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Experiencing Business Challenges to Using Information Systems: A Simulation-Based Learning Approach

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Experiencing Business Challenges to Using Information Systems: A Simulation-Based Learning Approach

Bernie Farkas
Yanyan Shang
Sykes College of Business
University of Tampa
Tampa, FL 33606, USA
bfarkas@ut.edu, yshang@ut.edu

ABSTRACT

This teaching tip describes a novel simulation, the Business Information Systems Simulation, designed for teaching information systems concepts. Created with *Capsiminbox*, the simulation places students in the role of a retail store manager who is assigned a leadership role in a strategically important pilot project to develop an app. Throughout the simulation, the student uses critical thinking skills to make decisions (grounded on the Rational Decision-Making Model) that must incorporate the company's Code of Conduct and satisfy various stakeholders. Later, the student leads their store through the response to a data breach. While encompassing many Information Systems concepts, the simulation challenges students to use their business rather than technical knowledge. A peer review, student survey, and analysis of skill scores demonstrate the simulation's effectiveness.

Keywords: Critical thinking, Information systems (IS), Simulation, Teaching tip

1. INTRODUCTION

Students must learn Information Systems (IS) concepts in their business program curriculum to adapt to the contemporary business and technological environment. Nisula and Pekkola (2018) posit that experiential learning in an integrated multidisciplinary curriculum is essential to prepare students with "a holistic understanding of a company and its business environment" (p. 97). A multidisciplinary approach teaches students "how to gain and use knowledge" and provides "comprehensive, broad problem-solving skills that correspond more closely to the interdisciplinary nature of most professions" (Ducoffe et al., 2006, pp. 278-279). The Association to Advance Collegiate Schools of Business (AACSB) International expects that business colleges instill students "[with a] learn-to-learn expectation to facilitate agility in adaptation to emerging technologies in the future" (AACSB International, 2020, p. 43). While AACSB does not insist on a multidisciplinary curriculum, it does expect that programs appropriately prepare students for current and emerging technologies, enabling them to join a workforce where organizations of all sizes and types use rapidly evolving IS and technology tools.

The authors' College of Business partially satisfies the AACSB's curriculum requirement by having its undergraduate students complete an introductory Management Information Systems (MIS) class, preferably in their sophomore year. The IS concepts covered in such courses traditionally include artificial intelligence, business intelligence and analytics, cloud computing, database and data management, enterprise systems

(e.g., customer relationship management, enterprise resource planning, knowledge management, supply chain management), information technology, networking and the world wide web, project management, and security. These courses typically use case studies, lectures, quizzes, readings, and tests. Textbook publisher's Learning Management Systems provide these materials and immersive assignments.

We found that over 900 students in the thirty classes we taught had limited interest in these IS concepts even though they have been using video games, electronic devices, and the World Wide Web, making the pedagogy for IS concepts challenging. In our experience, students are not receptive to focusing on IS concepts; the concepts need a relatable context. There is growing evidence of the merit of teaching IS concepts alongside other business concepts, including management skills (e.g., interpersonal and written communication, leadership, negotiation) (Blaylock et al., 2009) and managing innovation and problem-solving (Çeviker-Çınar et al., 2017).

AACSB accredits our college's business program, and our MIS major within the business program is also accredited by the Accreditation Board for Engineering and Technology (ABET). Therefore, the introductory MIS course's objectives align with the ABET Student Outcomes (see Table 1) required of IS programs (ABET, 2022). Knowing that games and simulations have been used across business college courses (Lovin et al., 2021; Tiwari et al., 2014), the authors sought an IS simulation for Student Outcome 1, an ability to analyze a problem and to identify and define the computing requirements appropriate to its solution; and Student Outcome 4, an ability to make informed judgments in computing practice based on legal

and ethical principles. While management simulations are available, none of them incorporate IS concepts. Therefore, the authors worked with Capsim (https://www.capsim.com/) to develop a Business Information Systems Simulation (BISS). Rather than using Capsim's Business Simulation, BISS is a wholly new simulation that uses Capsim's Inbox Simulation, which "uses an email environment to immerse learners in authentic, day-on-the-job situations and assess critical business skills" (Capsim, 2023, top of page).

The simulation occurs within a big-box department chain, placing the student in the store manager role. The chain's Chief Executive Officer (CEO) announces an IS pilot project in the student's store. The student works with executives, managers, and staff to determine the technology to include in the pilot touching on IS topics such as curating search results, safeguarding privacy and sensitive data, using artificial intelligence (AI) and smart technologies (e.g., packages, services, shelves), and working with third-party partners. Project choices are grounded in the company's Code of Conduct. In the later stages of the simulation, the student's store experiences a data breach and must decide the business response to the incident, e.g., create a communication plan and customer remedy. The background and use of this simulation are described in Sections 4 and 5 below.

This research examines the pedagogic effectiveness of a simulation of IS in a business management context. Such a pedagogic method should enable students to 1) understand the business-driven requirements for IS, 2) recognize the business-related issues of using IS, and 3) increase awareness of the ethical considerations of using IS.

Using a simulation environment, BISS was designed to provide students with a safe, *real-world* experience in which they learn to evaluate various information, including a code of conduct, to make decisions that may need to be reevaluated (critical thinking). The rest of the paper is organized as follows: a literature review, a description of the simulation, a description of the lesson plan approach (e.g., the preparations, playing, discussion, and grading), a discussion of the evidence of the simulation's effectiveness, and a concluding discussion.

2. LITERATURE REVIEW

Gamification involves incorporating game elements into non-gaming scenarios (Barata et al., 2017). When games are created explicitly for educational aims to fulfill learning objectives, they are termed *serious games*. Simulations are a common form of serious games (Beranič & Heričko, 2022), making up most of the games employed in business programs (Boyle et al., 2016).

Simulations (Dick & Akbulut, 2020; Tiwari et al., 2014) provide an experiential learning experience that embed the natural world into the classroom by placing students in a role where they analyze situations and make decisions, contributing to subsequent outcomes (Tiwari et al., 2014).

Management simulation games can be traced to the 1950s (Wells, 1990) when they began to emerge as a pedagogic method (Cullingford et al., 1979); they have been used to teach marketing, financial management, project management, knowledge management, and risk management since the early 2000s (Pasin & Giroux, 2011). Additionally, in the IS domain, Farkas et al. (2022) designed a multi-level game-based approach to help business students learn business process concepts and diagrams. Globally, business schools now widely accept simulations as a "dominant teaching pedagogy" (Tiwari et al., 2014, p. 261).

Studies have demonstrated the potential increase in student activity (Denny, 2013) and performance (Domínguez et al., 2013) from gamification. Dicheva et al. (2015) found that well-designed and used games could improve learning and that IS educators were early adopters. Monk and Lycett (2016) demonstrated the effectiveness of using simulations to teach IS. Adobor and Daneshfar (2006) found that individual learning was positively associated with a simulation's realism, and the simulation's ease of use was positively associated with learning problem-solving.

Techniques to improve learning with simulations include *post-simulation discussions* that connect students' experience with their performance (DuHadway & Dreyfus, 2017), *longer simulations* can foster deep thinking and knowledge integration (Cavanaugh et al., 2016), and *competition* can maintain student motivation (Ganesh & Sun, 2009). Chang et al. (2003) surveyed business students and found that a simulation enabled them to learn business concepts and develop problem-identification, planning, and decision-making skills.

