A Competitive Business Ethics Simulation Game

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ABSTRACT

This article describes a competitive business ethics simulation game I developed for business ethics courses. The simulation game, inspired by the 2010 BP Gulf oil spill, has been played by over 800 undergraduate and graduate students at ten universities. In this article I describe the simulation, how it works, the model behind it, and explain how the simulation functions as an experiential exercise supporting the teaching of business ethics. Based on my experience with the simulation, I make some recommendations about guiding student discussion of simulation results and on grading ethically-oriented simulations. Finally, I present some quantitative data on the effectiveness of the simulation. The contribution of this article is to support and encourage business ethics instructors to add an important experiential teaching method to the existing repertoire of readings, lectures, group projects and case studies.

INTRODUCTION

Computer-based simulation games are widely used to teach marketing, strategy, operations and management (Faria, Hutchinson, Wellington & Gold, 2009; Mayer, Dale, Fraccastoro & Moss, 2011, p. 65). These simulations have been shown to be effective teaching tools (Lu, Hallinger & Showanasai, 2014; Wellington, Faria, Hutchinson & Gowing, 2014; Tiwari, Nafees & Krishnan, 2014; Faria, 2001; Wolfe, 1997; for a contrary view see Gosen & Washbush, 2004, p. 286). Two of the assumptions that underlie the use of these simulation games are 1) that practice improves one's ability to perform and 2) that simulations provide students with opportunities to practice making management decisions in a safe environment (Sims, 2002, pp. 179-180; Scherpereel, 2005, p. 389; Hofstede, de Caluwé & Peters, 2010; Mayer, Dale, Fraccastoro & Moss, 2011, p.66).

This suggests that a business simulation explicitly designed to confront students with ethical challenges in business might provide useful learning opportunities (LeClair, Ferrell, Montuori & Willems, 1999, pp. 284-286; Fritzsche & Rosenberg, 1989, p. 47). Ethically-oriented simulations might give students practice recognizing the ethical aspects of a management situation, identifying relevant stakeholders, balancing competing interests and making responsible decisions. Moreover, the immediacy of the simulation experience might promote in students an awareness of the pressures on managers making morally complicated decisions (Schumann, Anderson & Scott, 1997; Scott, Schumann & Anderson, 1998; Wolfe & Fritzsche, 1998; LeClair & Ferrell, 2000; Schumann, Scott & Anderson, 2006.)

This article describes a competitive business ethics simulation game that I developed for use in my upper level undergraduate business ethics course. I developed the simulation to provide an intensive, semester-long, experiential learning exercise for students. I have used it since the Spring 2011 semester. It first became available to instructors at other institutions in Spring 2013. To-date, it has been used by over 800 students at ten universities.

In what follows I discuss a) how the simulation works, b) the computer-based business model behind the simulation, c) the ethical aspects of the simulation, d) grading student simulation performance, and e) data on the simulation's effectiveness.

HOW THE SIMULATION WORKS

The simulation game is called "Deepwater." It was inspired by the disaster in the Gulf of Mexico in April 2010, when the Deepwater Horizon offshore oil platform exploded, killing 11 workers. In the three months it took to seal the well, over 200 million gallons of crude oil flowed into the Gulf, creating the worst environmental disaster in U.S. history and damaging the Gulf economy at a cost of billions of dollars (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011).

Deepwater is played completely on the web and requires no software downloads or plug-ins. It can be played using a desktop computer, laptop, tablet or smart phone. It has been incorporated into online courses by several instructors, but to-date has been used primarily in face-to-face classroom settings.

In Deepwater, students manage a simulated oil exploration and production company. The company operates a production oil platform (or rig) located in deep water far offshore in the Gulf of Mexico. Students can play individually, in teams or in a combination of the two. Game revenue is generated by extracting crude oil from under the Gulf and selling it on the international oil market. Expenses include operating costs, labor, worker training, maintenance and safety, and fines (if any) for accidents or spills. Students compete against each other, not a computer, to maximize profits responsibly.

