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Introducing Students to the Integrated Audit with "Auditing Alchemy, Inc."

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ABSTRACT: "Auditing Alchemy, Inc." is a comprehensive case developed by PricewaterhouseCoopers. "Alchemy" can help students understand the importance of Accounting Information Systems (AIS) concepts in an integrated audit of financial statements and internal controls. Through filmed interviews, a machine simulation, and documentation, Alchemy gives students a view of how general and process (application) controls are directed to achieving an organization's objectives, while also showing how auditors must use their AIS knowledge to gather evidence needed for the integrated audit. The Sarbanes-Oxley Act of 2002 (U.S. House of Representatives 2002) and actions of the Public Companies Accounting Oversight Board (PCAOB) emphasize the need for auditors to have a thorough grounding in the details of general and process (application) controls. This paper provides instructors with a structured way to address this need by presenting four coordinated assignments—three in AIS and one in auditing—using the Alchemy materials. The assignments take students in stages from a description of the process and controls at Alchemy to recommendations for improving the effectiveness of the design of the controls to finding evidence for evaluating the controls' operating effectiveness. Other aspects of the assignments focus on evaluating the likelihood of fraud at the company and ways of discussing controls with the audit committee.

Keywords: accounting information systems; financial statement auditing; integrated case; PCAOB; Sarbanes-Oxley Act of 2002.

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I. INTRODUCTION

The "Auditing Alchemy, Inc." Case

Section 404 of the Sarbanes-Oxley Act of 2002 (the Act) (U.S. House of Representatives 2002) requires management to assess the effectiveness of their system of internal control over financial statement reporting and requires auditors to attest to the system's effectiveness. Thus, the Act has increased the importance of AIS-related knowledge for auditors, which in turn affects the role of Accounting Information Systems (AIS) in the accounting curriculum. As Arens and Elder (2006, 345) argue, "the Act demands students with greater understanding of ... the ability to document controls and link controls to assertions and audit evidence." In this paper, we describe how an integrated case experience—Auditing Alchemy, Inc.,[1] "Alchemy"—helps students recognize the importance of AIS knowledge in their careers as audit professionals. We also show how the case can help students connect AIS concepts to audit objectives, thus reinforcing the knowledge developed in AIS while students are studying auditing.

PricewaterhouseCoopers (PwC) designed Alchemy for use in the firm's staff training program and has made the case available to instructors upon request. With PwC's permission, this paper includes much of the case material that is pertinent to the student assignments that we have designed. Instructors can also order (free of charge) the CD-ROM that contains the complete set of materials through the following website: http://www.pwc.com/Extweb/pwcpublications.nsf/docid/AB9E5B010EF14509852571BD0078BCA9. Overall, we find that the use of this practitioner-developed case helps address the call for accounting educators to better meet the needs of the profession by balancing skills development and course content (Albrecht and Sack 2000). We believe Alchemy is well suited for addressing the AICPA's three "competency dimensions"—functional competencies, personal competencies, and broad business perspective competencies (AICPA 2000)—thus enabling educators to emphasize such core skills as communication, client understanding, and critical thinking (AICPA 1999).

At the same time, Alchemy focuses on traditional AIS course content, which itself can be an important catalyst for change in accounting curriculums (David et al. 2003; Fordham 2005). Beyond this, Alchemy gives instructors an opportunity to show the importance to an audit professional of information systems control knowledge and related competencies (Gelinas and Dull 2008), emphasizing the fact that financial statement auditors can no longer ignore the work of information systems auditors (Hunton et al. 2004). Alchemy also allows students a chance to experience a practical application of systems competencies while still in the classroom, enabling AIS instructors to encourage students to consider the value of information systems competencies throughout their accounting studies.

II. CASE OVERVIEW

Alchemy describes the primary business process at the fictitious Alchemy, Inc.—preparing gold spheres for shipment to the firm's parent company. The case focuses on the control environment at the company, including the CEO's efforts at establishing management (entity-level, pervasive, general) controls and process (application) controls. A machine simulation depicts the production process, while written documents provide a description of the receiving, production, shipping, and data recording processes, together with information on the firm's audit committee, reports from the internal auditor, and a description of the firm's business and markets. Five-minute film clips show the audit partner interviewing the CEO, and an audit staff person interviewing the internal auditor, a machine

[1] "Auditing Alchemy, Inc." is a registered trademark of PricewaterhouseCoopers.

operator, a receiving clerk, and a shipping clerk. PwC also provides three background films that introduce the firm's approach to auditing controls and sampling, and an extensive set of Microsoft PowerPoint slides describing PwC's views on audit changes brought about by Section 404 of the Act. Instructional materials include introductions and suggestions to instructors about the significant points of each section and material suitable for classroom presentations. See Table 1 for a complete list of materials.

The Alchemy case asks participants to assess the potential for control deficiencies at the company. While management's description of management and process controls makes it appear that the control system is well designed, attention to case details raises questions about the likelihood of errors and possibly even fraud. Some of these details come to light from a close reading of the control descriptions, others by inspection of the machine simulation, while still others arise from the interviews. The user must make connections between management and employees, and between the different parts of the business process, to fully appreciate the odds of Alchemy facing problems in its system of internal control.

