Using Graphical Representations of Business Processes in Evaluating Internal Control

A. Faye Borthick, Gary P. Schneider, and Anthony Vance

ABSTRACT: In this case, students (1) extend business process diagrams (BPD) to represent current and contemplated business processes for accounts payable processing for a convenience store company's merchandise purchases and (2) use the graphical representations of the business processes to identify control weaknesses and their potential effects on the financial statements and operational effectiveness. The case is appropriate for students developing skills in documenting business processes and evaluating internal control in business processes in introductory courses in accounting information systems (AIS), auditing, and information technology (IT) auditing. Before beginning the case, students should be familiar with the procure-to-pay process, preparing BPDs, and identifying internal control weaknesses in business processes. Working the case requires students to think critically about the business processes and the implications of differences in current and contemplated processes.

Keywords: business process diagram; business process modeling; financial statement assertions; internal control evaluation; operational effectiveness.

THE CASE

The Business Situation: Accounts Payable for Merchandise at 24-Seven Company

The scene: The time is early in the year, when 24-Seven accounting staff members are documenting internal control for accounts payable for vendors supplying store inventory. Kiran, an accountant, is interviewing Pat, the payables manager.

Kiran: “Thank you for making time to talk to me. I really appreciate it because I know you’re busy!”
Pat: “Not a problem. What would you like to know?”
Kiran: “I’m familiar with the payables process up to the point where we receive invoices from vendors. Would you start there?”
Pat: “Sure. On the 5th and 20th of the month, the system matches all unprocessed invoices to purchase orders (POs).”
Kiran: “Just what gets matched?”
Pat: “PO number on the invoice to purchase order number on the PO, and PO and invoice amounts. When matched, invoice status is set to ‘A’ for payable.”

Kiran: “What happens if there’s not a match?”
Pat: “The system sets invoice status to ‘S’ for ‘suspended,’ and payables staff resolve the mismatch and set status to payable.”

Kiran: “How are payments made?”
Pat: “The payables system requests the bank to send an electronic funds transfer (EFT) to the vendor’s bank.”

Kiran: “How do you know an EFT was made?”
Pat: “On the 10th and 25th of the month, EFT requests are prepared. Before the EFT request goes to the bank, the system sets the EFT status for an invoice to ‘P’ for ‘pending.’ After the system sends a batch of EFT requests to the bank, it changes the EFT status for each one in the batch to ‘R’ for ‘requested.’ After making payments, the bank returns EFT confirmations to us.”

Kiran: “How do you know the process works correctly?”
Pat: “As part of closing the month, we run a report that verifies that payments were made only for valid requests.”

Kiran: “Are there adjusting entries for payables each month?”
Pat: “Yes. To close the month, we download the payables file from the system into a spreadsheet on the first of the month, which sums the amounts of invoices with status = ‘R.’ The sum becomes the amount for the adjusting entry to the general ledger that enters the payables amount for the month being closed.”

Kiran: “And the prior month’s entry is reversed?”
Pat: “Yes. The spreadsheet keeps up with the monthly amounts.”

Kiran: “Where is the spreadsheet, and how do you know that it does what it is supposed to do and nothing else?”
Pat: “The spreadsheet is on Bern’s PC. That’s because when we started using a spreadsheet to calculate the entry, Bern [an accounts payable staff member] had the time to develop it.”

Kiran: “When Bern isn’t here, who runs the spreadsheet to create the adjusting entries, and was it tested by anybody else?”
Pat: [thinking] “I looked over test results based on the month before we started using it, and everything looked fine to me. I know it’s easy to use because when Bern’s not here, other accounts payable staff members go to Bern’s PC to run it.”

Kiran: “I’ve got to ask. Is there a reason the enterprise system (ES) doesn’t do the adjusting entries every month?”
Pat: “I’m with you on that one. We started using a spreadsheet when we acquired the first company that wasn’t integrated into our existing ES. Over time, there were more of these. If you look at other financial statement balances, you’ll find spreadsheets used similarly. And there’s a monster spreadsheet that consolidates all the financial data from all the different systems run by all the subs (subsidiaries). As long as we keep acquiring companies, but not integrating them into our ES, I guess we’ll keep using spreadsheets to prepare the adjusting entries.”

Kiran: “So are the subs volatile, i.e., is there much change in them?”
Pat: “Actually, there will be changes several times a year. Some are acquisitions and some are spin-offs. You just never know what will happen next. Finding out about the spin-offs is easy—there are no data when we go to download it. Usually, we see a press release when there’s a new acquisition. Bern just adds and deletes columns as the companies change.”