The simulation game is played in a series of rounds usually beginning with one or more practice rounds (for the importance of practice in experiential exercises, see Snow, Gehlen & Green, 2002, p. 526). The instructor decides how many rounds in the game and how often rounds occur. Typically instructors play the game in one or two rounds a week with two practice rounds and a total of eight to twelve non-practice or "regular" rounds.

Simulation rounds do not represent any specific period of time such as a month, quarter or year. Rather, the simulation clock tracks only the number of rounds in the game and the current round number. Each round has a deadline, by which time students need to enter their management decisions. The round closes once the deadline passes. The simulation engine processes students' decisions, calculates results for the round, and generates reports that are available to students online. The next round then opens and students can enter decisions for that round up until its deadline.

For each round, students make a variety of operational and strategic management decisions. These decisions affect the results of that particular round, and need to be made again in the next round, even if the student wants to make the same decision round after round. With a few exceptions, there are no "set and forget" decisions.

For each round, students first need to decide how much crude oil to produce. They can set a target production volume of any amount of oil up to the rig's maximum physical capacity. For a point of reference, students are given a "baseline" production volume. This is presented to students as the production the rig should be able to produce round after round with no problems – provided of course that other decisions such as spending on maintenance and repair are also "baseline" decisions.

The crude oil is sold on the open oil market. Instructors have the option in each round of using the actual market price or setting their own oil prices.

An offshore oil rig is a dangerous place to work. Accidents with heavy and powerful equipment can injure or kill. Given that hydrocarbons are being extracted from highly pressurized underground reservoirs, oil rigs are also subject to fires and explosions. The most important piece of equipment preventing explosions is the blowout preventer or BOP. This sits on the ocean floor. When activated in an emergency, it functions as a gigantic valve, shutting off the flow of flammable oil and gas out of the well.

A rig's BOP has a recommended service life measured in rounds. Once the BOP has been in service longer than the recommended number of rounds, it should be overhauled. An overhaul costs millions of dollars and requires the oil rig to be "shut in" or stop producing for one or more rounds. Students have the option every round to shut in and overhaul their BOP. They can overhaul early, or they can push their BOP beyond its recommended service life and hope that it holds up.

Maintenance and repair are important factors in making sure dangerous equipment functions as expected. The more an oil rig's pumps, valves, motors, engines and electrical systems are worked, the greater the chances of a breakdown. Students who produce more than the baseline amount of crude oil round after round can expect their equipment to wear out sooner. To compensate, students decide each round how much to spend on maintenance for that round. Maintenance spending above the baseline value lowers the chances of a mechanical breakdown, spending below the baseline increases the chances of a breakdown. Lowering production volumes also reduces the chances of a blowout, while raising production increases the likelihood of a blowout. Together production and maintenance decisions determine the risk of a catastrophic accident.

Students can reduce the chances of a worker injury or fatality by spending for safety programs and for additional worker training. Spending on safety affects the chances of a worker accident for the current round only, so the rig's safety program is an ongoing expense. Advanced training requires that workers be sent off the rig to the mainland. They are gone for two rounds, but when they return they work more safely than workers who have not benefited from the additional training. Advanced training costs money, and short-term production is impacted, but the more workers a student sends for training, the lower the chances of an accident.

Students can also fire workers if they believe they have too many or to reduce expenses. There is an immediate, short-term cost to fire a worker, but that cost is quickly made up by the reduced payroll.

Weather is also a factor students must consider in making their decisions. Instructors have the option to tie the simulation to the actual weather in the Gulf of Mexico, or to set their own weather. In either case, hurricanes are a serious threat to continued operation of an offshore oil rig. Although the rigs are built to withstand heavy weather, trying to operate in the midst of a hurricane is a risky proposition. Students can shut down their rig in the event of a hurricane to be safe, or attempt to continue operations and risk a blowout or other accident.

Students can also invest in pollution control equipment for their rig. The cost of the equipment is capitalized, so the financial impact is limited to reducing the amount of cash on hand and additional depreciation expense each round. There is no requirement to install this equipment, but doing so lowers the amount of pollution emitted by the rig and lowers the company's impact on the environment and society as a whole.

