Due Diligence on Fast-Fashion Inventory Through Data Querying

A. Faye Borthick, DBA, CISA, CMA, CPA
School of Accountancy
Georgia State University
POB 4050
Atlanta GA 30302-4050
404 651-4472; fax: 404 651-1033
borthick@gsu.edu; www.gsu.edu/~accafb/borthick.htm

Mary B. Curtis, PhD, CPA, CISA
Department of Accounting
University of North Texas
Denton TX 76203-6677
940 565-4366; fax: 940 565-3803
curtism@unt.edu

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Abstract: In this audit simulation of a due diligence engagement for a fast-fashion retailer’s inventory account, learners (1) prepare a business process representation, (2) develop audit objectives for testing management assertions about inventory, (3) design audit procedures to implement the audit objectives, (4) execute audit procedures through querying data files, and (5) communicate procedures, results, findings, unresolved conditions, and lessons learned. The learning objectives represent essential skills for audit expertise in situations where auditors are expected to analyze data electronically to verify the internal consistency of accounting records and to detect conditions warranting further investigation. Because the necessary artifacts can exist in digital form, working a simulation is a feasible approach for developing analytical and querying skills through situation model building. Unlike most existing audit cases, this simulation has data volumes large enough to channel learners to manipulating the data with software rather than manually. Completing the simulation requires learners to wrestle with ambiguities embedded in a realistic audit setting as they make the inferences necessary to develop an approach to performing the audit. The simulation is staged with a narrative of a conversation among audit staff members, an audit program from an earlier engagement, results to date on the audit, a database with tables pertaining to the company’s inventory, and a report template. The simulation, which can be worked with a database query tool or audit software, is appropriate for students with database querying proficiency and the capability to design audit procedures for testing management assertions about inventory. Although this set of skills typically converges most often in IS assurance or audit courses, the simulation is accessible to auditing students that have developed query skills, e.g., from a co- or prerequisite AIS course. The simulation offers some potential for bridging the understanding gap between IS auditors and general auditors by enabling novice auditors to experience an auditing situation in which they apply IS audit tools to
verify internal consistency of data and detect unusual conditions as they perform an audit of financial statement assertions.

**Key Words:** Audit program design; Audit simulation; Audit software; Database querying; Due diligence; Fast fashion; Integration of financial and IS auditing; Query strategy; Queries
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I. THE SIMULATION

The Engagement

*Scene: October 1, auditors planning the inventory account portion of a due diligence engagement*\(^1\) on Threadchic, a fast-fashion\(^2\) phenom

Bradlei (engagement partner): “As usual for due diligence work, we didn’t have advance notice. Because of the short time frame, the site team observed the company’s year-end inventory count, which is why we have count results before we developed the rest of the audit procedures. The team also downloaded copies of the full client data files for us. In addition to the data, here are data attribute definitions (Figure 1), results to date on the engagement (Figure 2), and the audit program for a due diligence engagement similar to this one (Figure 3). Before I forget, Threadchic marks down inventory 21 days after no sales, automatic from corporate, with posting to G/L as a month-end adjustment.”

Sumit (audit senior): “This is my first due diligence assignment. How does it differ from a financial statement audit?”

Shantor (audit manager): “About two months.”

Sumit: [looking puzzled]

Shantor: “We have the same objectives as a financial statement audit, but, instead of 75 days after year end to sign off on the audit, there might be two weeks from offer to closing. Hence, two months’ difference.”

Sumit: “Why so short?”

Shantor: “It’s the nature of the M&A [mergers and acquisitions] business—urgency to do the deal before anybody gets cold feet or other suitors spoil the duet.”

Bradlei: “To be specific, closing is ten days away, giving us a week for our work. Another difference is that our client is the acquiring company, not the company being audited. And, there’s no opportunity for testing controls. All the evidence we collect will come out of the data.”

Roseyrl (first-year audit staff member): “So that’s why we keyboard jockeys are on this job—to analyze the data electronically in just a few days.”

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\(^1\) Due diligence is the process of examining the financial underpinnings of a company for the purpose of assessing the risks associated with acquiring or merging with the company. Due diligence assurance engagements pertaining to financial statements address the same five management assertions as financial statement audits.

Jantor (second-year audit staff member): “I’m ready! We didn’t do inventory in last month’s query course, but I’ve got some ideas to get us started.”

Bradlei: “Good! We need your query expertise and the analysis it affords for jobs like this where there’s only enough time for doing the most crucial analyses with software. As companies have to accelerate their financial statement filings over the next few years, I believe we’ll be increasing the proportion of audit hours devoted to analysis of whole data files with query tools. More of our training will soon be oriented this way.”

Shantor: “Querying also has the advantage of enabling us to maintain an objective perspective—no halo effect for anything about the company—it’s just data to us.”

Bradlei: “Good point! Regardless, we know a lot about the company to inform our risk assessments. It’s been profitable throughout its life, albeit short, as a fast-fashion retailer. Some audit procedures have already been done—no problems in cutoff and no evidence of inventory being pledged. Sarbanes-Oxley 404 compliance is not a concern because the acquirer intends to replace all of Threadchic’s systems with their own. The company was founded as an alternative source for fashion goods that are as stylish as the high-priced threads but not nearly as expensive. It’s a “fast-fashion” version of a “high-fashion” retailer. The founders are getting their wish to cash out by being bought by a larger retailer.”