Student Outcome
1. An ability to analyze a problem and to identify and define the computing requirements appropriate to its solution
2. An ability to design, implement, and evaluate a computer-based solution to meet a given set of computing requirements in the context of the discipline
3. An ability to communicate effectively with a range of audiences about technical information
4. An ability to make informed judgments in computing practice based on legal and ethical principles
5. An ability to function effectively on teams to establish goals, plan tasks, meet deadlines, manage risk, and produce deliverables
6. An understanding of and an ability to support the use, delivery, and management of information systems within an Information Systems environment

Table 1. Student Outcomes for IS Programs (ABET, 2022)

3. FOUNDATIONAL CONCEPTS USED IN THE BISS DESIGN

Decision-making, using a Code of Conduct in decision-making, and Critical Thinking comprise the foundational concepts in BISS's design. The sections below discuss the background of each concept and how it is incorporated into BISS.

3.1 Decision-Making

Decision-making is a collection of cognitive activities in which the decision-maker chooses from identified alternatives (Galotti, 2005; Schraagen et al., 2008). According to Intezari and Pauleen (2018): "Decision-making is an ongoing process of identifying and evaluating various alternatives for achieving one or more objectives, in which expectations and preferences about a particular course of action lead the decision-maker to select the course of action that is most likely to result in achieving the objectives" (p. 338). Decision-making is essential to business and managers' work (Michel, 2007), and the quality of the decisions is correlated with the organization's performance (Intezari & Pauleen, 2018).

A popular conception of decision-making is a process where information is collected, evaluated, and considered resulting in a conclusion (Wang et al., 2006). Nevertheless, it is common for decision-makers to confront complex, interrelated problems that can affect a decision (Moxnes, 2000). The Rational Decision-Making Model (RDMM) applies to complex decision-making in a social context, e.g., a business or an organization. According to the RDMM, a decision-maker proceeds through steps: understand the problem and its environment, generate and evaluate candidate solutions, and determine goals and values to establish priorities and preferences based on the likelihood of attaining the goals (Nageen & Kingston, 2014). Regardless of the steps, the decision-maker's decision must also be accepted by others who are aware of the decision (Ranyard et al., 1997). RDMM forms the basis of the Decision-Making Skills Model (see Figure 1) on which the BISS decision-making was designed.

Figure 1. Critical Decision-Making Skills Model (based on Uzonwanne, 2018)

Given the complexity of certain decisions, simulations provide a means to learn the effects of decisions (Karakul & Qudrat-Ullah, 2008).

3.2 Code of Conduct in Decision-Making

As described above, decision-making is a process that evaluates collected information which includes facts about the matter being decided and organization norms. One such norm is an organization's Code of Conduct. According to Kaptein and Schwartz (2008): "a business code is a distinct and formal document containing a set of prescriptions developed by and for a company to guide present and future behavior on multiple issues of at least its managers and employees to one another, the company, external stakeholders, or society in general" (p. 113).

Therefore, a Code of Conduct is implemented to provide guidance and behavior expectations to organizational members to ensure their actions and decisions align with the organization's policies, principles, and rules and statutory laws and regulations (Ferrell et al., 2000). BISS provides students with a Code of Conduct to use throughout the simulation, and it is incorporated into BISS's scoring.

3.3 Critical Thinking

Simulations enable learners to use critical-thinking skills in a risk-free environment (Bell & Loon, 2015). The meaning of critical thinking runs a spectrum from the perfection of thought (Lai, 2011) to learning to learn (Pithers & Soden, 2000), which aligns with AACSB's expectations of business schools. Dwyer et al. (2015) define critical thinking as "A metacognitive process consisting of the skills of analysis, evaluation, and inference that, through purposeful, reflective judgment, increases the chances of producing a logical conclusion to an argument or solution to a problem" (p. 260).

While critical thinking skills are essential for problem-solving (Facione, 1990), they must be used with the appropriate critical-thinking disposition to be effective, i.e., the skills and dispositions are mutually reinforcing (Facione et al., 1995; Norris, 1990). A "human disposition is a person's consistent internal motivation to act toward, or to respond to, persons, events, or circumstances in habitual, and yet potentially malleable, ways" (Facione et al., 1995, p. 64); the critical-thinking dispositions are "precursors and gateways to problem-solving, solutions, and decision-making" (Bell & Loon, 2015, p. 120).

Critical thinking dispositions contain three constructs: Engagement, Cognitive Maturity, and Innovativeness (Irani et al., 2007; Ricketts & Rudd, 2004). The Engagement construct is the thinker's predisposition to seek and anticipate using reasoning and to use their reasoning skills; it encompasses the thinker's confidence in their reasoning skills to solve problems and make decisions, resulting in communicating the process used to reach a decision (Irani et al., 2007). A decision maker's acceptance that a problem may hold unseen complexity results from the Cognitive Maturity construct—the predisposition to awareness of a problem's complexity and being open to other perspectives while maintaining awareness of their and others' biases before making a decision (Bell & Loon, 2015). The thinker's predisposition to be intellectually curious and to discover knowledge and truth even when such discovery contradicts their beliefs and opinions is the Innovativeness construct (Irani et al., 2007; Ricketts & Rudd, 2004).

Bell and Loon (2015) found that student's use of a business simulation had a correlated increase in their critical-thinking disposition and their achieving the learning outcome. Specifically, Bell and Loon (2015) found that the Engagement construct was the essential critical-thinking dimension in

achieving the learning outcome; the Cognitive Maturity construct supported it. The researchers concluded, "those students who are more open-minded to the opinions and views of others and have a greater awareness of the complexity of problem-solving are better able to learn from simulations" (Bell & Loon, 2015, p. 125). Consistent with these findings, playing BISS necessitates a student's use of each construct, i.e., the student is continually challenged to use their reasoning skills, and their choices are subject to and must be agreed to by various stakeholders, even when the student disagrees.

4. BUSINESS INFORMATION SYSTEMS SIMULATION

We developed BISS as a single assignment (students must complete each part of BISS in a single sitting; the simulation cannot be paused and resumed) for an undergraduate introductory IS course. It could also be used in undergraduate courses that cover topics such as management, project management, risk, security, and system analysis. BISS relies on students' *decision-making* skills to select the Information Technology (IT) for business use. Students *use critical thinking skills* by *applying a code of conduct* to make decisions, often using opposing information from stakeholders. The students are challenged to determine the features to be included in an exploratory project while balancing the interests of various stakeholders and leading the business response to a security breach.

We began the development of BISS after a meeting with Capsim and our Management department faculty about their use of the Capsim Business Simulation. After discussing the BISS idea, Capsim's product team offered to assist with developing BISS using the Capsim Inbox Simulation product. Rather than a self-contained simulation, Capsim Inbox provides a user experience that incorporates instant messages, email messages, and support files. We worked with Capsim Inbox Simulation specialists to develop the BISS story and script. (This was an engaging and challenging experience as we learned how to best design the script and adjust simulation timing and scoring). Finally, we piloted BISS, made many needed adjustments and refinements, and developed the various instructor support documents (see Appendix A) which were intended to assist with using BISS as a course assignment. (BISS is a *Capsiminbox* product and does not need to be modified to use it; instances are set-up to be run for a class or classes).