TABLE 1
Materials Included on the "Auditing Alchemy, Inc." CD-ROM

Materials Related to the PricewaterhouseCoopers (PwC) Auditing Approach

- "404: Changing the Way We Work" (Microsoft PowerPoint presentation)
- Filmed interviews of discussions with PwC professionals
  - Controls over financial reporting
  - Sampling
  - Using the work of others on the audit

Alchemy, Inc. Background Documents

- Background and process description
- Simulation of Alchemy's production process (sorting and refining spheres)
- Machine drawing, a static visual representation of the production process
- Walkthrough document, listing Alchemy production process steps and controls and the related walkthrough plan
- Management control matrix, cross-referenced to the machine drawing, prepared by management, and listing controls that are mapped to the Alchemy process
- Audit committee description and policy
- Internal auditor report with appendix
- Internal auditor file memorandum

Student Deliverables

- A copy of the management control matrix to be completed by the student
- A copy of the walkthrough plan for students to describe the walkthrough procedure performed for controls testing
- Conclusions about management's anti-fraud program
- Summary of points to discuss with Alchemy's audit committee

Instructional Materials

- Solution to management's control matrix
- Introductions to each section for the instructor, classroom presentations, and videos introducing control environments and their testing, and the steps to conduct a walkthrough
- Filmed interviews with Alchemy's CEO and internal auditor, and with one of Alchemy's machine operators, shipping clerks, and receiving clerks
- Case debriefing
- Notes for recap and reflection

In short, the materials provide a rich context for a number of learning objectives related to the integrated audit, the required combined examination of a company's internal control system and its financial statements, as we discuss below.

Learning Objectives

Alchemy addresses the following learning objectives:

- To increase student appreciation of how accounting information systems can assist in attaining organizational objectives and improving planning and control at all levels of the organization.
- To illustrate the fundamental connection between AIS and auditing on the integrated audit—namely, that controls designed in AIS must provide management with reasonable assurance that their financial statement assertions are fairly presented and that assets are safeguarded.
- To help students learn the operational and information functions of a major business process.
- To integrate an understanding of business processes with the risks present in those processes and the controls management should have over those risks.
- To develop reasonable student proficiency in documenting systems.
- To develop and enhance student communication and teamwork skills.

Faculty often want to show students how the concepts of their discipline are put into practice in organizations. For some time, accounting faculty have seen that cases can be effective in providing those insights for students (Knapp and Knapp 2000; Lipe 2006; Stout 1996), but case writing challenges authors to provide sufficient, coherent, connected details to give a case some of the complexity that organizations face, while staying true to the given organizational context. Alchemy provides the necessary degree of detail and organizational context, relieving instructors of the need to create their own situations. Similarly, for cases to be effective, the assignments that are linked to the cases must bring out the concepts that instructors believe students should learn. We designed the coordinated set of assignments discussed in this paper to use the Alchemy materials extensively in order to bring AIS concepts to the fore. In the following paragraphs, we discuss our goals for knowledge content and for skills and competencies in more detail.

Knowledge Content

The Act and the resulting technical audit guidance issued by the PCAOB and the Auditing Standards Board have significantly affected what students entering the auditing profession need to know about AIS. In particular, PCAOB's Auditing Standard No. 5 (AS5) (2007) requires auditors to understand the design of their client's system of internal control, test the actual operation of the system, and report on deficiencies in the system. AS5 specifies that the integrated audit mandated by the Act begin with a detailed evaluation of the design and operating effectiveness of entity-level controls (ELCs), since the pervasiveness of such controls affects the scope of work completed during the internal control audit (PCAOB 2007, A-12).

In addition, AS5 reinforces the importance of understanding and evaluating the effect of information technology (IT) on the operation of automated application controls and manual controls that rely on information generated from the audited company's IT infrastructure. The standard also notes that "the identification of risks and controls within IT is not a separate evaluation. Instead, it is an integral part of the top-down approach used to identify significant accounts and disclosures and their relevant assertions, and the controls

to test, as well as to assess risk and allocate audit effort as described by this standard" (PCAOB 2007, A1-18). As a result, Arens and Elder (2006, 354) call for faculty to emphasize such traditional AIS topics as "general controls and the control environment. The increased emphasis on such things as top-level management controls in the Act makes the control environment component of internal control increasingly important."

As discussed above, Alchemy provides a firm foundation to address the knowledge content objectives that emanate from the professional standards. Specifically, the case shows the importance of IT general controls (ITGCs) and ELCs as part of the design of an effective internal control system by allowing students a multi-faceted look at their presence or absence in the company's key business process. Students get a chance to see how the controls should affect the process by watching the machine simulation and can hear how those involved in the process view controls and activities through the taped interviews. These supplement the standard written descriptions of controls that appear in the company's memos and the management-prepared control matrix. While these are the building blocks of internal control from an AIS perspective, the visualization, interviews, and documentation are evidence from an audit point of view. This underscores the flexibility of the case. On the one hand, it can be used to give students practice in how the AIS concepts they are learning are turned into daily realities within a business process. On the other hand, the case requires students to put their AIS understanding to use, as AIS concepts are the substantive focus and content of this phase of the integrated audit.