The energy sector of the economy creates very large negative externalities, none more so than extraction industries such as oil production. Crude oil is refined into fuels such as gasoline, diesel and jet fuel. When these fuels are burnt pollutants and large amounts of CO_2 are released into the environment. The extractive operations themselves consume large amounts of fossil fuel energy and inevitably result in spills and other forms of water and air pollution. Local businesses such as fisheries, resorts and restaurants are affected.

These negative externalities are estimated and monetized by the Deepwater simulation model and reported to students as the "social costs" of their operations. These do not represent direct costs to the student's simulation company, but they do provide students with information about the negative impact of their business on society.

THE SIMULATION MODEL

Unlike other business simulations, Deepwater does not model product demand, company sales or changes in market share. In fact, Deepwater assumes that players are able to sell all the oil they produce at the going market rate. Instead, Deepwater is designed as an operations-oriented simulation game.

The simulation engine calculates revenues and expenses based on players' operating decisions, and outputs operating, financial and market reports for each player. These reports indicate whether the player's rig has experienced a blowout and the number (if any) of worker injuries, fatalities and safety violations. Other operating metrics include actual production, equipment condition and the number of hours worked by the rig crew. The financial report includes an income statement and balance sheet. The market report ranks competitors by profitability.

Also unlike other business simulations, the simulation model is not a system of deterministic functions. Instead, the mathematical functions connecting inputs and outputs are probabilistic. A player's operating decisions do not completely determine whether she is cited for a safety violation, experiences an accident or suffers a blowout. Rather decisions about how much oil to produce and how much to spend on maintenance and safety shift the probabilities of something going wrong. Producing more oil or spending less on maintenance and safety increases the probability of a blowout or an accident, while producing less oil or spending more decreases those probabilities.

Deepwater's functions are designed for either diminishing returns or increasing risks at the margin. Moreover, since most of the functions are asymptotic, the probabilities output by these functions never decrease to zero or increase to 100%.

Probabilistic functions are a distinctive aspect of the Deepwater engine. As in real life, it is possible for a player to produce the right amount of crude oil, spend the right amount on maintenance and safety, and still have an accident or blowout – unlikely, but possible. On the other hand, it is possible for a player to work her equipment and crew until they are ragged, skimp on maintenance and safety, and have no accidents and no blowout – again, unlikely, but possible.

ETHICAL ASPECTS OF THE SIMULATION

The simulation does not confront students with explicit ethical dilemmas, and hence the ethical aspects of Deepwater may not be immediately obvious. Students are not, for example, forced to choose between an expensive repair or bribing an inspector, between losing market share or lying about a product, between a falling stock price or fraudulent accounting.

Instead of these kinds of dilemmas (where the challenge is not to determine what is right but to actually to do the right thing) students playing Deepwater are faced with what I call ethical "conundrums." In Deepwater students confront the daily challenge of making responsible tradeoffs between profits, on the one hand, and other values such as worker safety, social impacts and the environment, on the other. These tradeoffs are part-and-parcel of every manager's day-to-day decision making.

Consider, for example, the question of how much a chemical plant manager should spend on maintenance, repair and safety training. In general (although there are diminishing returns), the more spent, the safer the plant will be. Yet a serious accident could still happen no matter how much is spent. How much spending is enough? How safe is safe enough?

These challenges are not ethical dilemmas with obvious right and wrong answers, but conundrums. Like all conundrums, they present managers with "confusing or difficult problems" ("Conundrum," Merriam-Webster, n.d.). Moreover, because the eventual outcome of these decisions is not knowable in advance, good judgment plays an important role in responding to these conundrums. In the midst of having to make a decision, reasonable, well-informed, well-intentioned people can come to very different "good" judgments. Not only the right solution to the problem is contested, but even how to think about the problem is contestable. (This makes ethical conundrums much like so-called "wicked" problems [see Rittel and Webber 1973].).

Deepwater presents students with a very specific kind of ethical challenge: how, when managing morally perilous business activities, to strike a responsible balance between benefits to themselves, on the one hand, and harms to others, on the other. Fundamentally, the question each Deepwater player must answer is: how much risk is it acceptable to expose others to in pursuit of my own interests?