4.1 BISS Overview
BISS occurs in Swares, a fictional retailer with an online and brick-and-mortar presence. The student is placed in the role of a store manager. When the simulation begins, the student's store is selected by the Chief Executive Officer (CEO) to pilot the development of the SwaresNow app, a strategic project charged with bringing state-of-the-art technology to the in-store shopping experience. The project's leadership team includes the student, the Chief Marketing Officer (CMO), and the Chief Information Officer (CIO). The student receives instant messages and emails throughout BISS, which provide information from various stakeholders. The student is asked in emails to make decisions, which can result in challenges from stakeholders, and the student can reconsider the decision (other choices enable the student to proceed to the next decision).

BISS is divided into two sections, each containing various scenarios (see Table 2). The first section traverses the challenges of planning an IT project. Beginning with the CEO's announcement, BISS presents varying issues and perspectives from Swares staff on using sensitive data and artificial intelligence in the app. The section ends with the Chief Financial Officer (CFO) seeking to include initiatives beyond the app to justify the project's cost. Throughout the first section, everyone is provided hints of a security concern. The second section increases the security concern, confirming a data breach at the student's store. A variety of opinions are presented to the store manager, who needs to decide when and how to communicate with the store's customers and what compensation they should be offered.

Section	Scenario	Student Outcome	IS Concepts	Business Concepts
Planning	1. Project Announcement		Project Authority, Project Objectives	Strategic Alignment
	2. Sensitive Data	1, 4	Data Security, Personally Identifying Information (PII)	Regulatory Needs, Business Needs
	3. Using Artificial Intelligence	1	Project Objective Alignment, Project Risk	Customer Service
	4. Monetization	1	Project Scope, Budget	Cost Justification, Cost Savings, Responsibility to Staff
Data Breach	1. Communicating with Customers	4	Security Incident, Security Breach	Incident Communications
	2. Customer Compensation Plan	4		Incident Compensation

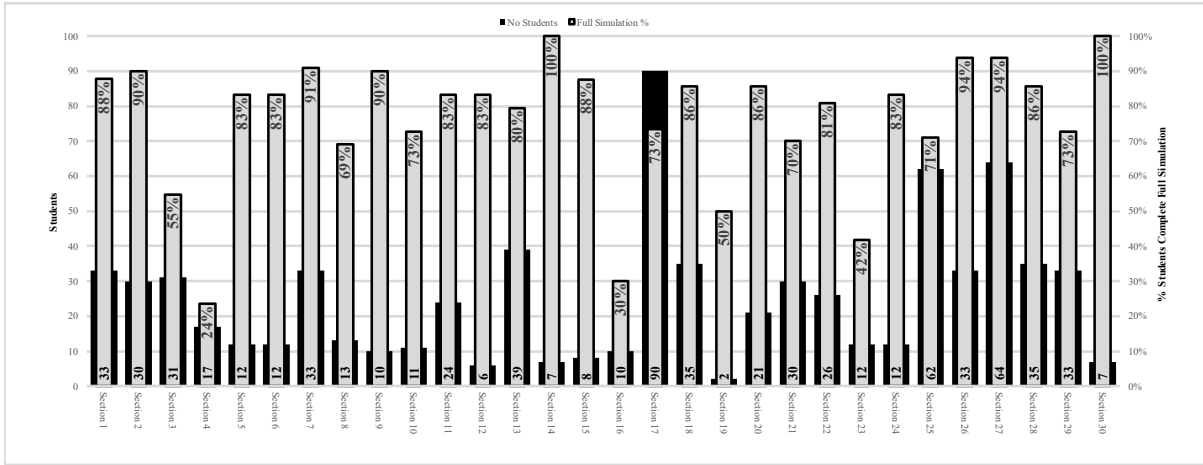**Table 2. BISS Sections and Scenarios**

Figure 2. Students Completing BISS in Sections Over Time (May 2020 – May 2023)

4.2 Class Setting

Class size varied from as low as seven students in the summer to as many as thirty-three during the fall and spring semesters (Figure 2 summarizes the number of students in each class section and the percent that completed BISS in all classes since its release, including the five pilot classes). Since BISS is performed by each student independently, it can scale to larger class sizes.
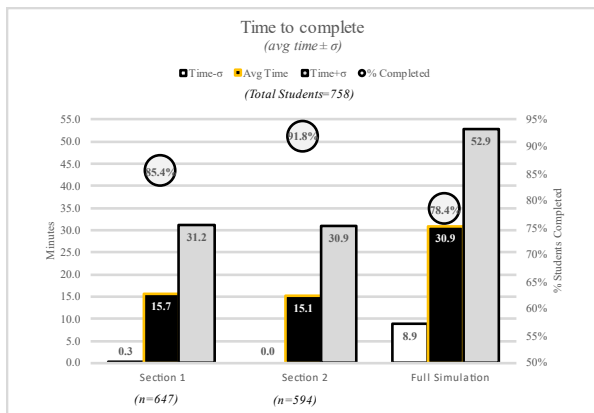

Figure 3. Time to Play BISS

We use the simulation in conjunction with the textbook *Principles of Information Systems* (14th edition) by Ralph Stair and George Reynolds at the beginning or halfway through the course semester; it is usually placed within the module regarding enterprise systems, ethical use of technology, or IT projects. BISS can be used as an in-class exercise or a homework assignment; therefore, it is suitable for in-person or asynchronous online course delivery. Since BISS was developed, it has been used in 30 class sections by 758 students (including the five pilot sections). Students have taken 15.7±15.4 minutes to complete Section 1, 15.1±15.7 minutes to complete Section 2, and 30.9±22.0 minutes to complete the BISS (see Figure 3). Also shown is that of the students registered to play BISS, 85.4% completed Section 1, and 91.8%

of these students completed Section 2; overall, 78.4% of the students completed the entire simulation.

5. LESSON PLAN APPROACH

BISS's scenarios cover a variety of IS and IT concepts, including Security, Privacy, Cloud Computing, and Artificial Intelligence. Before assigning the simulation, the class should familiarize students with these concepts. At every step in each BISS scenario, the student is challenged to make the correct decision; however, the *best* choice is not evident. Each decision challenges the student to incorporate the Code of Conduct, and they are confronted by stakeholders who use the Code of Conduct to advocate their position. Therefore, before assigning the simulation, students should understand how to make *critical decisions* incorporating *ethics* using the Critical Decision-Making Skills Model (see Figure 1). This section explains the lesson plan approach step-by-step (see Figure 4).
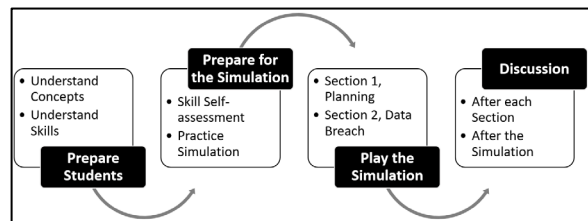

Figure 4. Lesson Plan Approach

5.1 Prepare Students

Table 3 shows the required concepts and resources on specific topics. This information helps students understand why organizations use these ITs, why organizations are expected to safeguard customers' privacy, and the difference between a data incident and a data breach.