Skills and Competencies

To discuss our goals for developing students' skills and competencies, we use the AICPA's three broad categories of competencies (AICPA 2000).

Functional competencies. Pertinent to our discussion is the AICPA's emphasis on risk analysis as a functional competency (AICPA 2000). The Alchemy materials are designed to help students develop an improved understanding and appreciation of the risks involved in a business process and how such risks affect an organization's antifraud program. In particular, the case allows students to see how weaknesses in ITGCs and the control environment (traditional AIS topics) ultimately affect their evaluation of the antifraud program at Alchemy, helping them understand the connection between significant business processes, overall ELCs, and the issues that can give rise to fraud in an organization.

Personal competencies. Personal competencies include professional demeanor, problem solving and decision making, interaction, and communication (AICPA 2000). Alchemy shows how auditors work with client executives and client staff, emphasizing the need for effective communication and interaction on technical topics such as internal control. For example, flowcharting the Alchemy process gives students a chance to appreciate the significant volume of information that they will need to access in order to effectively evaluate ELCs and the overall internal control design. Stated simply, an auditor cannot make effective use of his or her AIS knowledge without strong client communication skills. In addition, the interview segments include moments when the interviewer must ask sensitive questions about employee integrity and show how client staff reactions to interviews can range from accepting to nearly hostile. Throughout, case participants must not only come to decisions about the effectiveness of the design and operation of Alchemy's system of internal control, but must also defend their problem-solving method by explicitly referring to the evidence or inferences they used to come to their judgments.

Broad business perspective competencies. According to the AICPA (2000), the broad business perspective competencies include critical thinking and a focus on marketing and the client. Alchemy shows students a complex business process that requires participants

to understand how the business process fits into the company's strategic plans for profitability. The case intentionally uses a fictitious production process (preparing gold spheres) in order to provide all users with the same starting point—that is, students are less likely to bring in their assumptions or understanding of how a more standard process (e.g., manufacturing a table or making a hotel reservation) actually works.

Implementation Guidance

Arens and Elder (2006, 354) conclude that the Act's requirements for an integrated audit "increase the importance of students' understanding of internal controls and information systems, which in turn increases the importance of integrating the information systems and auditing courses." At the same time, recent literature in accounting education suggests that an integrative case experience may be productive in imparting knowledge content while also helping students develop critical lifelong skills (Ammons and Mill 2005; Jervis and Hartley 2005). In this spirit, we designed our use of Alchemy to reinforce AIS concepts in both the AIS and auditing courses at our university and to show how the integrated audit requires an integration of AIS knowledge and auditing concepts. Institutions which feature AIS and auditing as a single course can easily adapt our approach.

Our use of Alchemy features three AIS assignments and one auditing assignment. Details of the assignments, including the Alchemy materials used in each, appear in Section IV below.[2] Because of the extensive nature of the materials, all assignments use teams of students (ranging from two students per team to five, depending on instructor preference and class size). We set assignment due dates to coincide with the conclusion of classroom presentation of related textbook material. The first AIS assignment is introduced as the students learn to prepare systems flowcharts, the second as they learn to prepare control matrices, and the third near the end of the course. The auditing assignment is given after students have been exposed to the control risk assessment, control objectives, typical control activities, and fraud risk assessment for the revenue and purchasing cycles. A summary of the assignments follows.

The first AIS assignment requires the team to analyze the company's process narrative to determine who or what performs each activity (i.e., to prepare a table of entities and activities) and to prepare a systems flowchart for Alchemy's business process. The second calls for the team to revise their systems flowchart, annotating it to indicate control locations, and to prepare a control matrix with explanations of how the controls address relevant control objectives. (Our control matrix and its debriefing are based on the approach found in Gelinas and Dull [2008].) This deliverable concludes with an overall assessment of the effectiveness of the control system's design. The final assignment is an assessment of Alchemy's control environment and pervasive and general controls. The team's analysis is to include controls that ensure effective and efficient operations and security of resources, while paying attention to fraud risks and the controls that address those risks. We debrief each assignment separately during the class in which the graded deliverable is returned.

For auditing, students must assess whether the controls Alchemy management has listed are really in place and working to mitigate risks. They must also include an evaluation of the likelihood of fraud at Alchemy, and discussion points and recommendations for the firm's audit committee. We have also designed a version of this assignment for use in graduate auditing courses. This version requires the same assessment and evaluation as

[2] Additional suggestions for implementing the case appear in the teaching notes that are available to instructors via the journal's website.

detailed above, but expands the students' work by extensive in-class discussion of management controls, auditor interaction with audit committees, the art of interviewing, and the audit as an influence on employee and management behavior.

Student Assessments

Student feedback confirmed the value of Alchemy across the AIS and auditing curricula. In general, students found the materials easy to use and understand. They saw the connection between the materials and the assignments. They judged the materials and assignments to be generally interesting, contributing to their learning, and improving their understanding of key concepts. The Alchemy experience increased their interest in the significant work they will perform as professionals. While there were some questions about the degree to which Alchemy is a realistic case, students overwhelmingly believed it was valuable to the courses and recommended its continued use.