The decisions required for every Deepwater round (viz., how much to produce, how much to spend on maintenance and safety, how many workers to hire, train or fire, and when to overhaul the BOP) confront students with different variations of the challenge of balancing benefits to oneself against harms to others. To expand the variety of challenges and to keep students engaged in longer games, instructors can select from a number of special, round-specific ethical challenges. In what follows I discuss one such challenge – the BOP Testing challenge –in order to illustrate the nature of these special ethical challenges.

Every business decision must be made in the face of uncertainty. Most business students are familiar with one kind of uncertainty – uncertainty about outcomes. Will the new product capture significant market share? Will the new hire actually

EXHIBIT 1
ASSESSMENT SURVEYS USED WITH DEEPWATER

Survey Number	When Administered	Number of Questions (Individual / Team Implementations)	Topics
1	Pre-Practice Rounds	11 / 17	Prior simulation experiences, concerns about individual performance, attitudes about relevance and expected learning benefits.
2	Post-Practice Round	9 / 11	Readiness to play, familiarity with game rules, self-confidence, engagement and level of concern/ anxiety.
3	Simulation Midpoint	9 / 11	Attitudes about relevance, learning benefits, engagement, self-confidence, satisfaction, and expectations.
4	Final Rounds	5 / 7	Satisfaction, engagement, and stressfulness.
5	Simulation Wrap-up	8 / 17	Satisfaction and engagement, recommendations for improvements.
6	Learning Outcomes	12 / 13	Perceived learning outcomes.

deliver the value promised on the resume? Will we get the new plant up and producing on time?

But there is also always considerable uncertainty about what is happening today: Are customers really as satisfied with our service as surveys suggest? Do we actually have two of a given item in stock as the inventory system reports? Is marketing actually collaborating as effectively as it could with sales?

The challenge in dealing with uncertainty about the present arises because a manager is likely to have considerable information, but much of it is likely to be incomplete, ambiguous or inconsistent. A pressure gauge registers an acceptable value, but some employees suspect that the gauge is malfunctioning. A team leader reports that the team is working well together, but perhaps she is keeping quiet about some serious team conflicts in the hope of resolving them herself. A salesman claims that a prospect will sign "within the week" but actually knows that contract negotiations are likely to drag on much longer. What should a manager do with "information" such as this?

In the absence of clear, definitive information, competing perspectives on the significance and characteristics of a problem naturally arise. These competing perspectives often reflect competing interests among stakeholders. Decision makers must not only deal with the uncertainty, but also navigate through a thicket of conflicting interpretations. The result is that decisions made under uncertainty tend not to be made solely on the technical merits of one option versus another, but in many case on the basis of other factors – simply because of the lack of good information.

The BOP Testing ethical challenge provides students with the opportunity to experience the difficulty of making decisions in the face of uncertainty and creates an opportunity to practice balancing conflicting values such as revenue generation and protecting the environment.

In Deepwater, players have no direct information about a very critical piece of equipment – their blowout preventer (BOP). The BOP is five thousand feet underwater and hidden from day-to-day observation. Players know that the manufacturer estimates the average service life at a certain number of rounds. They know that the chances of a blowout increase if their BOP is left in service after the expected service life, but they have no idea how rapidly those chances increase. Overhauling a BOP is expensive, not only because of the direct cost but because of the high opportunity costs of being shut-in for a round or two.

In the BOP Testing ethical challenge, students receive two documents: a maintenance bulletin from the company's quality control engineers and input from the company's budget office.

The engineering bulletin reports the discovery that a critical component of the BOP may be defective. This uncertainty is worrisome because the BOP is the last line of defense against a blowout. It is arguably the most important safety device on the entire rig.

To complicate matters further, the engineering bulletin hints at past organizational conflicts between engineering and management (not an uncommon occurrence). The outcome of this conflict is that it is squarely a management call on how to respond to the uncertainty about the BOP. Engineering, having been reprimanded in the past, is careful not to make a recommendation themselves. The budget office, concerned about cost control issues, has jumped in with its own perspective. A memo from them attempts to down play the importance of the maintenance bulletin.