Kiran: “How hard is it to set up the data download for a new acquisition?”
Pat: “Must not be too hard because Bern doesn’t spend much time setting them up.”
Kiran: “Has anybody ever cross-checked the entries calculated in the spreadsheet against the trial balances of the subs?”
Pat: “I don’t think so. Because each of the subs has its own idiosyncrasies, that might be quite a job.”
Kiran: “Can we go back to the process for a moment? Where was the status set to ‘R’?”
Pat: “When we receive an invoice from a vendor, the system sets status = ‘R’ for ‘received.’”
Kiran: “Okay. What can you tell me about how the payables application was developed?”
Pat: “Unfortunately, not much because I wasn’t here when it was installed a couple of years ago.”
Kiran: “I understand. Have there been problems with it? Does it get updated often?”
Pat: “I guess the best responses are ‘no’ and ‘no.’ You’ll have to talk to one of the application developers.”
Kiran: “I’ll do that. Can you tell me who has access to payables?”
Pat: “Now, that I can answer. All the payables staff (eight full-time and four part-time) have ready access to payables transactions and reports. All the staff can edit payables transactions. Only my two supervisors and I can develop reports that run against the transactions in the database or enter adjusting entries. Depending on their job functions, payables staff members can run reports.”
Kiran: “What kind of reports do you have?”
Pat: “Some of them are analysis reports, e.g., we just wrote one that identifies groups of similar payables so we can inspect them visually for potential duplicates. Another one matches employee addresses to vendor addresses.”
Kiran: “How did you get started writing reports? In Structured Query Language (SQL)?”
Pat: “We got started because it took so long to get ad hoc reports developed by the IT development group. When one of the IT analysts indicated an interest in rotating through payables to understand the business better, I jumped at the chance. Jan, who knew SQL, wrote the first ones and explained them to us. When we saw how powerful the report writer was, we paid attention because we realized that we could answer a lot of our questions ourselves by querying the data. The pressure to analyze data is relentless. A lot of people want information about payables. The report writer we’re using supports SQL and Query-By-Example (QBE). Although I’m not exactly a whiz at it and Jan has long since rotated out, I have friends in IT and in other app areas that will answer occasional questions. Sometimes, I can search the web for answers to specific querying questions. Now that we’ve written several reports, we can use them as models for new ones.”
Kiran: “How hard was it to learn to write reports yourself?”
Pat: “Not very. We’d already been experimenting with the QBE interface in Microsoft Access®, which worked the same way in the report writer. Access® is on all our PCs. Once you get familiar with one relational database manager, you’re familiar with them all!”
Kiran: “What do you do about checking for errors in the queries?”
Pat: [looking puzzled] “We just keep modifying reports until they run to our satisfaction.”
Kiran: “Do you modify them often? Do you run them only for yourselves?”
Pat: “Mostly, the reports are just for us and, yes, we modify them often. Actually, it’s more like we take an existing report and work with it to create a new one. Sometimes, though, one of our reports strikes the fancy of others, who clamor to get access to it. For example, buyers like the report that shows purchases by inventory item ID grouped by vendor. They can use that information to manage their buying better.”
Kiran: “Do the buyers run the reports from your private program library?”
Pat: “The libraries are organized into a hierarchy. When I get a request for running one of our reports from non-payables staff members, I decide whether it makes business sense. If so, I request the database administrator (DBA) to copy the report to a library that they can access. If the DBAs are busy, it might take a while.”

Kiran: “Would buyers have access to updated versions of reports?”

Pat: [thinking] “I never thought of that. I haven’t asked the DBAs to republish reports for buyers or anybody else. Maybe I should.”

Kiran: “There’s one more area to talk about. How will the payables application change with the contemplated system?”

Pat: “The current plan is to use the existing application to the extent feasible. I’m looking forward to doing away with the payables flowing from the delivery tickets. I’ve never been quite sure how accurate the tickets were and whether they were accurately reflected in the invoices.”

Kiran: “Why was that?”

Pat: “I guess I’m just a born skeptic. Everywhere else we have receiving reports, but not with these deliveries. Another change will be that instead of all invoices coming over leased lines from vendors, some invoices will be created in web forms.”

Kiran: “Which ones?”

Pat: “The ones from small vendors, e.g., the souvenir makers. For these, the vendor will complete a web form and submit it. If the validation routine detects missing or inconsistent fields, it will prompt for changes until the invoice passes all the edit checks. Once validated, the invoices will go straight to the database, where they’ll be handled like any other invoice. When stores take delivery, the store manager (or designee) will indicate receipt to the system.”

Kiran: “Cool! Thank you very much for talking to me!”

Pat: “You’re welcome!”

The Scene: Kiran Interviewing Denny, the IT Applications Development Manager

Kiran: “Thank you for finding time to talk to me. Would you explain your development process? Maybe illustrate it with the payables application.”