The model begins with recognizing an issue and proceeds to identify stakeholders, discover facts, propose solutions, and evaluate consequences. Table 4 explains the purpose and ethical dimension of each skill. By the end of the simulation, students learn about decision-making in an environment with stakeholders' support and disagreement with their choices.

Technology/Concept	Resource Link
Credit Monitoring vs. Identity Protection	1. https://www.safety.com/credit-monitoring-vs-identity-theft-protection/ 2. https://www.lifelock.com/learn-identity-theft-resources-identity-theft-protection-vs-credit-monitoring.html 3. https://idtheft-protection.com/articles/credit-monitoring-vs-identity-monitoring/
Data Breach Response Plan	1. https://www.forcepoint.com/blog/insights/data-breach-response-plan-best-practices-2019
General Data Protection Regulation (GDPR)	1. https://gdpr.eu/what-is-gdpr/
Microsoft Azure	1. https://docs.microsoft.com/en-us/azure/cloud-adoption-framework/get-started/
Microsoft Machine Learning	1. https://docs.microsoft.com/en-us/azure/machine-learning/overview-what-is-azure-ml
Personally identifiable Information (PII)	1. https://www.gsa.gov/reference/gsa-privacy-program/rules-and-policies-protecting-pii-privacy-act 2. https://www.dhs.gov/privacy-training/what-personally-identifiable-information 3. https://www.investopedia.com/terms/p/personally-identifiable-information-pii.asp

Table 3. Technology and IS Concept Resources

| Skill	Activity
Recognize Issue	Perceive, detect, and define the hallmarks of the ethical dilemma or problem.
Identify Stakeholders	Identify the primary individuals or groups likely to be affected by a decision and determine the central obligations to each.
Discover Facts	Gather, explore, and examine all relevant facts and information about the problem.
Propose Solutions	Expand the solution set to include several decision alternatives, including using effective decision-making techniques to promote the number of ethical alternatives.
Evaluate Consequences	Examine the likely outcomes of alternatives against ethical criteria such as equity, equality, or need, as well as the feasibility and risk of each alternative. Developmental Tactics – take another look and make sure the choice is your decision.

Table 4. Critical Decision-Making Skills

5.2 Prepare for the Simulation

5.2.1 Skill Self-Assessment. A *Capsiminbox* simulation interacts with the student with email and instant messages. On entering Capsim, students are presented with a dashboard (see Figure 5), which lists the simulation. BISS has two sections; students must complete the first section before beginning the second. Once both sections are finished, students receive feedback at the bottom of the dashboard.

Once the student selects Begin to initiate the first BISS section, they are asked to rate their skills (Table 4) used throughout BISS relative to the other students (see Figure 6).
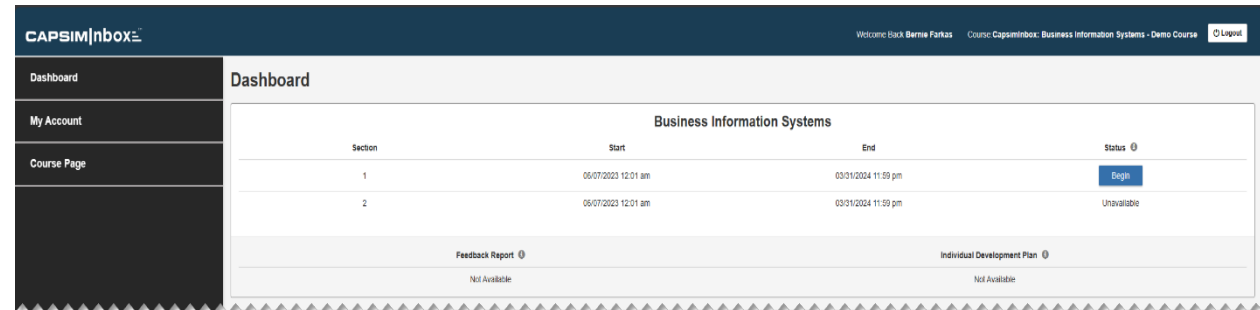
©Capsim; used with permission

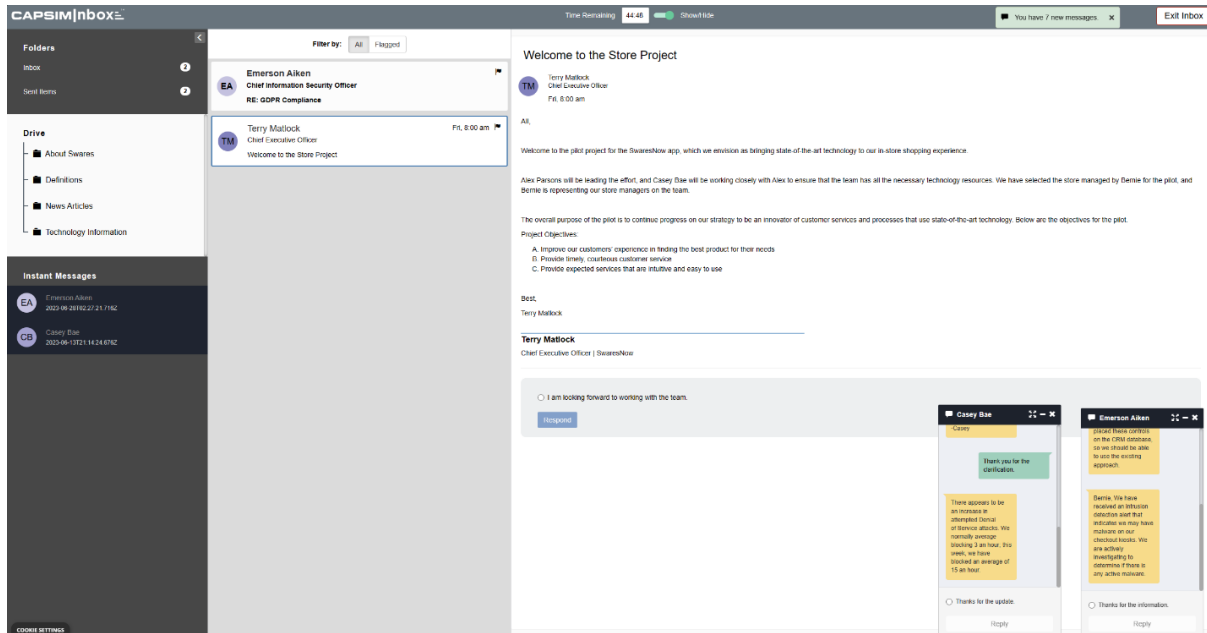**Figure 5. *Capsiminbox* Dashboard**
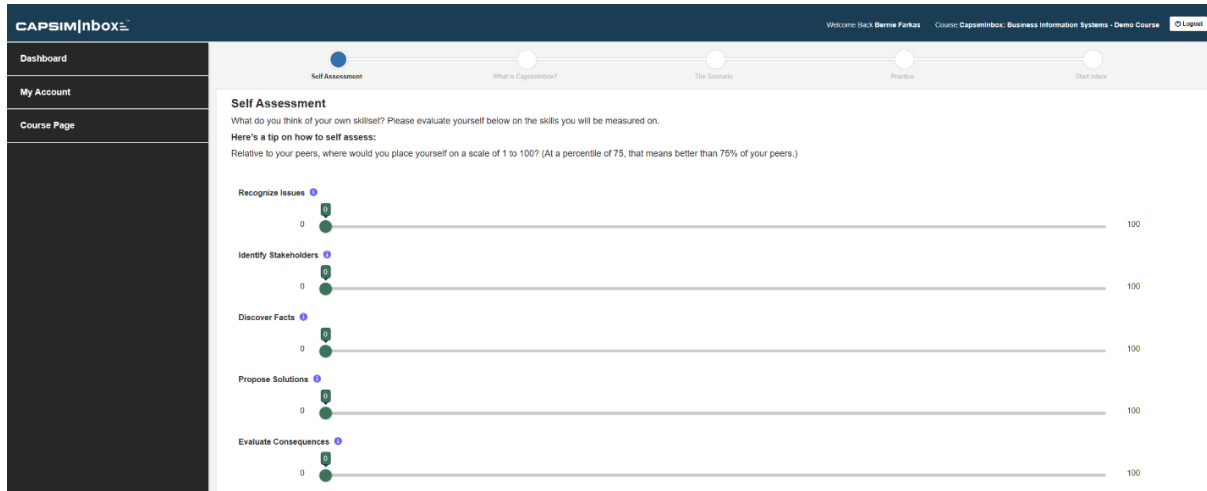
Figure 6. Student Self-Assessment