Demographics

The results presented below and detailed in Table 2 are based on responses from two sections of our undergraduate AIS course (n = 47). Results of evaluations conducted in sections of undergraduate and graduate auditing are available from the authors on request.[3] Fifty-five percent of the AIS students were female. Seniors constituted 23 percent of respondents; all but one of the other participants were juniors. There was an average of 3.1 years experience among students reporting any work experience (n = 40), with seven students reporting having had an internship in public accounting or in a field that involved them in internal control. On average, students said they spent 13.7 hours on the AIS assignments.

Materials: Ease of Use and Understanding, and Student Interest

In general, students found the materials interesting and easy to use and understand. They saw the role the materials played in the written assignments and believed that the materials contributed to their learning. Thus, 51 percent of AIS students found the Alchemy written materials somewhat or very easy to use. Similarly, 46 percent said that it was somewhat or very easy to understand the content of the written materials. Over half of the students regarded the written materials as somewhat or very interesting, while over 95 percent found some or great contribution to their learning from the written materials.[4]

Assignments and Debriefings: Interest and Contribution to Learning

Generally, half of the AIS respondents found the three AIS assignments somewhat or very interesting (57 percent for the table of entities and activities and systems flowchart, 44 percent for the control matrix and evaluation of business process controls, and 53 percent for evaluating the control environment and assessing fraud risk). The vast majority of these students saw some or great value to their learning from the assignments (94 percent, 92 percent, and 85 percent by assignment). The debriefing for each AIS assignment generally

[3] At the time of the Alchemy implementation that we describe here, our five-year degree students typically took a combination of undergraduate AIS and graduate auditing. The graduate AIS course was not offered in the semester described in this paper but did subsequently adopt the Alchemy materials used in the undergraduate AIS course.

[4] Students in the auditing courses were generally more likely to rate the materials higher in these areas than students in AIS. The filmed interviews, which were available only to auditing students as part of the requirement to gather evidence, drew more positive responses than the written materials.

TABLE 2
Student Assessment Details

Proportion of Student Responses by Item

	Very Easy	Somewhat Easy	Neither Difficult nor Easy	Somewhat Difficult	Very Difficult
Ease of use:					
Written materials	.13	.38	.19	.30	.00
Ease of understanding:					
Written materials' content	.06	.40	.34	.19	.00
Part played by:					
Written materials in assignments	.15	.40	.21	.23	.00
	Very Interesting	**Somewhat Interesting**	**Neither Boring nor Interesting**	**Somewhat Boring**	**Very Boring**
Interest in:					
Written materials	.06	.45	.32	.17	.00
Assignment 1	.04	.53	.28	.15	.00
Assignment 2	.06	.38	.32	.19	.04
Assignment 3	.23	.30	.23	.15	.09
Debriefings					
AIS assignment 1	.09	.49	.38	.04	.00
AIS assignment 2	.13	.49	.30	.09	.00
AIS assignment 3[(a)]	.24	.39	.26	.11	.00
	Great Value	**Some Value**	**Little Value**	**No Value**	
Contribution to learning from:					
Written materials	.53	.43	.04	.00	
Assignment 1	.64	.30	.06	.00	
Assignment 2	.66	.26	.09	.00	
Assignment 3	.51	.34	.11	.04	
Debriefings					
AIS assignment 1	.34	.49	.17	.00	
AIS assignment 2	.45	.45	.11	.00	
AIS assignment 3[(a)]	.39	.48	.09	.04	

(*continued on next page*)

TABLE 2 (continued)

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Written materials improved understanding of documenting business processes	.38	.49	.13	.00	.00
Alchemy increased interest in documenting business processes	.00	.45	.28	.26	.04
Written materials improved understanding of business process controls	.40	.36	.23	.00	.00
Alchemy increased interest in business process controls	.04	.53	.23	.17	.02
Written materials improved understanding of firm's control environment and pervasive and general controls	.26	.49	.19	.04	.02
Alchemy increased interest in firm's control environment and pervasive and general controls	.13	43	.32	.11	.02
Assignments improved understanding of the firm's control environment	.32	.40	.26	.02	.00

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The Alchemy case was realistic	.02	.26	.30	.34	.09
The Alchemy case was valuable to the course	.19	.62	.13	.06	.00
Recommend continued use of the Alchemy case	.23	.57	.09	.09	.02

Proportions may not sum to 1.00 because of rounding. n = 47 except (a) n = 46.
Assignments were as follows: (1) prepare a table of entities and activities and a flowchart of the process; (2) prepare a control matrix and assess business process controls; (3) evaluate the firm's control environment, pervasive and general controls, and assess the risk of fraud.

received high ratings for interest, with 58 percent, 62 percent, and 63 percent of students (by debriefing) finding the respective class session somewhat or very interesting. Again, students clearly perceived contributions to their learning from the debriefings, as 83 percent, 90 percent, and 87 percent of students (by debriefing) found some or great value to the classroom experience. Similar strong results were apparent in the auditing courses.

