.	1
	Calculate service charge revenue and/or unearned service charge revenue (e.g., revolving credit receivables).	1
Inventory	Extract a top stratum for 100% verification.	1
	Select a statistical sample for counting and/or pricing tests.	1
	Perform extensions (price x quantity).	1
	Total and/or subtotal book and/or physical count.	1
	Extract and summarize obsolete and slow moving items.	1
	Perform lower of cost and market calculation.	1
	Extract key items (e.g., negative quantities, zero prices).	1
	Roll forward from count date to year-end and compare to actual records.	1
	Perform year-to-year and count date to year-end comparisons for large quantity and/or price changes.	1
	Perform book-to-physical comparison and summarize significant variances.	1
Analyze and summarize inventory population (possibly in histogram form).	1	
Inventory	Focus testing on inventory based on financial value, risk, portability (i.e. prone to theft), items that are selling for less than market value, etc.	3
	Generate a sample of random items to allow for testing.	3
Hazardous Materials	Cross reference the inventory information to government regulation (i.e. to identify high risk materials that warrant additional testing)	3
Hazardous Materials	Identify relevant transactions, locations, and relevant regulations to target sites that require attention	9
Securities	Select securities for counts and pricing tests.	1
	Perform calculation of margin requirements.	1
	Select items for confirmation.	1
	Print confirmation letters.	1
	Analyze and summarize brokers' clients accounts and produce reports for regulatory agencies.	1
Mortgages Receivable	Segment mortgages into old and new categories, applying different statistical sampling criteria to the segments.	1
	Extract a top stratum of policies and mortgages receivable for 100% confirmation and other verification.	1
	Select a statistical sample of policies and mortgages receivable for confirmation and other verification.	1

Category	Technique or test	Source (see Notes)
	Print confirmation letters.	1
	Test computerized calculation of interest revenue and accrued interest at year end.	1
	Total and/or subtotal mortgage population by type, branch, etc.	1
	Extract and summarize key items (e.g., mortgages in arrears and under foreclosure, mortgages not under repayment, mortgages not fully advanced, unusual/unreasonable interest rates, maturity dates, etc.).	1
	Perform year-to-year and confirmation date to year-end comparisons to identify new mortgages, large changes in interest rates, mortgages matured, etc.	1
	Perform premium income calculation.	1
Fixed Assets, Investments	Recalculate depreciation or appreciation	9
	Identify negative amounts	9
	Reconcile opening balance, additions, and disposals with ending balance	9
	Reconcile sale amounts to disposal amounts	9
Asset Disposal	Review asset disposals and ensure that disposal values correspond with expectations	9
Real Estate, Asset Revaluation	Identify historical values of properties and reconcile to market value assumptions	9
	Identify assets for which the market value is lower than cost.	9
Guaranteed Investment Certificates and Term Deposits	Perform year-to-year comparison of accounts to identify new and redeemed items.	1
	Select a statistical sample of items for confirmation.	1
	Print confirmation letters.	1
	Test computerized calculation of interest expenses and accrued interest pay able.	1
	Total and/or subtotal population by category.	1
	Extract and summarize key items (e.g., GICs redeemed prior to maturity, odd interest rates, issue dates or maturity dates, etc.).	1
Savings and Checking Accounts	Select a statistical sample of items from population of interest credited during the year for confirmation and other verification.	1
	Total and/or subtotal by branch.	1
	Extract and summarize key items (e.g., large dormant accounts, error suspense accounts, overdrafts, etc.).	1
	Perform year-to-year and confirmation date to year-end comparisons of branch balances to identify large fluctuations.	1