Sumit: “Fast fashion?”

Roseyrl: “Yes. Threadchic buys from companies that knock off designer fashions and make them faster than the designer houses can. Threadchic started out selling knock-off stuff to just anybody, but pretty soon the fashionistas caught on. Fashionistas buy but don’t tell anybody—except, of course, their closest fashionista friends.”

Jantor: “I can vouch for prices there being less than those of bigger, fully-integrated companies, like H&M and Zara. And stores get new styles every 2-4 weeks direct from vendors, which go on the shelves from the shipping carton. Vendors do everything, like attaching hang tags, putting on hangers, and sending electronic invoices to corporate.”

Sumit: “Are you a fashionista?”

Jantor: “Heavens, no. I hear the neighborhood kids talk about it. You know—kids SKUing each other on cell phones. I can’t figure out what distresses them more—not having the latest knock off or more than one of them wearing it at the same time.”

Bradlei: “Skew’ what?”

Jantor: “Dropping the S-K-U, the inventory Stock Keeping Unit, into a text message they send through their cell phones.”

Bradlei: “Thanks for the translation! So that’s what my kids are doing.”

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Required

Part 1: Readiness Questions

After you have become familiar with the Threadchic situation as represented by the narrative, the data, data attribute definitions, audit results to date, and the audit program for a similar engagement, answer the following questions to assess your readiness to begin analyzing Threadchic’s inventory account. The questions illustrate the kinds of thinking that will enable you to understand the situation in order to develop productive audit objectives. Select the best choice for each question. The questions are independent of each other.

1. SKUs appearing in the purchases table but not in the inventoryCount table is most likely attributable to inventory:
   a. having been sold earlier for those SKUs
   b. not being accounted for or counted properly
   c. being lost before being placed on store shelves
   d. records being lost sometime during the year
   e. being stolen before or after reaching store shelves

2. Suppose for one vendor there is a concentration of observed inventory counts lower than the system's counts. The audit implication of this outcome would be to:
   a. suggest that Threadchic staff be especially careful when they count inventory for this vendor
   b. base calculations for this vendor’s items on the counts observed at year end for the items
   c. prompt the adjustment of counts for other items downward consistent with the counts for this vendor
   d. create the need for the auditor to investigate whether this vendor's items are more theft-prone
   e. call into question whether the counts for the items from the other vendors can be relied upon

3. The risk of employee theft of items during the year is a threat to the inventory account at year end with respect to the assertion of:
   a. existence
   b. completeness
   c. rights and obligations
   d. valuation
   e. presentation and disclosure
   f. none of the assertions is threatened

4. Comparing current-year manufacturing costs with those of the prior year might reveal:
   a. trends over time in manufacturing costs
   b. discrepancies in records of manufacturing costs
   c. how Threadchic's cost structure differs from that of other companies in its industry
d. symptoms of runaway costs soon enough for Threadchic to bring them under control

e. that Threadchic has no manufacturing costs

5. Suppose item costs in the markdown file did not match the costs in the purchases file. If the reason for the mismatch was that Threadchic had already marked down items to the lower of cost or market, which audit procedure would most likely detect that condition?

a. Match purchased items to invoice totals to verify correctness of vendor invoices. Investigate any invoices whose total does not match the sum of line items for that purchase.

b. Calculate the difference between cost and the most recent sales price for all items. Recommend financial auditors investigate items sold for a price different from the standard markup.

c. Obtain data about returns and allowances from vendors and verify that costs have been adjusted to agree with credit given by vendors for item purchases.

d. Ask Threadchic staff to explain the approach to marking down items. Recompute to verify that all item costs in the markdown file adhered to Threadchic's approach.

e. Compare prior year inventory costs to current year inventory costs, compare prior year inventory turnover to current year turnover, and investigate any differences larger than 10%.

**Part 2: Analysis**

1. Prepare a one-page business process diagram (BPD) for Threadchic’s processes concerning inventory to the extent you can infer them from the materials provided.

2. By financial statement assertion, develop audit objectives for Threadchic's inventory account.

3. Design audit procedures to implement the audit objectives.

4. Execute the audit procedures by querying the data.

5. Communicate audit objectives (by assertion), audit procedures, results from execution of queries, matters warranting followup, lessons learned, and time spent by completing the report in Figure 4. The report form shows the results of work already performed.

**II. LEARNING OBJECTIVES**

**Learning Objectives**

The learning objectives for this audit simulation are for students to learn to:
1. Prepare a business process representation,
2. Develop, by financial statement assertion, audit objectives for the inventory account,
3. Design audit procedures to implement the audit objectives,
4. Execute the audit procedures by querying the data, and
5. Communicate audit objectives (by assertion), audit procedures, results from execution of queries, matters warranting followup, and lessons learned.

Set in the context of a due diligence engagement on a fast-fashion retailer’s inventory account, the objectives represent essential skills for audit expertise in situations where auditors are expected to analyze data electronically to verify the internal consistency of accounting records and to detect conditions warranting further investigation as they perform an audit of financial statement assertions. Working the simulation develops analytical and querying skills. The simulation materials include a narrative of a conversation among audit staff members, an audit program from an earlier non-automated engagement, results to date on the audit, files containing transaction and balance data pertaining to the company’s inventory, data attribute definitions, and a report template.