Denny: “Sure. Users and management get together to agree on application functions. When they sign off on them, we start. Sometimes, we suggest changes based on the difficulty and cost of implementing features. Usually, we’re able to come to agreement that pleases everyone involved. Analysts develop the specs in more detail. If they encounter surprises, they go back to users with them and work them out.”

Kiran: “Are there many surprises?”

Denny: “There used to be a lot, but that was before the new CIO (chief information officer) helped management develop a strategic IT plan for supporting the business.”

Kiran: “How did that change the process?”

Denny: “Part of the plan is the requirement that every user proposal be vetted against the plan. As long as proposals enable the plan and fit the budget, everything’s fine. When they don’t enable the plan, the proposal has to go to the IT steering committee. If the proposal improves on the plan in some way, the committee is likely to incorporate it into the plan. If not, the committee suggests changes users might make.”

Kiran: “Okay. What happens after the analyst has developed the specs?”

Denny: “Programmers develop programs and test them. Once they’re satisfied that programs pass program-level tests, they check them into the development program library. Once a week, all the programs are compiled together into a build, and integration tests are run against all the programs in that build. Any programs that break the build are returned to
Kiran: “Is this the electronic version of running one’s car at high speed to see how long it lasts?”

Denny: “Sort of, but in the case of programs, there’s no damage analogous to blowing out the engine after redlining the tach for too long. It may be tedious to analyze the results to see what broke first, but the programs themselves are intact.”

Kiran: “This kind of testing must be expensive. How did you come to this approach?”

Denny: “Once you get in the pattern, this testing is probably no more expensive than what we used to do. The reason we do it is because several years ago, when we brought up a new system, everything came to an abrupt halt because the load was too much. In hindsight, we figured out that the throughput and volume were predictable. We think we learned our lesson. Once an app passes stress testing, users get a shot at it in user acceptance testing. When users sign off, the app goes to QA (quality assurance), which occasionally finds things that need fixing. From there, QA authorizes the DBAs to install the app in the production library.”

Kiran: “Who can run programs from the production library?”

Denny: “Only operations personnel. When programmers need data for the next program iteration, whatever extracts they need are made available to them in their development libraries.”

Kiran: “Do you have much of a backlog?”

Denny: “Not as much as we used to have. The strategic plan helped, and more users are writing more of their own ad hoc reports now. I’m skeptical of their quality, but can’t do anything about it because we just don’t have the staff to write reports for everyone. But even BI (business intelligence) reports would be better than spreadsheets.\(^1\) Another thing that worries me is desktop control.\(^2\) Users actually want IT to defend their desktops against viruses and bots. After that, it’s a mess. Users want to install new software before IT can vouch for its good behavior. Even worse, users can plug in external media like USB drives. Although users need flexibility, it makes us vulnerable. In my opinion, it’s just a matter of time before we’re written up in the business press about some unintended data exposure.”\(^3\)

Kiran: “I see balancing control and ease of use getting even more complex. Thank you for talking to me.”

**The Scene: Kiran Interviewing Kwan, the IT Security Manager**

Kiran: “Thank you for finding time to talk to me. This won’t take long. Tell me who authorizes access.”

Kwan: “It all goes back to user management. When employees are hired, their managers specify the access privileges they get based on existing profiles. For example, there’s a base-level profile for entry-level accounts payable staff. When employees move to different positions, their managers authorize us to add privileges consistent with their new roles.”

Kiran: “When do you terminate access?”

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Kwan: “Usually, it’s when employees leave the company. We remove the employees from the access tables, and that takes care of that. You won’t hear about our former employees still having access to IT resources! We get lists of terminated employees daily from HR (human resources), which means we’re not having to rely on managers to tell us.”

Kiran: “How secure is the system?”
Kwan: “Of course, it’s very secure. Employees gain access to their areas with radio frequency identification badges, and passwords have to be eight characters with some upper and lower case letters and some numbers. The system enforces password changes every 90 days, and passwords can’t be reused within a year.”

Kiran: “What can you tell me about server security?”
Kwan: “You mean the computers in the operations center?”
Kiran: “Yes.”
Kwan: “You need to see Dana in systems support.”
Kiran: “Thanks!”

The Scene: Kiran Interviewing Dana, Systems Support Manager

Kiran: “Kwan said you could tell me about server security.”
Dana: “I’d like to say ‘secure,’ but I know better. After reading about the holes in one company’s security perimeter,4 we did a little sleuthing. As a result, we identified over a hundred servers that weren’t protected. We’re in the process of protecting them, although some users aren’t exactly ecstatic about it.”

Kiran: “Has there ever been a penetration test of perimeter security?”
Dana: “No, we haven’t been able to budget for it. Finding that many unprotected servers is giving us reasons to ask for more security-related funding. Now that we’ve identified all the servers (I think!), we’re working through changing all the default settings.5 The stuff to fix is endless!”