Overall, we find it encouraging that such high proportions of students perceived value in the assignments, no matter what their level of interest in the assignments. As we know from our contacts with other AIS instructors, students often do not view the topic of control description and evaluation with great interest. Despite that, our respondents appear to grasp the importance of these activities.

Alchemy's Perceived Effect on Improving Understanding of and Interest in Concepts

Perhaps the most lasting value of Alchemy can be seen in student perceptions of how the exercise improved their understanding of key processes and concepts covered in their course. In AIS, 87 percent agreed or strongly agreed that the Alchemy materials improved their understanding of documenting business processes, while 76 percent agreed or strongly agreed that the materials increased their understanding of documenting business process controls. In addition, three quarters of the AIS students agreed or strongly agreed that the materials contributed to their understanding the firm's control environment and pervasive and general controls. In general, half of the AIS respondents found their interest in these items improved thanks to Alchemy—with 45 percent saying this was so for documenting business processes, 57 percent for business process controls, and 56 percent for the firm's control environment and general and pervasive controls. Ratings generally were even higher among auditing students and were similar between undergraduate and graduate students.

Overall Assessments

Over 80 percent of AIS students regarded Alchemy as valuable to the course and 80 percent recommended its continued use. Among auditing students, the responses were similarly strong, with 85 percent of undergraduates and 99 percent of graduate students finding it valuable, and 93 percent of undergraduates and 100 percent of graduate students recommending continued use. (Auditing student data do not appear in Table 2.) On the other hand, only 28 percent of AIS students agreed with the statement that the Alchemy case was realistic—another 30 percent were neutral—in contrast to 40 percent of undergraduate auditing students and 45 percent of graduate students. We believe the overall tepid response in this area is likely due to Alchemy's manufacturing process (treating gold spheres). We also believe the AIS students' reaction was tempered by the absence of the filmed interviews in their exposure to Alchemy. As noted earlier, the somewhat fanciful business process is intended to introduce students to an unfamiliar setting where they cannot bring their experience or preconceptions to the analysis—forcing closer attention to case details and controls. Similarly, the filmed interviews received high ratings for interest from the auditing groups, suggesting the interviews may have given the exercise more of a realistic touch.

III. CONCLUSION

The integrated audit now required under the Sarbanes-Oxley Act calls for auditors to use their AIS knowledge more extensively during the course of their duties. The assignments we have designed using Alchemy parallel this renewed emphasis on AIS concepts. Students can more clearly appreciate the importance of internal control design and operation, fraud risk assessment, and the auditor's responsibility to test controls and communicate with the audit committee—thus reinforcing connections between academic areas and practice activities that students may view as distinct and only weakly related. Feedback from

students indicates that Alchemy helps students see how course concepts are translated into practical activities, illustrated by materials that are easy to use and understand, and that generate high levels of interest, perceived contribution to learning, and improved understanding of key AIS concepts.

IV. CASE ASSIGNMENTS

PwC developed Alchemy as an interactive training exercise for use in the firm's staff, manager, and partner training after the issuance of the Sarbanes-Oxley Act. Realizing that the students they would be hiring needed to be aware of the changed audit environment, PwC adapted materials from their training exercise and now makes these available to instructors on a CD-ROM. Because of the extent of these materials and their nature (e.g., interview film clips and a working machine simulation), it is not practical to reproduce them in the pages of a printed journal article. However, with PwC's permission, we include below some items pertinent to the student assignments that we have designed. (Case Exhibits 1, 2, 3, 4, and 5 are either taken directly from the PwC materials or are slightly adapted from those materials.) In the assignments below, we direct students to the course website for the Alchemy materials that they need that are not distributed in class. Instructors should change those directions as appropriate for their circumstances.

AIS Assignment 1

Deliverables: Using the narrative of the Alchemy, Inc. process (Exhibit 1), prepare a table of entities and activities and a systems flowchart of the Alchemy process.

Notes:

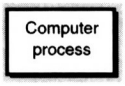
1. The table of entities and activities should be formatted as follows:

Entities	Para	Activities

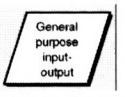
2. Use the following columns on the systems flowchart:

Receiving Clerk	Machine Operator	Machine	Shipping Clerk	Management

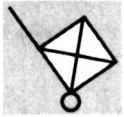
3. Use the following symbols on the systems flowchart:



process symbol for any machine processes



general purpose input/output symbol for the bins, logs, and manual counts



for the spheres. Also, the instructor should suggest that students label these spheres as they move (e.g., small green, large)

for all automated (machine) logs and counts.