Motivation for an Audit Simulation

The multi-decade quest for the determinants of audit expertise (Bonner and Lewis 1990; Libby and Luft 1993; Libby 1995) prompts consideration of whether there are learning experiences with the potential to accelerate the development of audit expertise in replicable, time-compressed ways. A promising approach to offering novice auditors experiences for developing audit expertise is audit simulation because of its potential for staging situations that replicate the essential artifacts of audit settings. Employing audit simulation for staging learning experiences constitutes an example of an “applied task performed by a novice/inexperienced subject” (Solomon and Shields 1995, 140). In addition to helping “provide a baseline for assessing the effects of experience” (Solomon and Shields 1995, 140), the approach may have promise in
revealing specific ways that novices’ performance is less than optimal, which can be used as a
guide to developing learning experiences for enabling improved performance.

IS auditing situations are especially suited for learning experiences through simulation
because their artifacts exist, for the most part, in digital form. By definition, the work of IS
auditors concerns relationships among transactions, controls, programs, files, records, and
attributes representing the activities of an organization. The relationships can be audited on an
historical basis, e.g., periodic audits of financial statements or ad hoc audits of operations, or on a
continuous basis, e.g., continuous assurance on the integrity of specific processes (Alles et al.
2002; Elliott 2002; Rezaee et al. 2002).

**Bridging the Understanding Gap Between IS and General Auditors**

The continuing pressure for more effective audits performed in less time at less cost has
gradually increased demand for analytical and querying skills on audit and due diligence
engagements (McCollum 2002; Fennel 2003; Jackson 2004). Concurrently, expectations have
been growing for auditors to increase their productivity with software (Elliott 2002; McCollum
2002). Some audit groups have been aggressively seeking to replace time-consuming manual
procedures with more powerful electronic procedures executed with audit or analysis software
that has become commonplace and affordable on PC desktops (McCollum 2002). Auditing
standards now suggest that auditors can no longer justify strictly manual audit procedures for
clients with complex computing environments (AICPA 2001). Business executives expect
auditors to be as technically savvy as the systems they audit. Responding to these pressures and
expectations sets up a demand for accounting graduates to have the analytical and querying skills
that enable them to be productive in an increasingly technology-enabled business environment.

An impediment to the productive application of analytical and querying expertise in
auditing is the perennial difficulty that IS auditors and general auditors have had in integrating
their efforts (Stazyk 1992; Vendrzyk and Bagranoff 2003; Carmichael 2004). As Carmichael
explained the situation, “there is often insufficient discussion between the computer auditors and general auditors for the general auditors to know what assurance is provided by the work being done by the computer specialists” (Carmichael 2004, 132). Different educational backgrounds and work experiences have led to different perspectives on auditing and information systems. Comparatively, IS auditors typically complete a higher proportion of college courses in IS while financial auditors typically complete a higher proportion of courses in accounting. IS auditors may have sought out ways to develop expertise with systems and software while financial auditors developed knowledge of financial accounting. Outcomes of different education and experience are findings that experienced IS auditors exhibit a dominant knowledge structure of transaction flow (Curtis and Viator 2000) while experienced financial auditors exhibit a dominant knowledge structure of control objective (Frederick et al. 1994). Furthermore, IS auditors possess another knowledge structure embodying the extent of computerization of a system (Curtis and Viator 2000). For a group of IS auditors, IS education and experience were associated with a propensity to weight automated controls higher (Viator and Curtis 1998).

We believe that experiencing an audit simulation like the one used here offers some promise for bridging the understanding gap between financial auditors and IS auditors by enabling inexperienced auditors to experience a financial auditing situation in which they apply IS audit tools. It is a small step toward achieving the integration of financial and IS auditing that has long been desired but rarely observed (Stazyk 1992; Venderzyk and Bagranoff 2003). As system complexity and the pace of system evolution increase, we believe that leveraging auditors’ efforts with technology will become more important (O'Donnell et al. 2000; Winograd et al. 2000; Venderzyk and Bagranoff 2003). By affording students an opportunity to apply IS audit tools to financial statement audit objectives, this simulation offers some potential for bridging the understanding gap between IS auditors and general auditors.
Learning Theory: Building Situation Models for Situated Action

The design of the simulation stems from the theory of situation models, in which learners construct their own situation models by making inferences and elaborations as they encounter new information. From this viewpoint, successful comprehension of a problem is synonymous with constructing a coherent situation model representing it (Johnson-Laird 1983; van Dijk and Kintsch 1983; Gernsbacher 1997; Graesser et al. 1997; Zwaan and Radvansky 1998). In this characterization of comprehension, constructing one’s own mental situation models constitutes the best preparation for situated action (Zwaan and Radvansky 1998; Barsalou 1999). In relation to this audit simulation, the situated action is performance on the next engagement requiring analysis and querying skills.

Situations devoid of ambiguities and conflicts do not prompt the inferences and elaborations leading to construction of robust situation models. In the absence of ambiguities and conflicts, there is no need to make connecting inferences about intentionality, causality, or probabilities surrounding assumptions in order to update the current model (Myers et al. 1987). When a situation is straightforward, the ease of comprehension comes at the expense of model building. Because easy comprehension does not prompt elaborations or inferences, the subsequent value in having experienced the situation is low (Duffy et al. 1990).