Kiran: “At least you know why you’re doing it!”
Dana: Yes, but users don’t always appreciate their work being rearranged.”
Kiran: [puzzled] “What’s ‘rearranged’?”
Dana: “Changing default settings entails users having to deal with harder passwords and more of them. In some cases, access privileges were removed. The end result is that it takes users longer to get their work done.”
Kiran: “Okay, I get it.”
Dana: “After we get the servers protected, we’ll worry about how to deal with the growing tide of personal technology that users want to have all the time.”
Kiran: “How’s that a problem?”
Dana: “We can’t support every personal technology, e.g., iPhones, but users figure out how to use them anyway. If we could work with users, we’d be more likely to help them take advantage of personal technology for business use without creating information or system vulnerabilities. The security risks are enormous.”
Kiran: “I think I understand—the personal technologies aren’t going away. They’re multiplying instead.”
Dana: “Like rabbits!”

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REQUIRED

Part 1: Extending Graphical Representations of Business Processes and Evaluating Internal Control

For 24-Seven’s processes, as represented in the conversation above:

1. Modify the stock replenishment system business process diagram (BPD) your instructor provides to include accounts payable processing for the current system.
2. Modify the stock replenishment BPD your instructor provides to include accounts payable processing for the contemplated system. Show controls in process symbols with dashed line borders, indicating the span of control with dashed lines. For example, the following process for maintaining petty cash has one control spanning one process step, as shown in Figure 1.
3. Complete a table (Figure 2) of control weaknesses and their potential effects on the financial statements and operational effectiveness. The table has separate sections for (1) weaknesses only in the current system, (2) weaknesses only in the contemplated system, and (3) weaknesses in both systems.

Part 2: Practice Objective Questions

Required: Select the best response for each question based on 24-Seven’s situation. The questions are independent of each other.

P1. In the current system, the process with the most manual effort is:
   a. Preparing and posting month-end adjusting entries
   b. Sending purchase orders to vendors
   c. Receiving and entering invoices from vendors
   d. Updating corporate inventory and sales

P2. The use of a spreadsheet model for calculating month-end adjusting entries represents a control:
   a. Strength because the spreadsheet sums the payable amounts

FIGURE 1
Petty Cash Process BPD with Control Notation

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b. Weakness due to the potential for undetected errors

c. Strength because all staff members can use it for the entries

d. Weakness because the spreadsheet program was bundled with other office applications

P3. The best approach to strengthening control over the calculation of month-end adjusting entries would be by:

a. Sending the payables transactions to an independent person to perform the calculations
b. Verifying that backups of payables transactions are usable as backups
c. Calculating them with a query manager that can access the transactions directly
d. Comparing the entries to those from prior months as a form of consistency checking

P4. Verifying that each EFT request has a corresponding EFT confirmation would ensure the:

a. Validity of payments
b. Completeness of payments
c. Valuation of payments
d. Validity and completeness of payments

P5. Payables staff could ensure the validity of EFT requests by verifying that each:

a. EFT request has a corresponding payable invoice
b. Payable invoice has a corresponding EFT request
c. EFT request has a corresponding EFT confirmation
d. EFT confirmation has a corresponding EFT request

P6. The coding scheme for values of the invoice status and EFT status attributes is:

a. Desirable because no values are duplicated

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### FIGURE 2
24-Seven: Effects of Control Weaknesses Associated with Payables Processing

<table>
<thead>
<tr>
<th>Control weakness</th>
<th>Current System Only</th>
<th>Contemplated System Only</th>
<th>Current and Contemplated Systems</th>
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<td></td>
<td>Potential effect on</td>
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<td>Financial statements</td>
<td>Operational effectiveness</td>
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<td>3 [Add/delete rows as needed]</td>
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b. Desirable because some values are duplicated
c. Undesirable because no values are duplicated
d. Undesirable because some values are duplicated

Part 3: Objective Questions

Objective questions for assessing students’ learning appear in the Teaching Notes to this case. This placement maximizes instructor flexibility by giving instructors control over the conditions under which they are viewed and used. The questions could be used at the completion of the case to assess learning, or during the period students are preparing their BPDs and internal control tables to prompt deeper engagement with the business situation.