4. The Alchemy machine simulation is available on the course website.

EXHIBIT 1
Case Assignment
(For AIS Assignment 1)

Narrative of the Alchemy, Inc. Process

Alchemy Incorporated—Company Background

Alchemy Incorporated is a wholly owned subsidiary of Al Chem Corporation. Alchemy, Inc. specializes in the processing of small gold spheres used in the aerospace industry. Alchemy processes approximately 60 percent of the spheres for Al Chem Corp. Alchemy is paid by Al Chem Corp. on a tolling basis which is calculated on the number of spheres processed. Revenue is recorded when the spheres are processed, not when they are sold. This is recorded as intercompany revenue on the books of both Alchemy and Al Chem Corp. Alchemy operates several factory locations, one in the U.S. in Pleasantville, Michigan, and additional factories in the U.K., India, and Taiwan. Alchemy sells each sphere for $20,000US. Alchemy Inc. is the top sphere processor in the industry and also sells spheres to the U.S. government and other aerospace contractors. Annual revenues are approximately $2 billion. Most customers for Alchemy spheres are based in the U.S. and U.K., but international sales are growing and are a steady focus for management's five-year strategic plan.

Alchemy Inc. has an Internal Audit department that was recently put in place to comply with stock exchange rules. Internal Audit reports to the CEO. In 1996, when the present CEO took over, he dismantled the then existing Internal Audit department since he did not perceive that it added value. The newly formed Internal Audit department is comprised of three individuals, plus the director. The average number of years' experience of this team is 2.5 years.

Management of Alchemy Inc. has been preparing for Sarbanes-Oxley (SOX) Section 404 for several months. They have been signing their SOX Section 302/906 certifications regularly. They have been working with you, the external audit engagement team, along the way. They are anxious now for the external auditors to get started auditing their controls and feel they have done an admirable job in preparing their documentation. They used a CAVR (completeness, accuracy, validity, restricted access) framework and have identified control weaknesses in the design of controls. They have documented the weaknesses and communicated them to the Audit Committee and the external auditors.

Alchemy has a code of conduct and a whistleblower program in place. One call has occurred this year to the hot line regarding intercompany sales. No further details are available.

Alchemy Inc. Processing Description

Alchemy spheres are processed using a five-step process that includes a step called helixination. This process uses a spiral centrifugal micro-sanding process which shapes the spheres to an exact specification. The helixination process is unique and management has applied for a patent. No other sphere processor has this technology, and Alchemy's management believes this is the key differentiating factor to their process.

(*continued on next page*)

EXHIBIT 1 (continued)

Alchemy receives raw materials mostly in four forms—large and small green colored spheres and large and small gold colored spheres. A receiving clerk counts the spheres in the bags of raw materials as they are received. He compares the count with the receiving documents and records his findings in a log. He then moves the raw materials to the factory floor for the operator to process. Raw materials can only be obtained in this form. It is not possible to obtain pre-color sorted spheres.

The operator pours the raw materials into the loading bin. At the bottom of the loading bin, the sorting process mechanically sorts out small spheres from large. Large spheres of both colors are sent through an enclosed tube to the curing process to be processed to the correct small size. An operator cures the spheres by turning a crank. A counter attached to the crank tabulates the number of times the curing process is started. Each turn of the crank cures one large sphere turning it into a small one. There is no waste in the process. All large spheres are cured in this process. Once the large spheres are cured, all move on to the color sorting process. Small spheres of both colors, and therefore the correct size, bypass the curing process and move directly in an enclosed tube to the color sorting process. The operator turns in the count of cured spheres daily to management.

In the color sorting process, the operator manually sorts green spheres from gold ones. Gold ones are counted when the operator "clicks" a manual counter as they pass to the helixination process. Green ones are placed in a "non-spec" receptacle and sold for $2,000 each. The operator manually counts the green spheres, which are picked up by the shipping clerk daily. The shipping clerk counts them again as they are packed for shipping.

Once the gold spheres have been helixinated, they are counted again by an automatic counter. The counter is a laser-operated apparatus that counts the spheres that pass out of the helixinator and into a container. From the container, the spheres are prepared for shipping. The tolling revenue is recorded based on the number of spheres counted by this final counter.

Once counted, management reconciles the count of spheres input at the beginning of the process, to the sum of spheres in the non-spec receptacle and the spheres counted by the final counter. Spheres are valued at $20,000 each, and the Alchemy process yields about a 7 percent output based on the inputs received.

AIS Assignment 2

Deliverables: An annotated systems flowchart of the Auditing Alchemy, Inc. process, a control matrix, including explanations of how each of the controls achieves each of the relevant control plans, and an overall assessment of the effectiveness of design of the system of controls.

Materials needed:

- Graded systems flowchart from AIS Assignment 1.
- Control matrix template for AIS Assignment 2 (Exhibit 2). This template is based on material from Gelinas and Dull (2008).

Notes:

1. You do not need to include controls for every activity and process in the flowchart. Do include controls that address each control goal. Do include controls that you think should be included (i.e., missing controls).
2. Your assessment of the effectiveness of design need not be more than a paragraph or two. Simply describe the major strengths and weaknesses of the system of internal control. Examine the controls (especially the counts) and summarize your conclusions. That is, are the data used to record tolling revenue valid, complete, and accurate?
3. The counts in the system are:
   a. Count 1: Receiving clerk counts the incoming spheres (used in the final reconciliation).