The simulation was designed to prompt learners to make the substantial inferences and elaborations required to make sense of the audit situation. The insights do not, however, come all at once. Instead, learners integrate new knowledge from the narrative, the data files, and other materials a piece at a time into their existing situation models (Gernsbacher 1997; Zwaan and Radvansky 1998). The inferences and elaborations are subtle, but they represent the kinds of situation model updating that auditors are expected to do as they make sense of nuances emerging from audit situations. For example, while it distinguishes due diligence engagements from audits of financial statements, the narrative does not spell out the kinds of ambiguities embedded in the
data files. As in real due diligence engagements, inconsistencies emerge through analyzing the relationships represented in the data files. Just as auditors often do not know ahead of time what inconsistencies, if any, they will find, the narrative does not reveal the specific conditions seeded in the data. Making the inferences required to resolve or document the ambiguities or inconsistencies gives learners practice in making the kinds of inferences and elaborations expected of auditors.

Constructing the business process diagram (BPD) serves as a focal point for learners’ understanding of the business processes associated with the company’s inventory. Creating an explicit representation of the business processes prompts learners to distinguish this company’s inventory processes from those of other companies so that they can design audit objectives tailored to the company’s specific processes.

The uncertainties are embedded in the data, from which unresolved conditions emerge. The learner’s problem is to investigate and characterize the unresolved conditions to the extent data are available, and explain how the conditions could be investigated with the least amount of additional data and effort. In practice, auditors trade off the potential benefits of having more information with the costs of obtaining and analyzing it. This simulation enacts the real-world predicament of auditors being unable to anticipate every possible data need because of not knowing what conditions will emerge over the course of an engagement. The learner gets practice in recognizing information that might help resolve open questions and indicating how they would analyze it.

Eliciting the inferences and elaborations for constructing robust situation models requires cognitive conflict tasks, tasks that have no correct answers because there is no right way to resolve ambiguities and conflicts (Laughlin 1980; McGrath 1984). With cognitive conflicts, conclusions or recommendations are justified as representing the most complete, plausible, or compelling understanding of a situation on the basis of the available evidence (King and
Kitchener 1994). Ambiguities and conflicts emerge in the simulation as learners struggle to make sense of the situation from the narrative and the conditions they make the data reveal to them.

Because they require more elaborations and inferences to resolve conflicts and integrate fragments, cognitive conflict tasks make more cognitive demands than intellective tasks, tasks with demonstrably correct answers (Laughlin 1980; McGrath 1984). The more simplistic models afforded by intellective tasks are less useful later because they have fewer relations (Zwaan and Radvansky 1998). Furthermore, integrated situation models constructed from elaborations and inferences to resolve conflicts are relatively resistant to decay over time compared to models developed without making elaborations and inferences (Zwaan et al. 1995). The conflicts prompt more effort to construct coherent models from otherwise contradictory fragments even if that means constructing and integrating additional models (Barsalou 1999).

Simulation Design

Part 1: Readiness Questions

In part 1, five multiple choice questions with tailored feedback for each response (in the teaching notes) assess learners’ understanding of Threadchic’s situation and its representation in the data files. To serve as an indicator of students’ readiness to work the simulation, the questions can be administered anytime after students have had an opportunity to become familiar with the simulation materials but before they begin executing audit procedures, e.g., the questions could be completed one week after students receive the materials, which might be one week before the simulation is due. The questions can be staged in a learning management system with automatic provision of the response-level feedback.

As a readiness indicator, the questions afford a potential Saving Sergeant Pabletti epiphany for learners (Prensky 2001). In their initial encounter with the Saving Sergeant Pabletti video game, U.S. Army recruits’ first attempt at saving the sergeant after he is shot accidentally leads to his death because the recruits fail to learn and apply their lessons. In subsequent game
plays, the recruits typically heed the lessons, shifting from unproductive to productive behaviors that enable them to save the sergeant. The readiness questions serve a similar function in this simulation—a wakeup call to learners indicating the need to think more deeply about the audit situation than they did initially, in order to understand it, in preparation for developing audit objectives and procedures that really match the situation.

**Part 2: The Simulation**

In part 2, learners (1) prepare a business process diagram, (2) design audit procedures for execution on data files, (3) implement audit procedures through data querying, and (4) communicate procedures, results, findings, unresolved conditions, and lessons learned. Although the simulation suggests a reporting format, instructors might also require students to prepare a memo to the engagement partner summarizing their results. Materials for part 2 can be staged on a Web site, which permits the situation narrative to offer links that make the situation more authentic.

The simulation context was designed with the least number of tables and attributes necessary to represent the financial transactions and balances associated with the retailer’s inventory. Because the tables are in third-normal form (3NF), learners are faced with deciding which tables to join for different queries and how to join them.

The data volumes are large enough to channel learners to manipulating the data with software rather than manually. For example, the purchases table has over 600 rows. In practice, IS auditors are more expensive than regular audit staff, which means the budget for their time sets up the expectation that their services will be valuable in ways that regular audit staff are not. Thus, students have the opportunity to develop skills with analysis and query software to differentiate themselves in the market for audit talent. Awareness of the market for IS audit skills might prompt more students to work harder at developing these skills in this simulation.
Audit simulations are not plentiful in the literature. To the authors’ knowledge, this simulation is the first one to require students to integrate analysis and query skills developed earlier to execute audit programs with software and recommend approaches for resolving the unusual conditions they detect. Although the Norwood case (Gelinas et al. 2001) has integrative aspects, it was designed as an introduction to computer-assisted auditing techniques. This audit simulation assumes learner proficiency with querying, analysis, and audit program design, and requires learners to interpret their results and offer procedures for resolving unusual conditions.