The BOP Testing ethical challenge requires students to make a decision based on the information contained in the maintenance memo and budget office email. A number of options are available to students. They can test the suspect component. The test will increase their expenses and also significantly reduce their production (and hence revenues) for the round. Students might decide that the risk is negligible and continue operating as normal, counting on a future BOP overhaul to completely resolve the issue. Alternatively, students might decide to shut-in for the round and do a BOP overhaul, which guarantees replacement of the suspect component.

As has been often noted, the value of experiential exercises is fully realized only when students have an opportunity to reflect on and discuss the exercise. The BOP Testing ethical challenge serves as a good example of this principle.

Typically, about two-thirds of students decide to forego the test and operate as normal, and one-third test the BOP. After distributing the individual reports to students, I begin the discussion of this ethical challenge by providing summary descriptive statistics on the percentage of students who decided to test their BOP. I ask students if, based on their own experience, the ratio of those who tested to those who did not is roughly what happens in the real world in similar situations. The goal is to encourage a discussion between those who view business managers as, in general, more cautious and those who believe managers, in general, are more willing to accept risk. It is also very helpful to bring the discussion around to what students themselves, as consumers, taxpayers, shareholders and small busi-

EXHIBIT 2
SURVEY RESULTS: "A SIMULATION GAME IS/WAS A GOOD WAY TO LEARN"

	Pre-Simulation	Post-Simulation
Strongly Agree	24%	24%
Agree	60%	58%
Neither Agree or Disagree	14%	12%
Disagree	2%	4%
Strongly Disagree	0%	2%
Totals	100%	100%
n	133	186

ness owners, would prefer from the managers of companies whose behavior affects them. For example, would the students feel comfortable having managers of airlines, food processing companies, medical device manufacturers, and drug companies play it safe or take on more risk?

I have found it useful to initiate a class discussion between those who decided to take the risk and those who conducted the test. The purpose of this discussion is not for each side to make its case, much less try to convince the other. The students' reasoning will very likely display striking parallels to the reasoning of real life managers in choosing to accept more risk rather than less (much of students' reasoning is likely to mirror that of the email from the budget area). I use this as an opportunity to engage students in a discussion about how easily such reasoning can turn into rationalizing a decision that has short term benefits.

It is important with all simulation ethical challenges to ask students if they would make the same decision in real life as they did in the simulation. Typically, a number of students who did not test will say that if they were really in this situation, they would definitely test. When asked why, they likely will say something such as: "Because lives are at stake and in the simulation nobody will be hurt by not being safe enough." Such remarks provide great opportunities to engage students in reflection on why they are so sure they would make a different decision and confront them with evidence suggesting that in the real world managers are quite likely to take risks that, in retrospect, seem excessive. I give students examples of instances where managers, even though lives were at stake, still did not take the "better safe than sorry" option and walk students through the reasoning behind those decisions.

GRADING THE SIMULATION

As with any experiential exercise, instructors need to decide how to incorporate an ethics-oriented simulation into their course requirements. A particularly thorny question is how to grade an exercise intended to support the teaching of business ethics. Instructors are faced with a difficult choice: grade exercise performance purely on the basis of business results (e.g., net income) or factor in the morality of students' decisions (e.g., total social costs).

In my experience, it would be a mistake to consider anything other than business results in grading a student's simulation performance. To do so – in effect to reward students for making the ethically right decisions – teaches the wrong lesson. An important learning objective is for students to experience conflict between personal gain and observing ethical norms – and to reflect on their own response to the conflict. A simulation which eliminates the conflict cannot achieve that learning objective.

In my own implementations, the only measures that determine a student's grade on the simulation are financial metrics. Students know about the harms they've caused to others and to the environment, but these do not affect their grade (except insofar as they trigger fines, loss of productive capacity, or direct costs to the business). Only the financial results count.