5.2.2 Practice Simulation. The instructor can configure the simulation to require students' next practice using *Capsiminbox* before entering BISS (see Figure 7). Finally, students are provided background information on Swares, the company where BISS occurs (see Appendices A and B). Students receive emails and instant messages from people in Swares. The list of emails is provided in the Inbox and Sent Items folder (the contents of the selected folder are displayed in the middle panel). Selected emails are shown in the right-hand panel, and students are asked to respond by choosing an option or providing a text response. Instant messages are displayed as pop-ups along the right-hand panel; students acknowledge

reading the message. Responding to the messages causes others to arrive.

The BISS simulation has two sections: Planning for the SwaresNow app and a store-level data breach. The sections can be completed as a single assignment or individual assignments; presently, BISS does not have the option to assign only one of the sections to a class. The planning section challenges the student with the project announcement and three scenarios: Sensitive Data, Using Artificial Intelligence, and Monetization. The Data Breach section's scenarios include Communicating with Customers and the Customer Compensation Plan.

Figure 7. *Capsiminbox* Interface

5.3 Play the Simulation - Planning Section

5.3.1 Project Announcement. On entering BISS, the student receives an email from the Swares CEO to the company announcing the IT project and the student's leadership role. The announcement sets the project's objectives and emphasizes its alignment with corporate strategy.

5.3.2 Sensitive Data. Initially, the student is presented with an issue regarding sensitive data, i.e., the project's approach to PII. The first concern regards the project and operating costs due to the app being declared sensitive, i.e., there is PII within the app's data. Subsequently, Swares staff express varying priorities regarding the need and use of sensitive data by the app. Students need to consider the following:
  a) *relevant regulatory needs* (e.g., should the project adhere to GDPR even though Swares is not conducting business in the European Union),
  b) *legitimate business needs* (e.g., the necessity of including sensitive data), and
  c) *project concerns* (e.g., including sensitive data might affect the project's schedule, budget, or procedures).

Each issue has business and technical components championed by various staff, and the Swares Code of Conduct must be considered, e.g., being a valued team member, being an honest recordkeeper, following trade rules, and protecting data.

5.3.3 Using Artificial Intelligence. After deciding how the app will use sensitive data, BISS presents the student with concerns regarding features to assist a customer in finding products within the store. Swares staff champion several features, including:
  a) adjusting recommendations based on inventory levels,
  b) incorporating advanced AI techniques,
  c) providing sensitive data to vendors to leverage the vendors' sales data,
  d) tracking the customer in the store to provide recommendations for products nearby, and
  e) using the current algorithm from the website.

Each idea challenges the student to decide which and how many ideas should be included in the project, e.g., does an idea align with the project's objectives, is the idea's risk acceptable? In addition, the student needs to evaluate each idea in the context of the Swares Code of Conduct: avoid a conflict of interest, follow trade rules, have honest communication, and protect information.

5.3.4 Monetization. Finally, the CFO challenges the project's leadership to justify the project's cost, i.e., how will the project's expense be monetized? Neither a Return-On-Investment (ROI) calculation nor performing a Break-Even Analysis is required. However, it is suggested that cost-saving initiatives be included in the project: Smart Packages, Smart Services, and Smart Shelves.

Business concerns must be evaluated when deciding on the initiatives to include in the project. Smart Package technology can reduce costs through inventory process improvements; however, there is minimal improvement in customer service. The Smart Services (introducing a concierge robot) could improve Sware's hourly staff retention rate; however, its estimated cost will consume the project's budget, eliminating the other initiatives. Introducing Smart Shelves would match competitors' use of in-store technology and reduce costs by eliminating staff hours. However, the monetization of Smart Shelves based on matching competitors is considered negligible. Further, the issue of Sware's responsibility to staff whose hours or positions would be eliminated is raised. In evaluating these business concerns, students must also consider the Swares Code of Conduct: Be a Valued Team Member and Follow Trade Rules.

5.4 Play the Simulation – Data Breach Section
From time to time, during the BISS Planning Section, the student received security-related informational messages. The student did not have to do anything with these messages. However, as the Data Breach section begins, the student gets an important security-related message – a data breach may have occurred at their store. The message initiates exchanges with Swares staff, and the student needs to make decisions for the business response.

5.4.1 Communicating With Customers. Initially, security sends a message: there is suspicion of a data breach. The store manager (i.e., the student) is asked how to proceed, e.g., only focus on the investigation or notify customers while the investigation is completed. The situation intensifies when security confirms the data breach occurred and announces that only the student's store's customers have been affected. As such, the student is delegated to lead the business response. In this role, the student must decide how to communicate with their customers, e.g., issue a press release, answer questions via the Call Center, or issue a message from the CEO and the Store Manager. The Swares Code of Conduct guides what to consider when making this decision: Be a Valued Team Member, Be an Honest Record Keeper, Honest Communication, and Protect Information.

5.4.2 Customer Compensation Plan. Having determined the approach to customer communication, BISS challenges the student to determine how the store's customers should be compensated. Best practices for managing data breaches are provided, e.g., providing clear, transparent notifications, offering a monitoring service, and offering some form of compensation. Several plans are proposed, including:
  a) offering a Credit Monitoring Service,
  b) offering an Identity Monitoring Service, and
  c) offering Monetary Compensation.

In choosing the form of compensation, the Swares Code of Conduct provides guidance: Be a Valued Team Member, Avoid any Conflict of Interest, Honest Communication, and Protect Information.