**Student Reaction to Learning with the Audit Simulation**

Students have been surprised at the depth of thought required to design the audit program, execute it with audit or query software, refine their audit programs, make sense of the results, and imagine procedures for resolving unusual conditions. Analogous to the readiness questions prompting a *Saving Sergeant Pabletti* epiphany (Prensky 2001) with respect to understanding the audit situation, the audit itself serves as a wakeup call to the level of reasoning required to verify internal consistency of accounting records and detect unusual conditions. Although it seems a straightforward audit of an inventory account, the simulation contains enough indeterminant conditions to make the audit sufficiently problematic to require strategic reasoning about data relationships (Wilks and Zimbelman 2004). Ironically, the stronger their audit programs are, the more likely students are to encounter the relationship anomalies embedded in the data. The realization that querying results might be spawning unresolved conditions rather than converging to a definitive outcome can be disconcerting to students because of their prior acculturation to learning experiences that enable a sense of closure when they work through tasks to obtain neat, tidy outcomes.

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4 For web staging, including a link to the database, view [http://www.gsu.edu/~wwwsys/pro/project/Threadchic/site/Threadchic.htm](http://www.gsu.edu/~wwwsys/pro/project/Threadchic/site/Threadchic.htm). For access, use name = ac863 and password = Qd0319.
Inheriting a prior audit program may predispose students to a false sense of security that belies the potential of this audit situation to be different. Students missing the unusual conditions in the data are much chagrined at their failure to detect them. Having been sensitized to the possibility of these conditions, students have tended to look for them in subsequent audit simulations. To the extent that this experience prompts students to be more wary of inheriting a prior audit program uncritically and accepting management assertions at face value, these are outcomes that will serve them well in their careers. Learning experiences like this simulation might help auditors overcome a tendency to engage in less strategic reasoning with use of standard audit programs (Asare and Wright 2004).

The challenges of the simulation have prompted a range of student reactions. Some students embrace the simulation enthusiastically, saying they are delighted to be able to apply their thinking skills in an ambiguous situation like the ones they will face in their careers. Some of these students become aware, for the first time, of their ability to analyze a complicated situation and make sense of it (Weick 1995, 2001). These students thrive on the challenge afforded by the simulation and are eager for even more challenging simulations. Another kind of student is able, with hard work and persistence, to develop and execute a reasonably good audit program but unable to develop implications of the unusual conditions or offer approaches for investigating unresolved conditions. A third kind of student executes the inherited audit programs in a perfunctory manner and misses all the unusual conditions. All students liked the readiness questions because the questions afford an opportunity for them to calibrate the level of their understanding of the audit situation early in their work on the simulation.
III. IMPLEMENTATION GUIDANCE

Matching to Courses and Assuring Prerequisite Skills

The simulation was developed for information systems (IS) auditing courses and auditing courses. It can be used as an individual or a team assignment to (1) develop learners’ audit program design and execution skills with software or (2) assess learners’ competence in designing and executing audit programs with software. Depending on the learners’ analysis, querying and auditing skills, the simulation takes between 6 and 15 hours to complete.

The simulation is appropriate for students with (1) querying proficiency, (2) data analysis skills, (3) sufficient understanding of management assertions in financial statements to adapt a generic audit program to a specific situation, and (4) knowledge of inventory-related processes in retail sales. The requisite query skills include joining tables, building expressions, using built-in functions, applying the Group By operator, sorting and formatting results, and naming, saving, and retrieving queries. A learning experience that develops querying skills is Borthick et al.’s (2001) case on assuring compliance for responses to Web site referrals, which can be used in AIS or auditing courses.

The requisite data analysis skills are (1) identifying risks in a business situation, (2) deciding which risks can be investigated with transactional data, and (3) querying data to determine the extent to which risks have been realized. A learning experience that develops the data analysis skills is Borthick and Jones’ (2005) case on investigating a potential budget overrun for warranty service call center operations, which can be used in AIS or auditing courses. This case assumes basic querying skills, such as those developed in Borthick et al. (2001).

Students can obtain knowledge of inventory-related processes in sales from study of revenue and expenditure cycles, which are covered in Perry and Schneider (2005) and many AIS textbooks and in many auditing textbooks. The simulation requires students to integrate their understanding of the two cycles. Many students will likely already be familiar with sales
procedures in retail stores through work experience or their experience as customers. Students that seem unfamiliar with the retail environment could be encouraged to observe sales activities in local stores.

Understanding the meaning of management’s assertions on financial statements can be obtained through the portion of an auditing course on financial statement auditing or careful reading of AU Section 326 Evidential Matter (AICPA 2004). If learners need more assistance developing the audit program, instructors could provide them with some or all of the audit objectives and procedures although doing so would limit the potential of the simulation to develop analytical skills for developing audit objectives and audit procedures to implement them.