REFERENCES


CASE LEARNING OBJECTIVES AND IMPLEMENTATION GUIDANCE

Motivation for Using Graphical Representations in Evaluating Internal Control

The Sarbanes-Oxley Act of 2002 in the U.S. and similar legislation in other countries have increased the demand for internal control reviews. Because managers and auditors must now attest to the effectiveness of internal controls for financial reporting, accountants have been seeking better approaches to documenting and evaluating controls. A promising approach for documenting business processes, business process modeling (BPM), has emerged as a way to accelerate the redesign of business processes and create reference models for reuse in subsequent redesigns of processes (Kalpic and Bernus 2002). The impetus for faster redesign of business processes was growing fascination with and increasing acceptance of innovation as a business strategy (Christensen 1997), propelled by management’s belief in the competitive advantages afforded by deploying technology-enabled business processes (Osterwalder et al. 2005). The growth of business process modeling in companies signals a commensurate need for business educators to help students develop knowledge of and expertise in business process modeling (David et al. 2003; Peslak 2005). Krishnan et al.’s (2005) extension of the business process-modeling notation (BPMN) (Business Process Management Initiative [BPMI] 2004) for explicit representation of controls offers a way to facilitate control recognition for evaluating internal control and performing audit risk assessments (Alencar et al. 2008).

BPMN was designed to “provide a notation that is readily understandable by all business users, from the business analysts that create the initial drafts of the processes, to the technical developers responsible for implementing the technology that will perform those processes, and finally, to the business people who will manage and monitor those processes” (White 2004, 1). By design, BPMN supports an internal model for enabling the generation of executable code which, when implemented, will enable systems to be generated from their graphical representations in BPMN. The auto-generation of code derived from graphical specifications offers the promise of solving the longstanding problem of nonexistent or out-of-date documentation. In a comparison of modeling notations, Carnaghan (2006) noted the need for explicit representation of information flows and flow of control in order to capture the internal control information necessary for performing process-level risk assessments. Although it has constructs for representing information flows, BPMN falls short, in our opinion, in representing flow of control. We believe, however, that Krishnan et al.’s (2005) extension of BPMN for explicit representation of controls offers a means of building out the constructs required to facilitate control recognition for evaluating internal control and performing audit risk assessments.

This case responds to the growing need for accounting graduates to represent business processes, participate in their design and development, and evaluate internal control over business processes. In Borthick’s (1996) categorization of learning objectives for the AIS course, the case pertains to the objective categories of documentation (understand symbolic representations of processes and modify and create symbolic representations) and internal control (evaluate internal control in information systems and design internal controls). The case instantiates some of the competencies in the categories of IT Control Knowledge and IT Control Competencies specified by the International Accounting Education Standards Board (IAESB) in its practice statement, Information Technology for Professional Accountants (IAESB 2007), for pre-qualification preparation of accountants as managers, evaluators, and/or designers of information systems.

Performing case tasks requires students to think critically about the business processes and the effects of internal controls. Critical thinking (Kimmel 1995; Springer and Borthick 2004) is...
especially productive in analyzing the effects of nonexistent controls leading to control weaknesses with the potential to threaten financial statement account balances. The need to consider the implications of two variants of the processes (current and contemplated) increases the opportunities to develop critical thinking skills.

Learning Objectives

The high-level learning objectives for the case are to learn to prepare graphical representations of business processes and use them to evaluate internal control in information systems. The case achieves the objectives through the sub-objectives of:

1. Extend graphical representations of business processes with additional processes from conversations about them:
   a. Modify a business process diagram (BPD) representing the current business situation
   b. Modify a BPD representing the contemplated business situation

2. Use process representations to evaluate internal control of information systems:
   a. Identify control weaknesses
   b. Explain the potential effects on the financial statements and operational effectiveness

In Part 1 of the case, learners modify business process diagrams (BPD). In Part 2, learners respond to a small set of multiple-choice questions to practice for answering the questions in Part 3. The learning objectives included in the questions in Parts 2 and 3 appear in Table 1.

Although the case is authentic in offering conversations among company managers, a limitation of this case is that it does not include a learning objective for observing the operation of the current system and integrating those observations into the system diagram for it. We point this out as an opportunity for future case writers to use video technology to overcome this limitation. Of course, observation would not be possible for the contemplated system.

LEARNING THEORY: SITUATION MODEL BUILDING

Business process modeling maps directly onto the theory of situation model building (Zwaan and Radvansky 1998; Barsalou 1999), in which one prepares for future action by constructing one’s own mental situation models in analogous prior situations. Modeling straightforward situations, however, does not prompt learners to make the inferences and elaborations required to develop robust situation models that are useful in subsequent situations. Instead of straightforward situations, learners need situations with ambiguities and conflicts. As learners resolve the ambiguities and conflicts, they make the inferences and elaborations required to develop robust situation models that are useful later (Johnson-Laird 1983; van Dijk and Kintsch 1983; Gernsbacher 1997; Graesser et al. 1997; Zwaan and Radvansky 1998).