Category	Technique or test	Source (see Notes)
	Perform calculation of accrued interest expense by account and summarize by branch.	1
Estate, Trust and Agency Accounts RRSPs, RHOSPs and other Investment Funds	Select a statistical sample for security counts and pricing tests.	1
	Select customer accounts for confirmation and other verification.	1
	Print confirmation letters	1
Dormant Accounts	Identify accounts that have been changed from dormant status to active status.	7
	Ensure that status change was authorized and verify that the account has actually moved from dormant to active population (i.e. operationally)	7
Accounts Payable	Analyze and summarize population into debits and credits.	1
	Perform an aging of debit balances.	1
	Select accounts for circularization.	1
	Check cut-off (see disbursement stream below).	1
	Summarize discounts lost or earned.	1
	Perform year-to-year comparison of supplier characteristics (e.g., volume of business).	1
Accounts Payable	Identify payments where the invoice number + vendor number is duplicate	5
	Where lack of controls exist over maintaining the vendor master file (e.g. anyone can setup a vendor) may have to classify and summarize on vendor name and identify duplicate vendor numbers	5
		5
Accounts Payable	Companies can work to eliminate the penalties they are paying on overdue payables. Through analysis of where such charges (i.e. in terms of location, office, employee, etc) investigation can be conducted to determine the root cause of the delay in payment.	3
Accounts Payable	Sample transactions before and after year-end to ensure liabilities are complete	7
Accounts Payable	Identify negative balances, duplicate payments	9
	Reconcile to goods/services received	9
Share Capital	Reconcile transactions to shareholder of register	9

Category	Technique or test	Source (see Notes)
	Calculate accuracy of share transactions	9
	Identify negative shareholdings	9
	Reconcile dividends paid to shareholder of record	9
Payroll	Select a statistical sample of payments for compliance and/or substantive verification.	1
	Analyze a payment stream and extract unusual items (e.g., excessive hours, rates, etc.).	1
	Perform calculation of net pay.	1
	Summarize payroll expenses (e.g., by distribution category.)	1
	Perform month-to-month or year-to-year comparisons (e.g., number of employees, hours worked, gross pay, etc.).	1
Payroll and Employee-oriented Info	Determine the impact of an early retirement program within a given areas. For example, shortage of resources can be identified where they has been a significant number of early retirees.	3
Payroll Costs and Benefits ; e.g., employee savings plan:	Recalculation of the allocation of shares to a company plan based on the prescribed formula	9
	Recalculation of investment income allocated to each employee	9
Employee Terminations	Expenditures claimed by the employee after the date of termination	9
	Identify where hiring needs are based on departures	9
	Identify blank, duplicate, or invalid SIN numbers	9
	Identify employees without standard information (e.g. location, email, extension, etc)	9
	Identify employees with no pay, negative pay, or no deductions	9
Input tax credits	Audit taxes received, paid, and audit that the net value-added tax is correct	9
Expenses/Purchases	Ensure purchases are authorized:	9
	Reconcile users with access to master file to independent user authorization list	9
	Identify gaps within sequence of purchase orders	9
	Identify unused purchase orders and ensure that these forms are located in a secure location	9
	Reconcile vendors listed in master file to independent authorized list of vendors	9
	Summarize transactions by vendor and determine if purchases have been made to unauthorized vendors	9
	Identify duplicate invoices or debit memos	9

Category	Technique or test	Source (see Notes)
Travel Expense	Reconcile receipt submitted to the maximum rate reimbursed (i.e. as per company policy) to the amount paid out to the employee.	6
Compliance With Laws and Regulations	Invalid or high dollar amount charges made by a physician	8
	Reporting by procedure code (e.g. Healthcare Financing Administration's Common Procedure Coding System codes)	8
	Analyzing trends and patterns by physician or laboratory	8
	Identifying duplicate medical charges for the same patient.	8
Compliance	Governments can work proactively to identify whether seniors or other high risk individuals have consumed a total of amount of specific or combination of medications that would put that individual at a higher than average health risk	9
	Identifying pharmacies that violate dispensing fees regulation prescribed for senior citizens or other individuals with special care needs	9
Input Edit Checks	Classify/stratify fields similar to "gender" fields that should only contain the values permitted by the edit checks.	5
	Recalculate and verify the accuracy of calculated field (e.g. unit price X quantity should equal the total price)	5
	Reasonability tests, e.g. age of the individual, only female employees can be pregnant, etc. This type of testing is driven by the relationships within the fields	5
	Non-numeric values in numeric fields	5
	Invalid values	5
Input Edit Controls	Test input edit controls to verify controls over input.	9
Log File Testing	Import log files into generalized audit software	4
	Analyze for unusual events and allow for focusing on specific issues and circumstances.	4
Security (Assessing adequacy of segregation of duties)	Reconciliation of access rights to roles	9
	Identification of users that have access to incompatible functions	9