Some instructors have taken a different approach, reasoning that grades based solely on business performance downplay the importance of pursuing profits ethically, thereby sending the wrong message to students. These instructors adopt a mixed grading approach, using a combination of financial results and social impacts to determine student grades. In these situations, students of course need to know what counts from a grading perspective as the "ethical" answer to ethical challenges. These students tend, as a result, to make ethical decisions in order to maximize their grade – where "ethical" here means what the instructor thinks is the "right" thing to do. This may be a good way to impart information about what is right and wrong in business, but I would argue this approach diminishes the experiential component of the exercise.

EFFECTIVENESS

I have developed a set of six student surveys to assess the effectiveness of Deepwater. These surveys are administered before the simulation begins, during the simulation and after it concludes. (On the importance of assessment see, among many others, Feinstein & Cannon, 2002; and Gosen & Washbush, 2004.) Exhibit 1 summaries these surveys.

Survey data were collected by myself and one other instructor on 337 students who have played the Deepwater simulation game in the last two years. Most, but not all, surveys were anonymous. Many made use of anonymous responder identifiers to support longitudinal analysis. For the sake of consistency, the following brief analysis of Deepwater's effective-

EXHIBIT 3
SURVEY RESULTS: "HOW ENGAGED ARE YOU WITH THE SIMULATION?"

	Post-Practice	**Final Rounds***
Very Engaged	20%	30%
Moderately Engaged	61%	50%
Minimally Engaged	14%	14%
Rather Disengaged	4%	4%
Very Disengaged	2%	2%
Totals	100%	100%
n	111	197

** 12 round games with one round per week* ness will be limited to data I collected anonymously from students enrolled in my 300-level business ethics course. The sample includes 236 students from 13 different classes spread over 5 different semesters (47 students in three classes from Fall 2012, 63 students in three classes from Spring 2013, 42 students in two classes from Fall 2013, 51 students in three classes from Spring 2014 and 33 students in two classes from Fall 2014). The survey data contains 11,387 data points.

For the purposes of this analysis, the 236 students are treated as members of a single group. The analysis that follows thus in effect uses a pre-experimental, one-group, pretest-posttest design. I believe this simplifying approach is justified, at least for this relatively high-level analysis, because: a) each class drew from the same student population (upper level business major students who had completed all core business courses); b) all simulation games involved two practice rounds and ran for 12 rounds, 1 round per week, extending over nearly an entire 14 week semester, c) each game was configured the same and included the same set of ethical challenges; d) essentially the same course syllabus was used in all 11 classes; and e) all classes were taught by the same instructor.

STUDENT EXPECTATIONS ABOUT LEARNING OUTCOMES

Students approach any learning opportunity, including an exercise, with certain expectations about the value of that opportunity. They may anticipate that they will actually learn from the opportunity, they may be uncertain or indifferent, or they may be convinced that they will learn nothing. These attitudes can impact how much the student learns (Gosen & Washbush, 1997; Feinstein & Cannon, 2002; Snow, Gehlen & Green, 2002).

Overall, students' expectations about the value of Deepwater as a learning experience were initially high and their actual simulation experience did not disappoint them in that respect.

Students participating in Deepwater are presented with the following two questions, the first before the simulation begins and the second after it concludes:

1. "Playing a simulation game is a good way for me to learn"
2. "Playing this simulation has been a good way for me to learn"

Results show that students, both before their simulation began and after it concluded, believed the simulation was a good way to learn. Prior to the simulation 84% believed in the learning value of simulations. That percentage was virtually unchanged at the end of the simulation, when 82% expressed a belief in the usefulness of Deepwater as a learning tool. It appears that the initial, relatively high expectations of the learning value of the simulation were for most students unchanged or only modestly reduced over the course of the experience (see Exhibit 2).

(A Kolmogorov-Smirnov test yields a D of 0.049, less than the critical value of 0.100, indicating the differences in distributions pre- and post-simulation are not statistically significant at the 0.05 level.)

STUDENT ENGAGEMENT

Active involvement in the simulation is an important condition for a positive and productive learning experience (Sims, 2002, p. 195). Several times during the simulation, students were asked "At this point, how engaged would you say you are with playing the simulation?" Their responses, immediately after completing the practice rounds and at the close of the simulation are presented below (see Exhibit 3).