In the case, learners explicitly model two generations of processes associated with a convenience store company’s supply chain. As portrayed in conversations among company managers, the current and contemplated situations are complex enough to require learners to make inferences and elaborations as they encounter successive bits of information about the situations. The managers alternate between discussing the current situation and the contemplated situation in a natural way, with one manager’s thoughts prompting related thoughts or questions from other managers. To demonstrate their comprehension of the situations, learners modify business process diagrams (BPDs) to incorporate information about accounts payable processing. In the terminology of the theory of situation model building, the BPDs are manifestations of learners’ comprehension of the situations revealed in the conversations, indicating the extent to
which learners have achieved coherent situation models (Johnson-Laird 1983; van Dijk and Kintsch 1983; Gernsbacher 1997; Graesser et al. 1997; Zwaan and Radvansky 1998).

Unlike documentation cases that are organized in narratives revealing procedural steps in temporal sequences, this case reveals, through conversations, process elements in seemingly random order with respect to the temporal sequence of process steps. Switching back and forth in the conversations in time sequence, and between the current and contemplated situations, reflects the way managers talk about their businesses (Orr 1996). The authenticity of the conversations prompts learners to make the inferences and elaborations required to construct robust situation models. A narrative in temporal sequence would not prompt nearly as many inferences and elaborations (Myers et al. 1987), which gives the authentic conversations more learning value than a sequential narrative (Gernsbacher 1997; Zwaan and Radvansky 1998) with respect to developing critical thinking skills (Kimmel 1995; Springer and Borthick 2004).

#### TABLE 1
Learning Objectives

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<thead>
<tr>
<th>Learning Objective</th>
<th>24-Seven Company Questions</th>
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<tbody>
<tr>
<td>Model business processes</td>
<td>Make inferences about processes</td>
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<td>Query databases to provide insights</td>
<td>Formulate queries</td>
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<td>Identify control strengths and weaknesses</td>
<td>Control objectives</td>
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<td>Completeness</td>
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<td>Design controls to mitigate control weaknesses</td>
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<td>Business process</td>
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<td>Access control</td>
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Prerequisite Skills

This case is suitable for introductory courses in accounting information systems (AIS), auditing, and IT auditing. To work the case, students need to have a general understanding of procure-to-pay processes and information technology general controls (ITGC) associated with system development and access control. A case germane to ITGCs is Norman et al. (2009). Before beginning the case, students need to be able to prepare business process diagrams (BPDs) and identify internal control strengths and weaknesses. In all cases, prerequisite skills are at the level of difficulty of exercises that typically appear in AIS textbooks, e.g., Romney and Steinbart (2011).

Course Use

The case is suitable for courses in which students learn to document information systems and evaluate internal control. Although we have used it in AIS courses, the case could be used in auditing and IT auditing courses. If used in the first AIS course, the case should be scheduled after students have become familiar with graphical documentation techniques, IT general controls, and the procure-to-pay process. Working the case near the end of the course enables students to integrate many of the skills and the knowledge they have gained in the course. Because the case does not require knowledge of auditing terminology, the case can be used in programs where AIS courses are taught before auditing courses.

So that they can be answered from a systems perspective, the multiple-choice assessment questions are written in language that does not use the vernacular of financial statement assertions, for example, existence. Instead, the questions are written using terminology commonly found in AIS textbooks on internal control, such as authorization, accuracy, and validity. In an auditing course, the case can be used whenever internal control is studied. To aid auditing instructors’ use of the case, the Teaching Notes associate multiple-choice assessment questions to specific financial statement assertions where they apply.

The case can be used as an individual or as a team assignment. If students complete the multiple-choice questions in Part 3 individually, as an in-class assessment of proficiency, they can serve as a control on freeloading by team members on the preparation of the BPDs in Part 1.

Graphical Software Choice

We recommend Microsoft Visio® or equivalent diagramming software for student preparation of the BPDs. Microsoft Excel® and Microsoft Word® can also be used. Microsoft Excel® has no page size limits, but defaults to resizing diagrams; Microsoft Word® has fixed page sizes, but does not resize diagrams.

Business Process Modeling Choice

We use the Business Process Modeling Initiative (BPMI) Notation Working Group’s Business Process Modeling Notation (BPMN) (BPMI 2004) for the business process diagrams, because BPMN was specifically designed to enable business users, business analysts, technical developers, and business managers to obtain the benefits of a common format for representing business process models. The documentation in White’s (2004) introduction, available at no cost from the BPMI website, has been sufficient guidance for preparing the process diagram for this case. We include an annotated BPD in the Teaching Notes that instructors could make available to students to explain BPD terminology and conventions. We illustrate Krishnan et al.’s (2005) notation for representing internal controls; i.e., dashed-line process symbol with arrows designating the span of control, with a short example in the assignment materials.
Organizations are on the cusp of a change in graphical documentation techniques. Before a business process diagramming standard was offered (BPMI 2004; White 2004), the predominant approach was flowcharting. Increasingly, organizations are adopting BPDs as a common graphical format to enable business users, business analysts, technical developers, and business managers to communicate more readily (Bradford et al. 2007). Eventually, BPDs (or their successors) are likely to drive automated coding systems that maintain consistency between the graphical representation and the system itself (Kalpic and Bernus 2002).