EXHIBIT 2
Case Assignment—Control Matrix Template
(For AIS Assignment 2)

Recommended control plans	Control goals of the Alchemy Manufacturing and Revenue Recording Process							
	Control goals of the operations process				Control goals of the information process			
	Ensure effectiveness of operations by achieving the following goals:		Ensure efficient employ-ment of resources (people, machinery, raw materials)	Ensure security of resources (raw materials, finished goods)	For the production data (number of helixinated gold spheres) inputs, ensure:			For the .... master data, ensure:
	A	B			IV	IC	IA	
Present Controls								
Missing Controls								

Possible effectiveness goals include the following:
A — Produce only small spheres
B — Helixinate only gold spheres

IV = input validity
IC = input completeness
IA = input accuracy
UC = update completeness
UA = update accuracy

The master data UC and UA columns are shaded to indicate that there is no master data in this process.

b. Count 2: Machine operator manually counts green spheres put into non-spec bin (used in the final reconciliation).
c. Count 3: Operator clicks a manual counter when spheres pass to helixination (not sent anywhere and not used).
d. Count 4: The machine tabulates the spheres that are cured when the operator turns the crank (not used).
e. Count 5: Laser counter on machine (final count used to record tolling revenue and in the reconciliation process).
f. Count 6: Shipping clerk counts the green spheres taken from the non-spec bin (not used).

AIS Assignment 3

Deliverable: An assessment of the control environment, pervasive controls, general controls, and IT general controls (ITGCs) as they relate to the Alchemy, Inc. business process. Include in your analysis controls that ensure effective and efficient operations and security of resources. Pay particular attention to fraud risks and the controls that address those risks. Essentially, you are describing the controls that need to be in place to make the business process controls effective and to prevent or detect fraud.

Notes:

1. Address specifically the risk of fraudulent financial reporting and security of resources (i.e., the spheres). You might organize your answer by identifying several risks and describing controls that are:
   a. In place (described in the narrative or observed in the machine simulation) and have an effect on the risk
   b. Not in place, put would provide some protection
   c. Unknown whether or not in place but would be an important control over the risk.
2. You might consider in your answer the following:
   a. The COSO Enterprise Risk Management Framework:
      i. Internal environment
      ii. Objective setting
      iii. Event identification
      iv. Risk assessment
      v. Risk response
      vi. Control activities
      vii. Information and communication
      viii. Monitoring
   b. The pervasive, general and IT general controls (ITGCs)
3. Do not address improvements to the business process controls from AIS Assignment 2 unless there is a pervasive control involved. For example, if you want to specifically segregate counting and reconciling steps, say who or what should count and who or what should reconcile.

Auditing Assignment 1

Deliverables: The Assignment Package (Exhibit 3) describes the assignment deliverables to be completed with your teammates. You will need Exhibits 3–6 to complete this assignment.

Alchemy materials needed: All Alchemy materials are on the course website.

Notes:

1. Make sure you have read or viewed the case material that provides background to auditors' work in general, such as "404—Changing the Way We Do Business" and Background Movies 1 and 3 on controls over financial reporting and using the work of others.
2. Look at the goals of your work on this case. That is, read the "Alchemy, Inc., Assignment Package" (Exhibit 3).
3. View the videos that provide background on the way to approach the case—Videos 5 ("This Learning Experience"), 6 ("CAVR"), 7 ("Walkthroughs"), and 10 ("Experience Overview"). The numbers appear at the start of the file's title. Remember that these materials discuss PricewaterhouseCoopers' perspective on auditing. While this is a firm-specific perspective, its elements are generally common among the major public accounting firms.
4. Read the background documents ("Alchemy Company BG," the audit committee policies, management's control matrix, the internal auditor documents).
5. Look at the machine simulation ("Machine Operation"). A drawing of the operation is also available on the course website.
6. View video 15 ("Information Gathering") and then the interview videos in any order you want (17, machine operator—C. J. Ready; 21, internal auditor; 22, CEO—Chris Ready; 23, shipping clerk—Sam Walker; 24, receiving clerk—Martin Rodriguez).
7. Discuss your findings with your teammates.
8. Complete the Assignment Package (Exhibit 3) as a team. Instructions appear in the package.
9. Prepare to discuss your findings and experience in class.

EXHIBIT 3
Case Assignment

Alchemy, Inc. Assignment Package
(For Auditing Assignment 1)

Please complete this package as a team and hand in one copy. You also may want to print out copies for the team members to have available during discussion in class.

Alchemy's management has identified the controls listed in the table "Alchemy, Inc. Results of Control Testing" (Exhibit 4). These descriptions come straight from management, with a little editing by the external auditor staff person. For each control, you should indicate whether you have any evidence that the control is in place and working as described. Of course, the case limits what you can use as a source of evidence: the write-ups (documentation) and the interviews that you have reviewed. Still, these should be enough for you to get an idea of whether the control is operating.

You will notice that in a few instances, management has recognized that there are some controls missing. However, Alchemy believes these controls are not crucial. If you find the controls are indeed missing, please note that. (I know it is hard to say what the evidence is that something is missing, but do your best to tell me how you know the control is not there.)

For each item listed in the table, you should evaluate the control's effectiveness. That is, is the control working as described? Is it actually a control? You can answer this last question by noting how it contributes to "CAVR." (If you do not know what CAVR is, please review the video with that title.) For the controls that management believes are missing, first note whether they are indeed missing, then tell me how they would have contributed to CAVR if they were in place.