5.5 Discussion
Each scenario's final email requests an explanation of the student's decision. While these responses can be used for grading, they can indicate the simulation's concepts and skills that need to be reinforced. Nevertheless, Table C-1 in Appendix C has suggested discussion questions. There are two approaches to class discussions: after each section or after the entire simulation. Since the two sections cover very different

scenarios, i.e., project planning versus crisis management, it is appropriate to have the students play Section 1 and review the issues the simulation presented. This approach also enables the instructor to reinforce the critical-thinking skills they use in the simulation.

5.6 Grading Approaches

Students are presented with many scenarios throughout BISS and arguments favoring various choices. There is no ideal path through the simulation. Therefore, rather than providing a raw score at the end of the simulation, the dashboard provides an overall percentile score. Approaches to grading the simulation include,

1. grading relative to the other class members' percentile scores,
2. grading based on the consistency demonstrated with the student's skill self-assessment,
3. grading based on the critical thinking skills demonstrated in the written responses, and
4. incorporating the simulation as a data source in a written assignment or project.

5.6.1 Using the Overall Percentile Score. The Overall Percentile Score indicates a student's choices in the simulation relative to an ideal use of the Code of Conduct relative to the other students. Therefore, the Overall Percentile Score provides a means to calculate a grade relative to the other students who completed the simulation. Grading calculations could be based on

1. the ranking of each student's Overal Percentile Score among all the students that completed the simulation, or
2. the quartile from all the students who completed the simulation contains a student's Overal Percentile Score.

5.6.2 Using the Skill Self-Assessment. The Self-Assessment has two aspects: the Self-Awareness Score and the Self-Awareness Consistency. *Capsiminbox* provides a Self-Awareness Score of 1 to 6, with six being the highest, based on the Skills Self-Assessment students complete at the beginning of the simulation. Further, students' performance during the simulation is rated against their self-assessment. Students receive a Consistency Rating: Consistently, Somewhat consistently, Somewhat inconsistently, and Inconsistently. The Self-Awareness Score and the Consistency Rating can be directly mapped to a grade individually or jointly.

5.6.3 Using the Written Responses. The number of written responses requested during the simulation is a function of the student's choices; therefore, the number of written responses will vary for each student. However, each response can be reviewed and graded (e.g., as Thoughtful, Reasonable, Expected, or Novice, where Thoughtful is assigned the most points and Novice the least). The average of these assessments can be used for the grade.

Each Simulation scenario concludes with a written response question. Information about each scenario is provided in Sections 5.3 and 5.4 above. Nevertheless, the Ethically Informed Decision-making phases described in the Tactics document provided with the simulation should be reviewed with the students before the simulation so that students understand what is expected in a written response.

5.6.4 Using Another Assignment or Project. BISS mimics the interactions within an organization as decisions are made about the use of technology. While the simulation is fictitious, the email threads are based on the lead author's real-world experience working with many organizations over four decades; many emails simulate the organization's role and issues raised during an actual IT project. Therefore, the simulation could be used as source data for student projects related to IT decision-making, analysis, stakeholder relationships, risk management, and governance.

6. EVIDENCE OF EFFECTIVENESS

BISS took eighteen months to develop, and its effectiveness was evaluated through two methods: subject matter expert (SME) reviews and pilots with several classes. Capsim selected the two SMEs who were tasked with assessing the accuracy, usefulness, and realism of BISS. One SME stated, "[BISS] provides a bonafide experience. The questions and scenarios are typical of what would be experienced in a real-world business environment." The SME also stated, "One thing I appreciate is the stakeholder aspect. This simulation helps to reinforce the observance and consideration of the various stakeholders at all levels of the institution." The second SME found that "[BISS] accurately makes a student think about what might happen and what the conditioned response might be from their superior. There is an element of questioning the correct decision which will absolutely make them think deeper into what might be next."

The authors conducted the pilots in five classes; 84.5% of the students completed BISS (see Table 5). Upon completing BISS, students were given a survey, which 64.4% completed.

Class	Number Students	Number Completed the BISS	Completed BISS and Survey
1	10	9 (90.0%)	7 (77.8%)
2	10	7 (70.0%)	7 (100.0%)
3	23	20 (87.0%)	17 (85.0%)
4	33	30 (90.9%)	10 (33.3%)
5	10	7 (70.0%)	6 (85.7%)
Total	86	73 (84.9%)	47 (64.4%)

Table 5. Simulation Participation and Survey Response Rates

The survey was adapted from Farkas et al. (2022) and consisted of six questions (see Table 6) that were answered on a five-point Likert scale (1=Strongly Disagree and 5=Strongly Agree).

Table 6 shows the average response to each question. Students Agreed that BISS provided a better understanding of using technology (E4_2), made the concepts more understandable (E4_6), had a better understanding of using technology in a business, and were made aware that using technology is about more than computers and apps. These results indicate that students perceive BISS as an effective pedagogical tool to meet the ABET Objectives.

Question No	Question	Average response
E4_1	I enjoyed the simulation.	4.20
E4_2	I thought the simulation reflected the real world.	4.40
E4_3	Because of the simulation, I have a better understanding of using technology in a business.	4.30
E4_4	The simulation made me aware that using technology is about more than computers and apps.	4.20
E4_5	I believe the simulation will help me in my career.	4.10
E4_6	The simulation made the subject more enjoyable and the concepts more understandable.	4.40

Table 6. Survey Questions and Average Responses

Further corroboration of the effectiveness of BISS was provided in comments students provided in the survey:

- "I enjoyed the simulation. It made me realize what actually goes into managing operations or sales. My inbox was getting blown up, and it was hard to make decisions quickly, as well as respond to everyone. It was a slight wake-up call to how life will be when we are in our careers. It was definitely helpful, and it was user-friendly as well."
- "The simulation puts you into a particular headspace. You're focusing on doing your best with the information given. You're not memorizing or guessing off the top of your head. You are taking the actions that you see best fit, given the circumstances, and you are explaining your reasoning behind them. It is MUCH more engaging than lessons and case studies."
- "The simulation was very helpful as it emulated a real day in the office. Getting constant emails and chat messages from colleagues that require your attention. It also was very helpful in making a decision based on your obligations to the company or the customers, which at times was a difficult decision to make."
- "The simulations seemed complicated, with lots of steps, but as the professor walked us through them, it began to make more sense. It seemed like a real work environment where I needed to problem-solve. I enjoyed the simulation."
- "This simulation was likely incredibly close to the real world, which is probably why I found myself pretty confused. I enjoyed it, though!"
- "Very interesting concept, and it was a nice switch up from our traditional learning methods."

7. DISCUSSION AND CONCLUSION

This teaching tip has described a hands-on, experiential approach to teaching IS concepts related to the use of IS by an organization. The simulation immerses students into a managerial role in which choices must be made on the scope of an IS project, and plans must be devised and deployed to respond to a data breach. During the simulation, students are confronted with various perspectives and priorities and the simulated real-world pace of communication. As the students make every decision, they are challenged to incorporate the company's Code of Conduct. The use of the simulation begins with the instructor preparing students on the concepts and techniques that will be used and then preparing them to use the simulation. The simulation is played in two sections, taking approximately 30 minutes, and is completed by engaging the students in a discussion emphasizing the essential skills and concepts covered.