Instructors wanting their students to have the experience of developing their own diagrams for the current and contemplated stock replenishment systems should see Borthick et al.’s (2010) case for that purpose. In the Borthick et al. (2010) case, students develop the diagrams for the stock replenishment systems based on conversations among 24-Seven Company managers, who compare the current and contemplated systems as a means to understanding how the contemplated system will differ from the current one. The two cases can be used together or independently. We have used the Borthick et al. (2010) case early in AIS courses as part of the instruction on documenting business processes and this case, which adds accounts payables processing, later in the courses after students have been given some instruction on internal controls.

Case Staging

Time on Case

With respect to time, we have devoted two to three weeks of a semester-length course to student work on the case, including the administration of the multiple-choice questions as an end-of-course exam on internal control. We allocate about one week each to developing the diagrams and constructing the table of weaknesses. We recommend several weeks for the case because in our experience, students need that length of time to think about the case outside of class. Not all the required insights occur to students at once. Instead, they accrete as students prepare diagrams, answer the practice questions, and prepare the list of control weaknesses and their potential effects on the financial statements and operational effectiveness. In terms of hours, the three weeks of elapsed time translates to about nine in-class hours and about 20 hours expected out of class.

Preparing the Diagrams

We make the case assignment available to students from a password-protected course website, staging the conversation in text form in an HTML page. We give students a week to modify the diagrams and publish them in their individual university-provided web spaces or attach them to an electronic discussion board message. We believe student publishing on the web has the advantage of prompting more diligent effort from students because their work will be visible to everyone in the class.

In the class session in which the BPDs are due, we have used two different strategies for structuring class discussion. For classes of students that have already developed proficiency in preparing BPDs, we invite students to ask the class to examine specific portions of their work for the purpose of untangling confusing aspects. Typically, there will be enough volunteers to show a variety of interpretations, which allows students and the instructor to comment on the work. This approach has the advantage of turning students’ attention away from an instructor version to students’ work, which reinforces a classroom atmosphere of, “We are working together to develop our skills. Furthermore, it is the process of learning how to construct the diagrams that matters, rather than the instructor’s solution per se.” In classes in which every student has a PC with web publishing privileges, students have updated their diagrams in the class session, republished them, and asked the class to examine them again to verify that they successfully modified their diagrams in response to the comments they received.
We use a different strategy with classes in which students are still developing their diagramming proficiency. In these classes, on a PC whose display is projected for class viewing, we open Microsoft Excel and ask the class to tell us what to do. If the response is “We don’t know where to start,” we begin by leading the class in thinking through a series of questions. The questions are:

1. Compared to the original BPD, what pools, corresponding to participants, do we need?
2. Compared to the original BPD, how should pools and swim lanes be arranged, top to bottom, to minimize crossed flow lines?
3. What event initiates the process?
4. What events occur in the process in what order?

After the class has worked through these questions, we begin by entering pool and swim lane headings and the first process symbol. In classrooms with a PC for every student, we ask students to prepare their own BPDs with us. We pause after every symbol set so students can tell us what to do next. This approach paces the generation of the BPD so that students can keep up with constructing their own diagrams.

At the end of the session, the instructor and students publish their BPDs on the web. Preparing the BPD for the contemplated system typically takes less time than preparing the BPD for the current system because students are already familiar with the current situation and use it as a reference point, which affords some time economy in working through the contemplated business process.

Even with the development process explained above, some students will succumb to their prior enculturation of depending on “the solution” and ask for good-form BPDs. To satisfy this longing in situations in which the BPDs will not be graded per se, we have published complete renditions of the BPDs after students have published their versions.

Grading the Diagrams

We have graded the BPDs in different ways. For example, we have and have not graded the BPDs explicitly. Not grading the BPDs explicitly facilitates demonstrating how to prepare and examine specific aspects of them, although this increases the likelihood that some students will not complete their own work on the BPDs.

Completing the Effects of Weaknesses Table

To promote students’ working effectively and efficiently on the table of effects of control weaknesses, we prompt the class to complete a small number of rows through class discussion as soon as they have complete diagrams. Before the next class session, students complete the table on their own or in small groups. In the next class session, students suggest entries that the class refines. We post the class-constructed table on the web or in a learning management system for student access.