Category	Technique or test	Source (see Notes)
Security (Assess access management)	Matching of user profiles and privileges to the user profile maintained in the operating system	9
	Identifying user accounts that deviate from the prescribed password policy	9
	Identifying user accounts that do not correspond to the normal naming convention	9
Fraud Detection	Comparing vendor addresses to employee addresses to reveal employees who are also vendors.	2, 6
	Searching for duplicate or missing check numbers.	2, 6
	Vendors with PO Box addresses.	2, 6
	Analyzing sequence numbers (checks, invoices, etc) to identify missing documents	6
	Identifying different vendors with the same mailing address.	2, 6
	Identifying payment amounts that fall below audit thresholds to identify series of transactions conducted to circumvent detection	6
	Identification of negative entries in the invoice field	6
	Voided transactions	6
	High percentage of returned items	6
	For a single product determine what the ratios of the highest price charged (i.e. for that product) to the lowest price charged	6
	Anomalies in customer purchasing patterns (e.g. big gaps between 1 st and 2 nd highest purchases	6
	Identify reasonability expectations for charges	6
	Use of Benford's law, where the probability that the leading digit will 1, 2,3,etc compared to what is in the data file	6
Fraud Detection	Scanning for new vendors with high level of activity.	2
	Scanning for vendors with the same mailing address.	2
	Scanning for unapproved vendors.	2
	Scanning for fraudulent checks.	2
	Scanning for invoices with no purchase order number.	2
	Scanning for transactions that fall just below financial control.	2
	Employing ratio, vertical, and horizontal analysis.	2
	Identifying unusual relationships by using correlation analysis.	2
	Scanning for excessive cash transactions.	2
	Scanning for excessive use of exchange items.	2
	Scanning for significant change in bad-debt write-off.	2

Category	Technique or test	Source (see Notes)
	Scanning for the recurrence of same amounts.	2
	Scanning for sudden activity in dormant accounts.	2
Fraud Testing	Identify vendors accessed and used by one employee	9
	Invoices received from the fictitious vendor would be all sequential, as the fraudulent vendor would have only one customer	9
	Fraudulent amount would be designed to escape threshold tests, but be larger enough to be profitable for the fraudster	9
	Total time from receipt of order to payment with the fraudulent vendor would be much shorter than normal to escape detection	9
	The vendor would not be the source of complaints, or be awarded credit memos	9
	The name of the organization would not conform to the normal organizations and would include initials “consulting” or “services”	9
	Address of the fictitious vendor will likely be P.O. Box number.	2, 6, 9
	Review of journal entries for characteristics that depart from norm. This could be identified based on previous experience and/or the use of specialized statistical techniques	9
	Identify stream of high volume, low value of transactions.	9

Notes:

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|------------------------------------|-------------------|-----------------------------|
| 1. Boritz (2005) | 4. Coderre (1995) | 7. Debreceeny et al. (2005) |
| 2. Christensen and Byington (2003) | 5. Coderre (1996) | 8. Hudson (1998) |
| 3. Coderre (1993) | 6. Coderre (1999) | 9. Kriel (2007) |

References

Albrecht, W. Steve and Robert J. Sack. *Accounting Education: Charting the Course through a Perilous Future*, Accounting Education Series Monograph Vol. 16, American Accounting Association, August 2000.