Before their simulation began 81% of students were very or moderately engaged. That proportion was essentially unchanged (80%) in the final rounds. This suggests that the simulation was successful in holding students' interest over the entire semester. The percentage of disengaged students begin low and remained low: 6% in both cases. Interestingly, the proportion of very engaged students increased over the course of the simulation, while the proportion of moderately engaged students fell. There were, on the other hand, only very small changes in the proportion of responses in the other three categories (minimally engaged, rather disengaged and very disengaged). This suggests that engagement with the simulation increased over time. (Indeed, a Kolmogorov-Smirnov test yields a D of 0.106, greater than the critical value of 0.097, indicating the differences in distributions pre- and post-simulation are statistically significant at the 0.05 level.)

PERCEIVED RELEVANCE

Ideally, students would recognize even before the simulation begins that it is relevant to business ethics and not simply a game or even just a business management or strategy simulation. In any case, unless students recognize the simulation's relevance to business ethics at some point in the game, the experience is unlikely to benefit them (Feinstein & Cannon, 2002, p. 434).

Students participating in Deepwater were presented with the following two questions, the first before the simulation be-

EXHIBIT 4
SURVEY RESULTS: PERCEIVED RELEVANCE OF SIMULATION TO BUSINESS ETHICS

	Pre-Simulation	**Mid-Simulation**
Believe simulation relevant	75%	83%
Uncertain or skeptical	25%	17%
Totals	100%	100%
n	134	148

gan and the second at the halfway point:

1. "Given what you know about the simulation so far, what is your view today about the relevance of a simulation to business ethics?" Possible responses: "Seems very relevant," "Not sure of the relevance," "Don't see how it could be relevant," "It's not relevant."
2. "Based on my experience so far, I believe the simulation is relevant to business ethics." Possible responses: "Strongly agree," "Agree," "Neither agree nor disagree," "Disagree," "Strongly disagree."

For the purposes of analysis to determine changes in perceived relevance over the course of the simulation, responses to the two somewhat different questions were combined into two categories:

- Believe simulation relevant: This combines from question 1 "Seems very relevant" and from question 2 "Strongly agree" and "Agree."
- Uncertain or skeptical: This category collects all other responses to these two questions: from question 1 "Not sure of the relevance," "Don't see how it could be relevant," and "It's not relevant" and from question 2 "Neither agree nor disagree," "Disagree," "Strongly disagree."

In the aggregate, student's perceptions of the relevance of the simulation to business ethics strengthened over the course of the simulation: the percentage of student's believing the simulation is relevant increased from 75% to 83% (see Exhibit 4).

It is not clear that this difference is significant. A chi-squared goodness of fit test indicates that the null hypothesis (H_0: no significant change in frequencies over course of simulation) should be rejected (chi-squared = 4.77, critical value of 3.84 at alpha = 0.05 and one degree of freedom). However, a Kolmogorov-Smirnov indicates the null hypothesis should be accepted at the 0.05 level of significance (D=0.077 and a critical value of 0.112).

SATISFACTION

Although there is some controversy about the relationship between student enjoyment and learning (Gosen & Washbush, 2004, p. 277), student satisfaction with their experience is nonetheless an important desired outcome of any teaching method. Students playing Deepwater were asked at several points during the simulation about their level of satisfaction with their simulation experience. Exhibit 5 presents the results from surveys administered at the half-way point (after round 6 of a 12 round game), and after the simulation concluded.

Direct inspection of Exhibit 5 suggests that student satisfaction with the simulation increased during the experience, driven primarily by a declining number of undecided and an increasing number of those who rated their simulation experience "Very good" or "Good." However, a Kolmogorov-Smirnov test yields a D of 0.078, a bit less than the critical value of 0.107, indicating the differences in distributions mid- and post-simulation are not statistically significant at the 0.05 level.

In any event, roughly 3 in 4 students rated their simulation experience "Very good" or "Good" at both the halfway point and after the simulation concluded.