Answering the Practice and Multiple-Choice Questions

We release the practice questions to students after they have prepared their BPDs and completed the effects of weaknesses table to enable them to assess their readiness to answer the multiple-choice assessment questions. The questions are delivered in a learning management system that scores the questions and returns feedback for each question. A week later, students answer the multiple-choice assessment questions in class. In classes in which every student has a PC on the university network, students answer the questions in the learning management system, which scores the questions and returns feedback.
Evidence of Efficacy

From Faculty

Two instructors have used the case in multiple sections of a required AIS course for senior accounting majors across four years at a large urban, public university with a diverse student population. The faculty comments below are based on this use.

Faculty members’ overall reaction was that it provided a rich learning experience for students. Compared to more traditional learning experiences on documentation and business processes, the case encouraged high-level learning and the development of critical thinking skills. They found the suggestions for different ways to use the case or portions of it helpful in configuring its use in their classes.

Faculty members observed that students were really interested in examining the diagrams that other students developed. Seeing others’ diagrams deepened students’ understanding of the business processes through critical analysis of alternative approaches, while allowing students to see which diagramming techniques were the most useful in specific situations. Other useful techniques were to (1) read the conversation after preparing a BPD to verify that each action was represented in the BPD, and (2) map diagram elements to the conversations to verify the faithfulness of the diagrams to processes revealed in the conversations. Some students wrote each action on a sticky note, put them in sequence by participant, and then arranged them to show flows between participants before beginning to work with graphical software.

Answering the practice objective questions prompted students to realize that they really did need to prepare complete diagrams. The processes were too voluminous and complex to think about without graphical representations to aid thinking about specific aspects of the processes. Students realized that complete diagrams could be enormously helpful in gaining clarity about processes. We believe this is an important realization on the students’ part because they came to it through the case experience, rather than by simply reading it in a textbook.

When we first used the case, students prepared diagrams, answered practice questions, and then attempted to develop the list of control weaknesses. Few students, however, were able to identify weaknesses readily. In subsequent uses of the case, we prompted students to defer list-making until after they had examined the conversation to find instances where it would be useful to ask further questions. Posed this way, students could readily spot instances where more information was needed and characterize the missing information in the form of its corresponding control weaknesses.

From Students

The case drew students into it as they studied the conversation. Students with business experience talked about analogous situations they had experienced or observed in their work places. Students without business experience were happy to have a case that portrayed a realistic business situation because it afforded a glimpse into an authentic business setting. Students recognized that the conversation form of the case was very realistic because auditors often interview client personnel for information about business processes.

Some students admitted feeling overwhelmed when first facing the prospect of developing the diagrams. They were able to complete them after receiving guidance to capture individual actions, one at a time, and group them in sequences by participant before beginning work with the graphical software.

The single hardest aspect of the case for students was distinguishing between weaknesses in validity and completeness of transactions, especially when the situation to be recognized was the absence of a needed control for one of these objectives. To promote their understanding, instructors pointed out, whenever a weakness in one of them was discussed, how the weakness might shift to the other objective with slightly different circumstances in the business process. The difficulty
students encountered in distinguishing between weaknesses in validity and completeness was not surprising, given that students had not encountered these concepts in earlier coursework.

TEACHING NOTES SUMMARY

The Teaching Notes for this case include:

1. Part 1
   a. A BPD representing the current situation without accounts payable processing
   b. A BPD representing the contemplated situation without accounts payable processing
   c. A BPD for the current situation that includes accounts payable processing
   d. A BPD for the contemplated situation that includes accounts payable processing
   e. An annotated BPD explaining and illustrating BPD terminology
   f. A completed table of the effects of control weakness associated with payables processing
   g. A link to a Microsoft Visio® file containing the diagrams

2. Part 2: Solutions for practice objective questions with response-level feedback

3. Part 3: Objective questions and solutions with response-level feedback

SUMMARY

This case, based on the context of a convenience store company’s transition from a traditional system to a more technology-enabled system for managing its supply chain, gives learners experience in modeling business situations graphically and using the graphical representations to evaluate internal control. Students (1) extend business process diagrams, and (2) use the graphical representations of the business processes to identify internal control weaknesses and their potential effects on the financial statements and operational effectiveness. The case, suitable for introductory AIS, auditing, and IT auditing courses, includes multiple-choice questions for assessing learners’ business modeling and internal control evaluation proficiencies objectively. The case responds to the need for learning experiences that help students develop business process modeling and internal control evaluation skills.

TEACHING NOTES

Teaching Notes are available only to full-member subscribers to Issues in Accounting Education through the American Accounting Association’s electronic publications system at http://aaapubs.org/. Full-member subscribers should use their usernames and passwords for entry into the system where the Teaching Notes can be reviewed and printed. Please do not make the Teaching Notes available to students or post them on websites.

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REFERENCES


