

# Development In Business Simulation & Experiential Exercises, Volume 21, 1994

## ENHANCING A COMPUTER SIMULATION WITH A STRUCTURED REPORTING ENVIRONMENT

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### ABSTRACT

This paper describes and evaluates a structured reporting environment designed to accompany a sales management simulation. Students' tasks, decisions, resources, constraints on play, and reporting requirements are detailed. Evaluations of both course and instructor showed (1) a drop from a baseline condition with the introduction of the unadorned simulation, and (2) a significant rise with the addition of the structured reporting environment.

### INTRODUCTION

For the last few years we have been exploring the use of the Day and Dalrymple (1992) simulation in an undergraduate sales management class. A number of sales management simulations are available. Some of them are interactive exercises that allow participants to select or supervise individual salespersonnel (e.g., Young, Gentry, and Bell, 1986); some of them allow participants to supervise a large, but impersonal, sales force (e.g., Dickinson and Faria, 1993). The unique pedagogical value of the Day and Dalrymple simulation is that students make decisions at the individual salesperson level while also deciding about such factors as selling price and production levels in a competitive environment. The simulation has some idiosyncrasies, however, that can lessen its impact. To overcome these, we developed a structured reporting environment that would encourage student involvement and by so doing, circumvent some of the limitations associated with this game. This paper describes the structure of this environment and reports two studies that evaluate its effectiveness.

While some simulations may be best undertaken by allowing students to explore the game with a minimum of guidance (e.g., Cadotte, 1993), frequently students do not have sufficient preparation at the start to learn by trial and error. Some students feel uncomfortable with unstructured simulations (Rieber and Parmley, 1992), but rather than destroying creativity, structure can actually stimulate it (Cannon, 1987; Cannon and Alex, 1990). Indeed, Wolfe and Byrne (1975) argued that experiences occurring without sufficient guidance and preparation may actually thwart a participant's ability to understand the underlying processes of a game. Our reporting environment motivates students to develop the necessary thought processes to participate in the game both rationally and creatively.

### OVERVIEW OF THE SALES MANAGEMENT SIMULATION

This game combines the usual benefits of any batch simulation (integrating the course, competing against other firms, and developing insights about time-linked decisions), with some benefits unique to sales management (learning the job of a sales manager, receiving practical training in sales management). Participants select sales recruits from 55 resumes contained in the manual and assign them to territories. Each salesperson is programmed to respond to fluctuations in compensation level, to transfer, to stress, and to random factors in the environment, consistent with his/her profiles. Thus, the special value of the game is providing the opportunity for participants to experience the process of supervising a number of individual salespersons.

### Knowledge Requirements for Simulation

In any beginning course, students typically do not have much knowledge when they enroll. For this reason, the complexity of a simulation should be

increased only gradually (Gentry, Burns, and Fritzsche, 1993). Consistent with this recommendation, we restructured the course material to provide maximum support for each phase of the simulation. We also increased the complexity of the reporting environment as the game progressed. The manner in which the tasks and reporting requirements build up is shown in Table 1.

### Involvement in Simulation Experience

To learn experientially, students must be actively involved in the process (Gentry, 1990), and involvement by students is important to success. Uninvolved students turn in token decisions, do not think through their strategies, and, as a result, do not benefit to the same extent, as do more involved students. Because of this game's idiosyncrasies, involvement is critically important. The consequences of unrealistic decisions can seriously disrupt this game and may even destroy the learning experience for others.

Our structured reporting environment encourages students to think through their decisions. We focus their minds on the process rather than the outcome (Gentry, Burns, and Fritzsche, 1993), and from the start make it clear to them that they will be graded on the quality of their reports, emphasizing the importance of their underlying thought processes. We give no course credit for winning, but do hold a mock awards ceremony at the end. All teams are recognized for some achievement, and a class champion is crowned. Prizes are also given for the best reports (to further underscore the importance of quality reasoning).

### DESCRIPTION OF REPORTING ENVIRONMENT

The reporting requirements are very specific and are spelled out in great detail. They are given to the students in advance of play, ensuring that students will carry out their tasks and implement their decisions with a maximum of care. Three reports are required corresponding to the three phases of the game: a Pre-Simulation Report, a First Annual Report, and a Second Annual Report. Table 1 shows an analysis of the reporting environment broken down into: tasks performed, constraints on play, and structure of required report. These change as the game progresses.