Students will probably consult their audit textbooks for audit programs for the inventory account. Most of the procedures they find will likely be manual, such as drawing a sample for vouching and tracing. On the one hand, this may prompt them to convert manual audit procedures to automated ones. On the other hand, such references have the potential to limit student creativity because some IS audit procedures have no manual audit equivalent. For example, there is no manual equivalent to matching two files to determine the reasonableness of field values or matching across three files to find non-matching records.

Because of growing interest from faculty in using audit simulations in auditing courses, the discussion of prerequisite skills above attempted to show how the simulation might be made accessible to students in auditing courses. If learning experiences for developing querying expertise were included in an undergraduate AIS course that is a prerequisite for an undergraduate auditing course, then students could begin the simulation after learning about management assertions and audit procedures in the auditing course. This approach has the potential to accelerate students’ integration of financial statement auditing and software tool use to afford advances in audit efficiency and effectiveness.
Choosing a Business Process Modeling Approach

Although the business process representation for activities related to inventory can be developed with any modeling approach, e.g., REA modeling, flowcharting, or entity-relationship modeling, an approach specifically developed for business process modeling is the Business Process Modeling Initiative (BPMI) Notation Working Group’s Business Process Modeling Notation (BPMI 2004). BPMN was developed as an approach to business process representation that would be understandable to business users, business analysts, technical developers, and business managers. White’s (2004) introduction to BPMN has been adequate for enabling students to apply this approach to develop their business process diagrams. The introduction (White 2004) and specification (BPMI 2004) are available at no cost from the BPMI web site.

Selecting the Software Tool

Students have worked the simulation using a database query tool (Microsoft Access® QBE) and audit software (ACL™). Use of either one enables achievement of learning objectives. Using database querying has the advantage of affording students experience with querying relational databases, which will be helpful to them regardless of whether they become auditors or use the same or different query tools in the future. Database query tools are usually less cumbersome to use than audit software because client data files are easier to import into a database than into a proprietary audit software format. Using audit software has the advantage of familiarizing students intending to become auditors with the typical functions in audit software packages. Given that either kind of software enables students to achieve intended learning outcomes, software choice may devolve to selection based on practical considerations such as which software tool (1) is more readily available to students, (2) is associated with higher initial proficiency with querying, or (3) is used subsequently in the curriculum.
Realizing Learning Gains through Collaboration

The simulation can be assigned to individual learners or to teams of learners. In our experience, teams usually exhibit the advantages of more thorough analyses, less frustration on the part of individual learners, and higher satisfaction with the learning experience due to its collaborative nature, which enables students to learn from each other (Rogoff 1998; Borthick et al. 2003). Working with others also lets students experience the demand for business professionals to collaborate on problems for which new approaches or solutions are required (Schrage 1990; Raelin 1997).

A risk of team completion of the analysis in part 2 is freeloading by individuals. Some tactics to deter freeloading are to require team members to rate each other’s contributions to the audit, to use smaller teams, to have student teams publish their work on the Web or in a learning management system before a class discussion of outcomes, and to select individuals at random to lead class discussion of the outcomes. The visibility of published work is often sufficient impetus to prompt student teams to make a good faith effort to complete the simulation. Within teams, the members wanting their teams to show well often exert enough peer pressure on their team mates to prompt everyone’s participation. Although it does not ensure that all team members work equally hard, public visibility of work seems to elicit more participation from all team members compared to the situation of student work being a private performance only for the instructor.

Although this simulation has particular audit issues for students to address, the larger objective is for students to develop analysis and query skills that will let them develop and execute audit programs in more challenging situations. The objective is for learners to internalize reasoning strategies that enable them to develop effective approaches to the next new problem they encounter (Kozulin 1998; Sfard 1998). Some of these long-lived skills appear to develop in the activity of tearing apart inferior solutions (Kruger 1993). Because they tend to implement the first solution approach that occurs to them, individuals, on their own, are unlikely to generate
many opportunities to learn from inferior solutions. For this purpose, collaborating with peers is helpful because peers think of different approaches and push each other to justify their beliefs or abandon them (Bruffee 1999).

**Realizing Learning Gains through Collaboration**

The simulation can be assigned to individual learners or to teams of learners. In our experience, teams usually exhibit the advantages of more thorough analyses, less frustration on the part of individual learners, and higher satisfaction with the learning experience due to its collaborative nature, which enables students to learn from each other (Rogoff 1998; Borthick et al. 2003). Working with others also lets students experience the demand for business professionals to collaborate on problems for which new approaches or solutions are required (Schrage 1990; Raelin 1997).

**Introducing the Simulation**

Although it is appropriate for instructors to introduce the Threadchic simulation by pointing out the need for integrative thinking, students may not realize what that means until they have spent time querying and analyzing the situation. We encourage instructors to minimize their introductory comments but be ready to respond to students’ questions by engaging them in discussions that enable them to answer their own questions. For example, we have found it helpful to prompt students for questions after they read the situation narrative, before and after they complete the readiness questions, and during the period they are working on the audit.

For students that seem bewildered at beginning the audit, it is helpful to point out that the Threadchic Inventory Account Report form in Figure 4 can be used as a guide to what to do, i.e., develop audit objectives for each financial statement assertion, design audit procedures to implement the audit objectives, execute the audit procedures by querying the data, and
communicate the results by completing the report. Thus, the report form can be used as an organizer for the work itself and a repository for portions in progress or completed.