Following this, as part of the "Conclusion about Management's Anti-fraud Programs and Controls" (Exhibit 5), you should evaluate the overall effectiveness of Alchemy's control system. As you do this, bear in mind PricewaterhouseCoopers' suggestions for following CAVR as a means to achieve effective controls. You also may have found compensating controls—items that management did not identify, but which help improve the control system. Remember that you are required to consider whether there is a chance for fraud to occur in the system, so your evaluation should specifically refer to your assessment of the likelihood for fraud.

Finally, you should prepare a "Summary of Points to Discuss with the Audit Committee" (Exhibit 6). In this section, you should feel free to list any efficiencies that management can use to improve their control system or their business processes. You also should list any deficiencies you have found in the control system. Remember, in the "Conclusion about Management's Anti-fraud Programs and Controls," you should discuss the importance of any deficiencies that you find. In the audit committee discussion points, you should discuss what you recommend the audit committee do about any such deficiencies. In other words, do not repeat your discussion in each section.

For this assignment, I am not looking for polished essays. Your list should be clear—that is, your points should be complete enough for me to understand what the issue is, why it is important, and what your recommendations are.

EXHIBIT 4
Case Assignment

Alchemy, Inc. Results of Control Testing
(For Auditing Assignment 1)

Key Activity or Control, Per Management	Evidence That Control Is in Place (Cite Interview or Other Observation)	Evaluation of Control Effectiveness
1. Receiving Clerk counts the raw materials and compares the count received with the receiving documents. All is logged on the "goods received for processing" log sheet.		
2. Slot in machine allows only small spheres to continue to the helixination process. Large ones are moved to the curing process.		
3. Access to the size sorting process is restricted in the enclosed tubes.		
4. Access is not restricted to the opening on the holding tank receptacle. Management has identified this weakness.		
5. Access to color sorting process from size sorting is restricted for small spheres (does not apply to large spheres).		

(*continued on next page*)

EXHIBIT 4 (continued)

6. Operator turns on the curing process and the number of "cranks" is recorded. Each crank cures one sphere. The operator turns in the count each day.		
7. Operator turns the crank which turns on the volume limiter in the curing process. This shrinks the large spheres and turns them into small ones.		
8. No control in place to ensure restricted access from color sorting to helixination. Management has identified this weakness.		
9. No control in place to ensure completeness of input from color sorting to helixination. Management has identified this weakness.		
10. Color sorter represents a control in place to sort colors and place only the gold spheres on the conveyor to the helixination and counting process.		
11. Periodic tests on the helixinator for quality assurance purposes (ensures the accuracy of the output). Specifically trained personnel test the operation of the helixinator daily and calibrate the sensors in the micro-sander.		
12. A counter is in place that counts the spheres entering the color sorting process (all colors) and that count is reconciled to the count of spheres that go through the counter after the helixination process. Spheres that are not the correct color are placed in a special tank, whose output is recorded daily and reconciled to the count emanating from the final counting process. The count of non-spec spheres plus the count of spec spheres from the final counting process will equal the count in place at the beginning of the color sorting process, and should also equal the count of spheres entering in curing process.		

(*continued on next page*)

EXHIBIT 4 (continued)

13. Restricted access is ensured since the tank is fully encased.		
14. Counting machine in place counts spheres.		
15. Management performs a reconciliation of the spheres added in Control Point 1 to the count of the spheres passing the final counter PLUS the number of nonspec spheres collected in the color sorting process.		

EXHIBIT 5
Case Assignment

Conclusion about Management's Anti-fraud Programs and Controls
(For Auditing Assignment 1)

Are Alchemy's management's anti-fraud programs and controls effective?
(Circle one):

Yes No

List the reasons for your decision. Please use a list rather than a running narrative. You may refer to the items in the table above by number, but include brief discussion if you do (e.g., "Item 7 shows ..."). If you raise issues other than those found in the above table, be certain to include the source for your information (e.g., "Our interview with the CEO brought to light ...") and why this item is indicative of effective or ineffective control.

EXHIBIT 6
Case Assignment

Summary of Points to Discuss with the Audit Committee
(For Auditing Assignment 1)

List below the points you want to raise to the Audit Committee. Number each point separately. Briefly refer to the source of your information for each point (e.g., "Our interview with the machine operator raised the issue of ..."). Note that you are mentioning your source only for purposes of this assignment. In practice, this may be a sensitive area. Be certain that each point you raise includes the source of your information, why the issue is worth Audit Committee attention, and your recommendations for Audit Committee action.

TEACHING NOTES

Teaching Notes are available only to full-member subscribers to the Journal of Information Systems through the American Accounting Association's electronic publications system at http://www.atypon-link.com/action/showPublisherJournals?code=AAA. Full member subscribers should use their personalized usernames and passwords for entry into the system where the Teaching Notes can be reviewed and printed.

If you are a full member of AAA with a subscription to the Journal of Information Systems and have any trouble accessing this material, please contact the AAA headquarters office at office@aaahq.org or (941) 921–7747.

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