### Tasks Performed by Students

The structure of the reporting environment forces students to perform specific tasks. These set the stage for, and guide them into, the decisions that they make. In the process, students work through the material of the course and gain insights.

**Pre-Simulation Phase.** Before the game begins students must organize into companies. We require that students report on all tasks they perform, and decisions they make, in detail. They first must analyze their company's sales job, focusing on the manner in which salespersons will perform the personal selling process. Based on this job description, students develop "job specifications or a list of desirable qualities for their prospective salespeople. They also analyze the likely demand in each geographic area, specifying characteristics that have implications for the assignment of salespersonnel. Only after performing these tasks are the students prepared to select sales recruits and assign them to territories. All these analyses are spelled out in the Pre-Simulation Report

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TABLE 1  
REPORTING PERIODS OF THE AUGMENTED SIMULATION

Category	Before the Play Begins	The First Four Quarters (Q-1 to Q-4)	The Second Four Quarters (Q-5 to Q-8)
Tasks	Organize into companies- Analyze Sales job- Develop Specifications for Salespersons. Analyze geographic regions. Evaluate available applicants for sales positions.	Strive to operate profitably. Assign salespersonnel to territories. Evaluate performance of salespersonnel. Evaluate effectiveness of corporate strategy.	Strive to operate profitably. Assign salespersonnel to territories within regions. Evaluate performance of salespersonnel. Evaluate effectiveness of corporate strategy. Intensify analysis of market. Develop sales forecasts each quarter. Set quotas for salespersons. Supervise salespersons (follow performance, explain reasons for failure to reach quota). Calculate turnover rate. Develop a training program. Design at least one contest.
Constraints	None	Commission rate may not exceed 4%. Contests not permitted.	No more than two contests (one is required). Market forecasts no longer available.
Reports	Pro-Simulation Report	First Annual Report	Second Annual Report
Contents of Report	Statement of Corporate Strategy. Job Description for Company. Statement of Job Specifications for Company (and rationale behind them). Report on unique characteristics of each geographic region. Discussion of initial hiring decisions, initial territory assignment, and rationale behind each of them.	Key financial statements for year. Analysis of results of each quarter. Report on effectiveness of Corporate Strategy and proposed revisions for the up-coming year. Analysis of results of each quarter, assessing how well you are holding to your initial strategy. Rationale for key financial factors. Justification for all hiring decisions and assignment of salespersonnel to territories during the year. Justification of managerial actions concerning salesperson's performance.	Key financial statements for the year and analysis of results. Analysis of the competitive situation, including such things as who has dominant market share, who is price leader, who is competing in your niche. Statement of overall strategy for the year. Explaining key decisions (e.g., price, production, compensation), how the initial strategy was amended in response to the game. Report on forecasting method, accuracy, and error rate. A justification for all decisions regarding salespersonnel (e.g., hiring, firing, reassignment). An explanation for all resignations. An analysis of the selling effort of each salesperson (e.g., charts, assigned quotas, and selling effectiveness). A ranking of salespersons by effectiveness and reasons for the rankings. A statement of recommended sales force size. Report on contests — design, goals, effectiveness, and designation of winner.
Weighting of Report	10% of course grade	10% of course grade	20% of course grade

**The First Four Quarters.** Students assign salespersons to territories each quarter. As the game progresses, they receive reports of sales and begin to realize that salespersons vary in their performance. They must distinguish between salespersons who are performing well and who are performing poorly and speculate as to the reasons. At the same time, they must establish an appropriate selling price and keep an eye on costs. They must continually re-evaluate their corporate strategy, re-grouping and re-strategizing if necessary. All of their actions must be defended in their First Annual Reports.

**The Second Four Quarters.** Participants continue running their simulated companies and perform the same tasks as before, but intensify the monitoring of their market. They must report on price and market leaders, and analyze the competition. They must develop and report on sales forecasts based on historic data, conceptualize about ways to achieve their goals, as well as quotas for individual salespersons. Their reports include observations about their salespersons' performance and they must speculate about the reasons underlying their differential effectiveness. A discussion of all of this must appear in the Second Annual Report.

Provision for contests and salesperson training is provided by the program, but not in any depth. When writing the Second Annual Report, we require students to consider these in detail, designing of one or two contests (specifying purpose and rules), evaluating their effectiveness, and identifying the winner(s). The Report also must include details of a training program designed by them, which takes some imagination since the results are not reflected in the actual game. A three-month training period for new salespersons is provided by the program and re-training is available, but the type of training is not specified.