**Posing as Single or Multiple Assignments**

The audit report can be completed as single or multiple assignments. As a single assignment, the simulation has the advantage of creating the opportunity for students to experience the audit as an integrative whole in which the effectiveness of sequences of audit objectives, audit procedures, and procedure executions matter. A single-assignment approach ensures that students experience the audit as auditors would, as a whole task, without check figures at interim stages because real world situations do not provide them. Although it likely increases the number of student audits that fail to detect the unusual conditions seeded in the database, a single-assignment approach increases the likelihood that students will develop the integrative thinking the simulation is designed to elicit. Ineffective audits may fail to detect important unusual conditions or inconsistencies. We believe we advantage students by offering them this lesson in a course rather than letting them experience it first on the job.

Our preference for a single-assignment audit may not be appropriate for all learners. For a multiple-assignment audit, we suggest making the audit objectives one assignment and audit procedures, procedure execution, and report completion a second assignment. A risk of this approach is that students might not fully grasp the significance of the integrated set of audit objectives if they did not develop them. These students might leave the simulation with an inflated sense of their auditing expertise.

**Closing the Simulation**

The most important aspect of closing the simulation is to ensure that the existence of the two unusual conditions is revealed and that possible explanations for them are thought through. This debriefing could be driven by student presentations or discussion or by instructor summary.
It is helpful to prompt students to characterize what they believe they learned from the simulation and especially how what they learned might be useful in the future.

IV. SUMMARY

This audit simulation enables students to develop skills for analyzing data with software tools to verify the internal consistency of data and detect conditions warranting further investigation in a due diligence engagement. In completing the simulation, learners wrestle with ambiguities embedded in a realistic audit context as they make the inferences necessary to develop an approach to performing the audit of a fast-fashion retailer’s inventory account. Working the simulation offers an opportunity for students to integrate previously developed skills in designing audit procedures to test management assertions and analyzing data through querying data files. The simulation enables students to experience a financial auditing situation in which they apply IS audit tools, which offers some promise for bridging the understanding gap between IS auditors and general auditors. The simulation experience responds to the growing demand for auditors to increase their productivity through software use for analyzing client data files electronically.
# FIGURE 1
## Data Attributes

<table>
<thead>
<tr>
<th>Table/Attribute</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>inventoryCount</strong>:</td>
<td>All items observed in the year end inventory count</td>
</tr>
<tr>
<td>SKU</td>
<td>Stock keeping unit, the unique identifier for each item in inventory</td>
</tr>
<tr>
<td>storeID</td>
<td>Unique identifier for each store</td>
</tr>
<tr>
<td>bookQOHprecount</td>
<td>Item quantity in inventory records immediately before the inventory count</td>
</tr>
<tr>
<td>bookDate</td>
<td>Date for values in bookQOHprecount</td>
</tr>
<tr>
<td>obsvQOH</td>
<td>Quantity on hand observed by the client in its inventory count</td>
</tr>
<tr>
<td>obsvDate</td>
<td>Date of inventory count</td>
</tr>
<tr>
<td><strong>invoices</strong>: All invoices for the year, sent by vendors to corporate</td>
<td></td>
</tr>
<tr>
<td>invoiceID</td>
<td>Unique identifier for each invoice</td>
</tr>
<tr>
<td>vendorID</td>
<td>Unique identifier for each vendor</td>
</tr>
<tr>
<td>invoiceTotal</td>
<td>Total for this invoice</td>
</tr>
<tr>
<td>invoiceDate</td>
<td>Date invoice created by vendor</td>
</tr>
<tr>
<td><strong>purchases</strong>: Line item information for each invoice, multiple lines per invoice</td>
<td></td>
</tr>
<tr>
<td>invoiceID</td>
<td>Unique identifier for invoice</td>
</tr>
<tr>
<td>lineID</td>
<td>Line ID within this invoice</td>
</tr>
<tr>
<td>SKU</td>
<td>Stock keeping unit, the unique identifier for each item in inventory</td>
</tr>
<tr>
<td>cost</td>
<td>Cost per unit</td>
</tr>
<tr>
<td>orderQty</td>
<td>Quantity of this item ordered</td>
</tr>
<tr>
<td><strong>markDowns</strong>: Markdowns taken on inventory items</td>
<td></td>
</tr>
<tr>
<td>SKU</td>
<td>Stock keeping unit, the unique identifier for each item in inventory</td>
</tr>
<tr>
<td>vendorID</td>
<td>Unique identifier for vendor</td>
</tr>
<tr>
<td>cost</td>
<td>Purchase cost of item</td>
</tr>
<tr>
<td>lastSalesPrice</td>
<td>Sales price for the last sale</td>
</tr>
<tr>
<td>lastSalesDate</td>
<td>Last date item was sold</td>
</tr>
<tr>
<td>markedDownCost</td>
<td>Cost value after markdown</td>
</tr>
<tr>
<td><strong>trialBalances</strong>: General ledger account balances just before the inventory count</td>
<td></td>
</tr>
<tr>
<td>acctID</td>
<td>Unique identifier for account</td>
</tr>
<tr>
<td>acctTitle</td>
<td>Account title</td>
</tr>
<tr>
<td>storeID</td>
<td>Unique identifier for each store</td>
</tr>
<tr>
<td>acctBalance</td>
<td>Account balance</td>
</tr>
<tr>
<td>year</td>
<td>Year and audit status</td>
</tr>
</tbody>
</table>
FIGURE 2
Threadchic: Audit results to date