Boritz, J. E., *Computer Control & Audit Guide*, Waterloo, Ontario: University of Waterloo Centre for Information System Assurance, 13th ed., 2005, 764 pages. (updated every two years)

Christensen, Jo Ann, and Byington, J. Ralph. "The computer: An essential fraud detection tool" *The Journal of Corporate Accounting & Finance*. Hoboken: Jul/Aug 2003. Vol. 14, Iss. 5; p. 23

Coderre, David G. "Automating the audit function", *The Internal Auditor*. Altamonte Springs: Oct 1993. Vol. 50, Iss. 5; pg. 18, 3 pgs

Coderre, David, Doing it differently. *The Internal Auditor*. Altamonte Springs: Feb 1995. Vol. 52, Iss. 1; pg. 16, 2 pgs

Coderre, David. Testing application controls, *The Internal Auditor*. Altamonte Springs: Dec 1996. Vol. 53, Iss. 6; pg. 18, 3 pgs

Coderre, David, "Computer-assisted techniques for fraud detection", *The CPA Journal*; Aug 1999; 69, 8.

Coderre, David G. *CAATs and Other BEASTs for Auditors*. 3rd Edition Vancouver, BC: Ekaros Analytical, 2005.

Debreceeny, Roger et al., "Employing generalized audit software in the financial services sector: Challenges and opportunities", *Managerial Auditing Journal*. Bradford: 2005. Vol. 20, Iss. 6; p. 605 (14 pages)

Gelinas, Ulric J. et al., "Norwood Office Supplies, Inc.: A teaching case to integrate computer-assisted auditing into the auditing course", *Issues in Accounting Education* Vol. 16, No. 4 (November) 2001, pp. 603-636.

Gray, Robert P., "The Collapse of Barings Bank", *Journal of Accounting Case Research* Vol. 8, No. 2 (Summer) 2005, pp. 1-15

Greenstein, Marilyn and McKee, Thomas E., "Assurance practitioners' and educators' self-perceived IT knowledge level: an empirical assessment", *International Journal of Accounting Information Systems*, Vol 5, pg 213-243, 2004.

Hudson, Mary E. "CAATS and compliance", *The Internal Auditor*. Altamonte Springs: Apr 1998. Vol. 55, Iss. 2; pg. 25, 3 pgs

Kriel, Eckhardt J. *Application of Computer-assisted Audit Techniques*, Toronto: The Canadian Institute of Chartered Accountants (CICA), 2007.

Lehman, Mark and Watson, Marcia Weidenmier. "Detecting Shell Companies with Dynamic Text Comparisons" *Journal of Forensic Accounting* forthcoming 2007.

Nieschwietz, Robert, et al., "Auditing with technology: using generalized audit software in the classroom", *Journal of Accounting Education* (Autumn) 2002, 307-329.

O'Donnell, Joseph and Moore, Jennifer, "Are Accounting Programs Providing Fundamental IT Control Knowledge?" *The CPA Journal*, Vol. 75, Iss. 5 (May) 2005, pg. 64, 3 pgs.

Splettstoesser, Ingrid B. "Information Systems Controls and Auditing: Mathra Tool Inc.", *Issues in Accounting Education*, Vol. 14, No. 2 (May) 1999, pp. 285-291.

Splettstoesser, Ingrid B. "Equality Stores Limited" Unpublished Manuscript, Atkinson College, York University, 1997.

Splettstoesser, Ingrid B. "Gabri Trading Ltd." Unpublished Manuscript, Atkinson College, York University, 1997.

Splettstoesser, Ingrid B. "Yarmali" Unpublished Manuscript, Atkinson College, York University, 1997.

Weidenmier, Marcia L. and Herron, Terri L., "Selecting an audit software package for the classroom", *Journal of Information Systems*, Vol. 18, No. 1 (Spring) 2004, pp. 95-110.