### **Constraints**

Several idiosyncrasies of the program make it advisable to place some external constraints on play. For example, we have found it prudent to set a cap on commission rates. In this simulation, if students raise their commissions unrealistically high, they can win the game but destroy the experience for the other players. The effect is that the total salesperson compensation of the other companies falls so low that their salespersonnel quit *en masse*. We resolved this by placing a "cap" of 40% on the commission rate during the first year of

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play. The desire to set unrealistic commission rates tends to disappear as students realize they must justify their decisions in their reports.

While the program makes provision for contests, we do not permit them the first year and place limits on them, thereafter. We eliminate them initially, because the course has not progressed far enough to enable students to make informed decisions. The second year we relax this constraint, requiring one contest but allowing two. We want the contest(s) to be held only for valid reasons and for students to think through all pertinent issues before implementation.

To encourage forecasting, we also limit the availability of simulation-generated market forecasts in the second year. Students must estimate their own demand based on theory. As the game progresses, the program allows students to assign multiple salespersons to the same region. We require students conceptually to sub-divide regions so that each salesperson has his/her own separate territory within the region, even through this detail is not modeled into the simulation.

## OVERALL DESIGN OF RESEARCH

We introduced the simulation in four different sections of a sales management course. The sections were taught by the same instructor, but were taught in different semesters. The first semester serves as a baseline for comparison purposes. In the first semester the course did not include a simulation but did include a "live case" study (LCS). The next semester, the computer simulation was introduced to the class with an unstructured reporting environment (USRE). Students studied the manual, made decisions, and wrote two annual reports, but were given no specific instructions as to their format. In semester three, some structure was placed on the reports resulting in a partially structured reporting environment (PSRE), and in semester four, the reporting requirements were fine-tuned resulting in what we call a fully structured reporting environment (FSRE). The identity of the instructor remained the same throughout. Table 2 contains a description of the four different experimental groups.

Student participants were undergraduate marketing students in their final two years at a large southeastern University. There were insignificant differences in gender distribution among the four groups (percent males: 58.0% (LCS), 41.7% (USRE), 49.2% (PSRE), 56.8% (FSRE).  $A = 3.225$ ,  $p > 0.358$ ).

We were able to evaluate the effectiveness of the pedagogical experience in two ways: (1) by performing a survey of students' attitudes and perceptions, and (2) by examining trends in course evaluations.

## STUDY ONE: SURVEY OF STUDENTS

We conducted the student survey during the last two semesters of the simulation. While students' attitudes and perceptions do not measure learning parse (Schreier, 1976) such a survey is appropriate since perception of what one learns seems to be an important part of the learning process (Klein and Fleck, 1990), and attitudes may moderate the learning process (Burns, Gentry, and Wolfe, 1990). We sought answers to three questions:

- (i) *Do students perceive positive values from the augmented simulation?*
- (2) *Do students feel that they were sufficiently prepared to undertake the augmented simulation?*
- (3) *Are students involved in the augmented simulation experience?*

Students completed a self-administered questionnaire. In order not to interfere with the University's official teaching evaluation process, they completed the questionnaire after the final examination. All students who finished the course participated in the survey.

Perceptions of value were measured by a series of Likert-scaled items scored from "1" (strongly disagree) to "5" (strongly agree). Three

**TABLE 2**  
**DESCRIPTIONS OF EACH CLASS**

Category	No Simulation Live Case Study (LCS)	Simulation with Unstructured Reporting Environment (USRE)	Simulation with Partially Structured Reporting Environment (PSRE)	Simulation with Fully Structured Reporting Environment (FSRE)
Description of course	No simulation. Lectures, discussion, and cases. One major group project involving live case study.	Simulation plus lectures, discussion, and cases. Unstructured reporting requirement.	Simulation plus lectures, discussion, and cases. Structured reporting requirement.	Simulation plus lectures, discussion, and cases. Structured reporting requirement fine-tuned.
Knowledge requirements	-	Course not structured to support simulation. Students learned by doing and expected to "discover" the value of the simulation.	Course restructured to introduce material in sequence to support the simulation,	Restructured course retained. Lectures supporting second year more focused on simulation, particularly forecasting and quota setting.
Ensuring involvement	-	No special efforts to ensure involvement. Some complaints concerning lack of realism: compensation and selling prices rose too high to be believable.	Students asked to visualize salespersons as real people. Commissions capped at 4%	Students asked to explain reasons underlying actions of individual salespersons.
Reporting requirements	Written report and class presentation of live case study.	First and Second Annual Reports. Students determined own format,	Pre-simulation Report and two Annual Reports. Reporting requirements carefully structured.	Pre-simulation Report and two Annual Reports. Requirements for Second Annual Report expanded -