The BISS's efficacy was demonstrated in two ways. First, during the simulation's development, it was reviewed by two independent, knowledgeable academics. Both reviewers found the simulation realistic and expected it to cause students to think deeper. Second, during the development pilot phase, students were given a survey; their responses and comments demonstrated the students' perceived effectiveness of BISS.

During the simulation's development, the Capsim team asked the authors if the messages were from actual incidents. They were told that they were fictitious; however, they were based on actual incidents. While the reviewers and students appreciated this reality, the simulation must be reviewed and revised as IS, IT, and organization norms evolve.

The simulation has been used in an introductory IS course in a synchronous face-to-face (up to 33 students) and an asynchronous, online (up to 10 students) modality. Since the simulation is an individual assignment, it should scale to larger classes in any delivery modality.

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AUTHOR BIOGRAPHIES

Bernie Farkas is an associate professor of information and technology management at the University of Tampa in Tampa, Florida. He is a certified Project Management Professional (PMP) by the Project Management Institute and a National Academic Advisory Council member of the Society of Information Management. Dr. Farkas uses mixed research methods, preferring interpretivist research. He investigates IS processes, governance, and pedagogical methods published in peer-reviewed journals and AIS conferences.

Yanyan Shang is an associate professor of information and technology management at the University of Tampa in Tampa, Florida. Her research interests lie in management strategies, social media, and data modeling and analysis. Dr. Shang has published peer-reviewed journal articles in *IEEE Transactions on Engineering Management*, the *International Journal of Knowledge Management*, and the *International Journal of Strategic Communication*. She had several peer-reviewed conference publications and presentations, including ICIS, AMCIS, HICSS, INFORMS, and MAM conferences.

APPENDICES

Appendix A. Swares Background Information

SWARES

Company Information

Swares
Retailer, online and traditional brick and mortar.

Mission
Our mission is to be a respected community member that provides our customers with exceptional service and convenience; a compelling shopping experience; an unsurpassed selection of products that exceed their taste, style, and budget goals; and a nurturing and engaging place for our associates to work and grow.

Strategy
To be the recognized innovator of customer services and processes that use state-of-the-art technology that is created with strategic partners or, when appropriate, organically.

Code of Ethics
As a member of each community in which we serve our customers each decision that you make and action that you take reflects our values and contributes to our culture. Our Code of Ethics reflects these beliefs and our commitment to be an ethical community member.

When making a decision consider the following:

- Would the choice be Legal?

- Would the choice be consistent with our Code of Ethics and Values?

- Would the choice enhance our reputation?

- Would the decision be positively reported in the news?

If the answer is no to any of these questions, don't do it.

Our Code of Ethics is important to help you to do the right thing in the workplace, the marketplace, and the community. This Code of Ethics provides you, your colleagues, your manager, our executives, and Board members with a guide for decisions and actions that embrace our values and ensure that you live up to the promises we have made to each other, our customers, our partners, and the community.

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Figure A-1. Swares Background Information

Appendix B. Swares Organization Chart
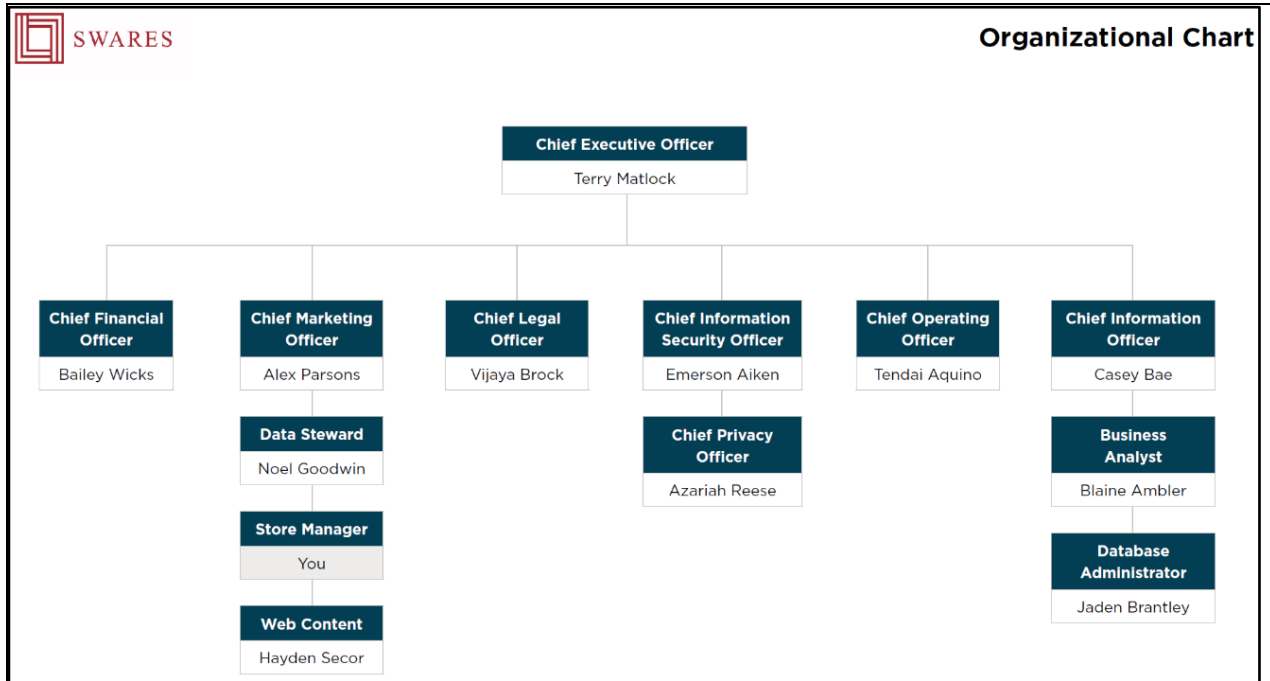
Figure B-1. Swares Organization Chart