Another satisfaction-related question asked for students' opinions about whether the simulation should continue to be used in the course in subsequent semesters. Students were asked whether the instructor should continue using the simulation with no changes, minor changes or major changes, or stop using it altogether. Over 9 out of 10 students recommended keeping the simulation: of 186 survey responses, 45% said continue using the simulation as is, 46% recommended keeping the simulation but making some improvements, 3% recommended making major changes, and 3% said the simulation should not be used at all in future classes (3% gave other, non-classifiable responses).

OUTCOMES

Perceived learning value, engagement, perceived relevance to business ethics and satisfaction with the simulation are important preconditions for a successful learning experience. As I have just shown, results from student surveys indicate that all these conditions are met by Deepwater. But is the simulation able to deliver on its pedagogical objectives?

Students were asked several outcomes-related questions at the conclusion of the simulation. The results from two of these are presented here.

Changing behavior begins with changing someone's understanding (Scherpereel, 2005, p. 389). Evaluating Deepwater's effectiveness must begin with determining whether students' understanding of the ethical challenges facing business was changed by their simulation experience.

EXHIBIT 5
SURVEY RESULTS: "HOW WOULD YOU RATE YOUR SIMULATION EXPERIENCE SO FAR?"

	Mid-Simulation	Post-Simulation
Very good	24%	29%
Good	50%	53%
Neither good nor bad	22%	14%
Bad	5%	3%
Very bad	0%	1%
Totals	100%	100%
n	106	161

Of 152 students responding, 97% reported that the simulation experience improved their understanding of the ethical challenges facing businesses at least to some degree. Sixteen percent reported that their understanding of business ethics increased "greatly," 43% that their understanding had increased "significantly," 27% reported a "modest" increase, 11% said "a little bit" and only 3% "not at all."

Understanding is one thing, taking the correct action another. One cannot know how students who played the simulation game will act in the future, but they themselves are likely to have opinions about whether an experience has changed their perceptions and understanding enough to result in changed behavior. There are undoubtedly difficulties attendant upon relying too heavily on students' own beliefs about their future behavior (see Gosen & Washbush, 2004, p. 277). Yet it is impractical to collect data on students' future behavior, so we are forced to rely on information that is available at the time of the simulation experience.

Students were asked to predict the effect of the game on their future behavior: "Playing the simulation has improved the chances I will make responsible business decisions when those decisions could harm workers, customers or the public." Seventy-six percent of 200 students responding "strongly agreed" (21%) or "agreed" (55%) with the statement that the simulation has improved the likelihood that they will make responsible business decisions in the future. Twenty-one percent responded "neither agree nor disagree," 3% "disagree" and 2% "strongly disagree."

Data from surveys of students who have participated in the simulation thus support claims that roughly eight in ten had a good experience and believe they benefited from playing the simulation game:

1. After playing the simulation game, 82% believed it had been a good way to learn.
2. Roughly 8 in 10 reported being very or moderately engaged both early on in the simulation and at the end.
3. The share of students who understood the relevance of the simulation to business ethics increased from 75% before their simulation game began to 83% at the end.
4. By the end of their simulation game, 82% of students said their experience was "good" or "very good."
5. Ninety-seven percent reported an increase in their understanding of the ethical challenges facing businesses
6. Seventy-six percent of students believe that the experience will change their future behavior.

CONCLUSION

As with case studies, simulations can bring real-world ambiguity, messiness and uncertainty into the classroom to flesh out textbook abstractions. They improve on case studies by viscerally engaging students and drawing them into grappling on a personal level with the challenges of managing a business responsibly. Simulations cannot stand alone in the business ethics classroom, however. Their effectiveness depends on exposing students to the concepts and principles of responsible business management, and to a guided process of reflection. An understanding of concepts and principles enables students to generalize their simulation experience to apply it to real world situations. Reflection on the simulation experience unfolds the full meaning of the experience and connects it to students' own work experiences.

The Deepwater simulation, built from the ground up as a business ethics simulation, has been effective as a business ethics teaching method. It demonstrates the promise and practicality of simulations as tools in support of improving students' ability to make ethical decisions once they entire the work force.

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