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items measured general pedagogical value: "Participating in the simulation helped me to integrate the various aspects of the course, - "Participating in the simulation gave me a sense of competing against other firms in the marketplace", and "Participating in the simulation gave me a sense of how business decisions build on each other through time." Two were specific to sales management: "Participating in the simulation gave me the opportunity to think through the problems that a sales manager faces," and "The simulation gave me practical training that would help me if I were to become a sales manager in the future."

Adequacy of preparation was assessed by responses to two items: "Did your previous marketing courses adequately prepare you for participation in the simulation?" and "Did you feel you had enough lecture material before the simulation began, to get started?" Degree of involvement was measured by responses to two items: "How comfortable did you feel with the 'role play' aspects of the simulation," and "How much did you enjoy participating in the simulation?" Responses to both were measured on a 0-10 thermometer scale ranging from "X (very uncomfortable/did not enjoy to "10" (very comfortable enjoyed very much.

### Analysis

The results of the statistical analysis of attitude items are shown in Table 3.

*Research Question 7: Do students perceive positive value from the augmented simulation?*

Multivariate analysis of variance revealed no differences among mean values between PSRE and FSRE ( $\chi^2_{5,96} = 0.961$ ,  $p > 0.5651$ , suggesting that intensifying the reporting requirements in the fourth quarter did not dramatically alter perceptions of value. As can be seen in Table 4, these mean values were all greater than "4" (signifying "agree"), suggesting that the participating students perceived positive value from the experience. Both groups of students agreed that they: (1) integrated the various aspects of the course ( $x = 4.279$  (PSRE),  $x = 4.341$  (FSRE)), (2) had a sense of competing against other firms in the marketplace ( $x = 4.145$  (PSRE),  $x = 4.317$  (FSRE)), (3) had a sense of how business decisions build on each other through time ( $x = 4.113$  (PSRE),  $x = 4.171$  (FSRE)), (4) received practical training that would help them as managers ( $x = 4.016$  (PSRE),  $x = 4.171$  (FSRE)), and (5) had the opportunity to think through the problems that a sales manager faces ( $x = 4.244$  (PSRE),  $x = 4.463$  (FSRE)).

*Research Question 2: Do students perceive that they have received sufficient background information to undertake the simulation?*

The majority of students felt that they had been adequately prepared for the simulation in previous marketing courses (PSRE: 66.1% agreed, FSRE: 75.6% agreed), and the differences were not significant ( $\chi^2_1 = 1.514$ ,  $p > 0.219$ ). The percentage of students who agreed that they had sufficient lecture material before the simulation began increased from PSRE to FSRE, (PSRE: 72.6% agreed, FSRE: 85.4% agreed), but these differences were not significant at the 0.05 level ( $\chi^2_1 = 3.199$ ,  $p > 0.074$ ). Subjective faculty estimates of the quality level of the reports in both semesters suggested that the students were well prepared by the sequence of course work, and had sufficient knowledge to handle the game.

*Research Question 3: Do students have a sense of involvement in the simulation?*

The mean involvement scores increased significantly from PSRE and FSRE for both enjoyment of the simulation ( $x = 7.613$  (PSRE),  $x = 8.390$  (FSRE),  $F_{1101} = 7.16$ ,  $p < 0.009$ ), and comfort in the role play ( $x = 7.950$  (PSRE),  $x = 8.707$  (FSRE),  $F_{1101} = 0.004$ ). The students' ability to become involved in the experience appeared to increase as the reporting requirements intensified.

### Discussion

The results tended to confirm what we had intuitively suspected. First, the students seemed to perceive the specific positive values

that we had anticipated, but there was no evidence that intensifying the reporting requirements altered this. Second, most of the students in both groups seemed to feel that their knowledge needs were adequately addressed before the simulation began. Only involvement appeared to increase with the structure of the reporting requirements, suggesting that more specific instructions make it easier for students to immerse themselves in the experience.