Appendix C. BISS Scenario Discussion Questions

Planning Section

Scenario	Discussion Questions
Project Announcement	While the introductory message appears to be a simple announcement, the message provides an opportunity to discuss governance concepts: strategic alignment, authority, and accountability. Possible discussion questions include: 1. Is it essential that the CEO states, "The overall purpose of the pilot is to continue progress on our strategy?" *Explain that governance ensures that the organization uses its essential resources in the desired manner; therefore, IT initiatives need to contribute to the organization realizing its strategy.* 2. What is the purpose of the CEO stating, "Alex Parsons will be leading the effort, and Casey Bae will be working closely with Alex … and [student name] is representing our store managers on the team?" *One of the vital governance responsibilities is the conveyance of authority to use the organization's resources. In declaring Alex Parsons the project lead, the CEO conveys such authority. Further, the CEO provides Casey Bae with the authority to use IT resources, and [student name] is provided the authority to make decisions on behalf of all store managers.* 3. How will the CEO's stated Project Objectives affect the project's planning? *Project Objectives declare what the project is expected to deliver to the organization. The Objectives limit what may be declared in-scope, e.g., the work the project has been authorized to perform.*
Sensitive Data	While students may be aware of the need to protect sensitive data, few, if any, will be aware of the business aspects of maintaining sensitive data, such as the need for auditing and controls. Suggested discussion questions include: *1.* Beyond the technical aspects of protecting customers' data, what is the business's responsibility to protect personal data? *There are several non-technical aspects to data privacy, such as:* a. establishing and using a process that ensures only appropriate staff have appropriate access to the data, b. routinely auditing the above process, c. establishing and routinely training staff about sensitive data, the appropriate policies, and their responsibilities, and d. establishing and routinely auditing the organization's data, ensuring that all sensitive data is identified and appropriately protected. 2. GDPR, the General Data Protection Regulation, is the most robust regulation globally regarding personal data; however, it only applies to companies that conduct business in the European Union. California has enacted similar regulations, and other states throughout the United States are expected to follow them. Should a non-EU-based business abide by the GDPR? *This is a complex business issue. There is a considerable expense in being GDPR compliant, and there is no guarantee that regulations adopted by other countries or states will be consistent with GDPR. However, GDPR provides a framework that can be used to guide an organization's privacy procedures.* 3. Much data is received and created by an organization. Should an organization keep all this data? Should the app that receives or creates sensitive data also be used by staff to access the sensitive data? *The BIS simulation presents students with the problem of limiting sensitive data exposure to reduce costs (project and operations) and liability. One solution is to create two apps: the standard app used by customers and staff that does not permit access to sensitive data and a separate app used by select staff with a business need to access the sensitive data. However, this approach also has hidden costs: now, two apps must be maintained and supported.*

| Scenario	Discussion Questions
Using Artificial Intelligence	Students are asked to balance competing priorities: improving customer service, increasing sales, and protecting customer privacy. The fulcrum in reaching a balance is the Swares Code of Conduct: avoid any conflict of interest, have honest communication, and protect information. Suggested discussion questions include:
	1. Should an in-store app like SwaresNow provide unbiased search results? A question raised in the simulation is whether the app should order the search results to reflect business priorities such as excessive inventory, profit margin for selling an item, or improving the house brand's sales.
	2. Should the customers' online and in-store sales and browsing history be used in the SwaresNow app to provide recommendations? *While the question addresses a key privacy issue, students should also consider whether the customers' permission is required separately on the website and the app to use data collected from the website and the store.*
	3. Is there a sufficient benefit to providing a customer's sales and browsing history to a Swares vendor to improve the SwaresNow search results? Should the customer know this data is being given to the vendor?
Monetization	The monetization of technology investments is an essential organization and governance concern in its IT portfolio management process. Since the simulated project is a pilot, i.e., an investment to determine what is feasible for the entire organization, the project team is responsible for justifying its choice of deliverables. Discussion questions include:
	1. How can an organization determine if a technology investment is sufficiently beneficial? Methods to determine the benefit of a technology investment (not including mandatory infrastructure improvements such as upgrading an operating system) include: Return-On-Investment: $\frac{net\ savings}{T_\iota}$ Break-Even Analysis: $0 \le T_\iota - \sum_1^\eta (O_\eta - Savings_\eta)$ Total Cost of Ownership: $T_\iota + \sum_1^\eta O_\eta$ Where T_ι is the Total Cost of the project (initial investment cost) O_η is the monthly cost of operating the technology $Savings_\eta$ is the monthly savings realized from using the technology **Bold italics show** the month since the technology started to be used.
	2. Should the organization consider the effect on its staff when considering benefits from cost reductions? Frequently, a technology project is justified by reducing staff costs, including eliminating positions. However, staff reductions can be costly, e.g., severance, job placement support, re-training remaining staff, and loss of institutional knowledge.
	3. What is the benefit of matching a competitor's early use of technology?

Table C-1. Planning Section, Scenario Discussion Questions

Data Breach Section

Scenario	Discussion Questions
Communicating with Customers	The decision on when and how to communicate with customers after a data breach is essential to the customers' perception of the organization.
	1. How does a data incident differ from a data breach? A data incident occurs when a violation of the organization's data security policies has occurred. A data breach occurs when the organization loses control of data after a data incident, i.e., the data is removed from the organization's facility.
	2. Should the organization thoroughly investigate a data breach before notifying its customers? If not, when should the organization notify its customers?
	3. What means of informing its customers about a data breach is most effective?
Customer Compensation Plan	There are many business considerations to a data breach compensation plan. These plans commonly include monitoring service for one or two years and monetary compensation for demonstrated harm to the customer. Suggested discussion questions include:
	1. What is the difference between offering a Credit Monitoring Service and an Identify Monitoring Service? Credit Monitoring examines activities found on credit reports and credit scores; it is reactive protection. Identity Monitoring includes Credit Monitoring and examines many other activity sources, e.g., United States Postal Service address changes, court records, utility service orders, payday and loan, social media, and the Dark Web (the area of the internet known to be used by criminals).
	2. What form of monetary compensation should be offered? Types of monetary compensation can include store credit or coupons, cash payment, and paid monitoring service. The decision is difficult. Offering cash would enable our customers to choose how to use the compensation. While offering a monitoring service coupon may seem responsible, it limits the customers' choice, e.g., the service could duplicate one they have or be with a company they do not want to use. Offering a store coupon to our affected customers could seem self-serving and contribute to a negative view of Swares. Coupons provide the affected customer with a product that we offer, which might be different from the product they would prefer, and it could be seen as primarily intended to contribute to our profit.

Table C-2. Data Breach Section, Scenario Discussion Questions

INFORMATION SYSTEMS & COMPUTING ACADEMIC PROFESSIONALS
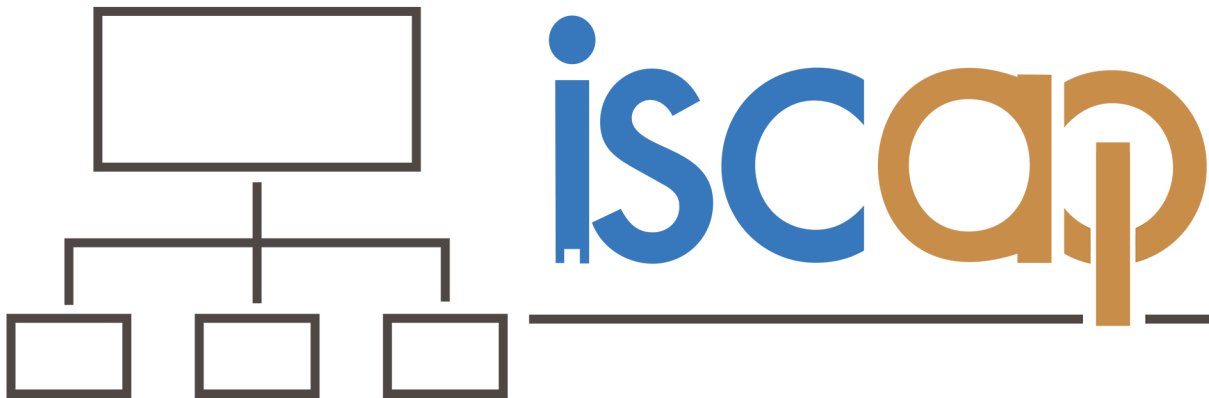
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All papers published in the *Journal of Information Systems Education* have undergone rigorous peer review. This includes an initial editor screening and double-blind refereeing by three or more expert referees.