<table>
<thead>
<tr>
<th>Objective</th>
<th>Audit procedure</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Count inventory</td>
<td>Observe inventory count on 9/30 (year-end date; compare with pre-count records)</td>
<td>Counts taken with sufficient accuracy. Counting errors random</td>
</tr>
<tr>
<td>2. Perform cutoff test on inventory transactions*</td>
<td>1. Examine a sample of receiving reports for a few days before and after year-end for recording of inventory purchases in the proper period. 2. Examine a sample of sales transactions for a few days before and after year-end for recording of sales in the proper period.</td>
<td>1. All sampled receipts recorded in proper period 2. All sales transactions recorded in proper period</td>
</tr>
<tr>
<td><strong>Completeness</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Count inventory</td>
<td>Observe inventory count on 9/30 (year-end date)</td>
<td>Counts taken with sufficient accuracy. Counting errors random</td>
</tr>
<tr>
<td><strong>Rights and obligations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Determine whether any inventory is pledged for non-inventory purposes*</td>
<td>Examine bank confirmations, debt agreements, and board minutes for evidence of inventory having been pledged.</td>
<td>No pledges of inventory found in bank confirmations, debt agreements, or board minutes</td>
</tr>
<tr>
<td>Objective</td>
<td>Audit procedure</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Existence</td>
<td>1. Observe inventory count at year-end; compare with pre-count records.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Cutoff</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Examine a sample of receiving reports for a few days before and after year-end for recording of inventory purchases in the proper period.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Examine a sample of sales transactions for a few days before and after year-end for recording of sales in the proper period.</td>
<td></td>
</tr>
<tr>
<td>Completeness</td>
<td>1. Observe inventory count at year-end date.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Trace test counts into inventory compilation.</td>
<td></td>
</tr>
<tr>
<td>Rights and obligations</td>
<td>1. Determine whether any inventory is pledged for non-inventory purposes.</td>
<td></td>
</tr>
<tr>
<td>Valuation</td>
<td>1. Vouch a sample of inventory items to vendors' invoices.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. For a sample of the oldest inventory items, verify markdowns.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Verify reasonableness of client adjustments.</td>
<td></td>
</tr>
<tr>
<td>Presentation and disclosure</td>
<td>1. Verify the mathematical accuracy of inventory computations:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Multiplication of unit times cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Extensions and footings of the final inventory compilation</td>
<td></td>
</tr>
<tr>
<td>Assertion and audit objective</td>
<td>Audit procedure</td>
<td>Results from execution of queries</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>1. Identity of the management assertion</td>
<td>Explanation of the audit procedure for implementing the audit objective in terms of the data attributes in the database</td>
<td>For each procedure: 1. The name(s) of the query(ies) that executes the audit procedure 2. A statement of the query results 3. An explanation the meaning of the query results in the context of the audit</td>
</tr>
</tbody>
</table>

### Existence

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Counts taken with sufficient accuracy. Counting errors random</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Count inventory*</td>
<td>Observe inventory count on 9/30 (year-end date; compare with pre-count records)</td>
</tr>
<tr>
<td>2</td>
<td>Perform cutoff test on inventory transactions*</td>
<td>1. Examine a sample of receiving reports for a few days before and after year-end for recording of inventory purchases in the proper period. 2. Examine a sample of sales transactions for a few days before and after year-end for recording of sales in the proper period.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>[add/delete rows as needed]</td>
<td></td>
</tr>
</tbody>
</table>
FIGURE 4 (continued)

### Completeness

<table>
<thead>
<tr>
<th>#</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Count inventory*</td>
<td>Observe inventory count on 9/30 (year-end date) Counts taken with sufficient accuracy. Counting errors random</td>
</tr>
<tr>
<td>2</td>
<td>[add/delete rows as needed]</td>
<td></td>
</tr>
</tbody>
</table>

### Rights and obligations

<table>
<thead>
<tr>
<th>#</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Determine whether any inventory is pledged for non-inventory purposes*</td>
<td>Examine bank confirmations, debt agreements, and board minutes for evidence of inventory having been pledged. No pledges of inventory found in bank confirmations, debt agreements, or board minutes</td>
</tr>
<tr>
<td>2</td>
<td>[add/delete rows as needed]</td>
<td></td>
</tr>
</tbody>
</table>

### Valuation

<table>
<thead>
<tr>
<th>#</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>[add/delete rows as needed]</td>
<td></td>
</tr>
</tbody>
</table>

### Presentation and disclosure

<table>
<thead>
<tr>
<th>#</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>[add/delete rows as needed]</td>
<td></td>
</tr>
</tbody>
</table>

*Results obtained earlier

**Lessons learned** (e.g., insights/strategies that could be applied in other audit/analysis situations)

<table>
<thead>
<tr>
<th>#</th>
<th>Lesson</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>[add/delete rows as needed]</td>
</tr>
</tbody>
</table>

**Time log** (hours spent on this engagement, by person)

<table>
<thead>
<tr>
<th>#</th>
<th>Auditor name</th>
<th>Total hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>[add/delete rows as needed]</td>
</tr>
</tbody>
</table>
REFERENCES