**TABLE 3**  
**SALES MANAGEMENT SIMULATION**  
**MEAN ATTITUDE SCORES**

Items"	Partially Structured Reporting Environment (PSRE) In = 62)	Fully Structured Reporting Environment (FSRE) in = 41)	Total (PSRE+FSRE E (n = 103)
<b>General Values.</b>			
Participating in the Simulation helped me to integrate the various aspects of the course.	4.279	4.341	4.304
Participating in the simulation gave me a sense of competing against other firms in the marketplace.	4.145	4.317	4.214
Participating in the Simulation give me a sense of how business decisions build on each other through time.	4.113	4.171	4.136
<b>Simulation Specific Values</b>			
Participating in the simulation gave me the opportunity to think through the problems that a sales manager faces.	4.244	4.463	4.330
Simulation gave me practical training that would help me if I were to become a sales manager.	4.016	4.171	4.078
"items in Likert-scaled format: 1 - Strongly Disagree, 5 - Strongly Agree			

### STUDY TWO: COURSE EVALUATIONS

While we received positive feedback from the student survey about the degree of effectiveness of the augmented simulation, we were not able to compare the results with the two baseline conditions: the unstructured reporting simulation (USRE), and the class with the live case study (LCS). The purpose of study two was, therefore, to compare reactions to PSRE and FSRE with LCS and USRE. We did this by analyzing the results of the University's formal course/teacher evaluation process. As part of this process, students rate both course and instructor on a scale from "1 - (poor) to "4" (excellent). These evaluations were conducted at the last regularly scheduled class period in each of the four semesters. They were administered by a student volunteer who collected the completed evaluations, and returned them directly to the department office. All students responded anonymously.

### Analysis

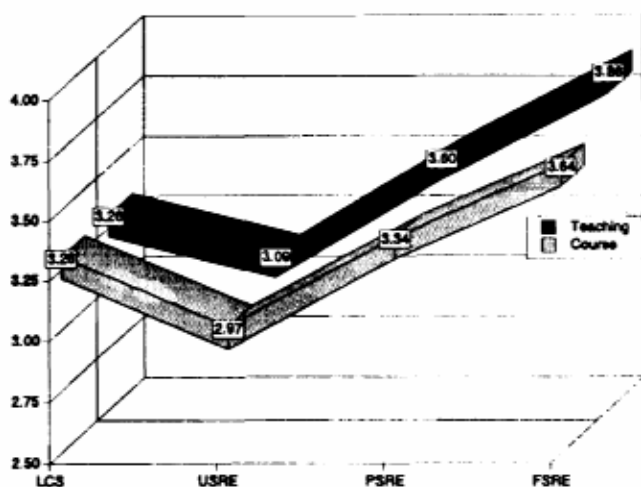
Analysis of variance on ratings of the course revealed statistically significant differences among the mean ratings ( $F_{3,115} = 5.056$ ,  $p < 0.003$ ). As can be seen in Figure 1, they dipped when the simulation was first introduced ( $x = 3.261$  (LCS),  $x = 2.970$  (USRE)), rose

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when the enhancement was first added ( $x = 3.342$  (PSRE)), and rose still further when the reporting requirements were strengthened = 3.643 (FSRE)). A Duncan Multiple Range Test at the 0.05 level showed that the course ratings for PSRE and FSRE were different from those of the USRE (PSRE, FSRE > USRE).

Analysis of variance of ratings of the instructor showed a similar, but more pronounced pattern. Once again, there were significant differences among these means ( $F_{3,118} = 7.359$ ,  $p < 0.001$ ). A slight dip in the teaching ratings occurred when the simulation was first introduced ( $x = 3.261$ ,  $x = 3.091$ ). Re-vamping the simulation (PSRE) brought a rise in the mean evaluations ( $x = 3.500$ ). Intensifying the instructions and making the reporting requirements more specific (FSRE), raised them still higher ( $x = 3.857$ ). A Duncan Multiple Range Test at the 0.05 level revealed that the mean teaching evaluations for PSRE were higher than those of USRE (PSRE > USRE while those for FSRE were higher than those of all three previous semesters (FSRE > PSRE, USRE, LCS). The drop in scores from LCS to USRE a negative reaction to the unadorned simulation in contrast to the baseline condition (LCS). The increase in the valuations in PSRE and FSRE underscores the value of the structured reporting environment. The rise in FSRE strongly suggests that the students perceived the greatest value when the structure of the reporting environment was fine-tuned.

FIGURE 1  
COURSE AND TEACHING EVALUATIONS



### CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

The evidence suggests that the degree of fine-tuning of the reporting structure is important. We think this is because students feel more comfortable with the structured approach. They like to feel very clear about what they are expected to do. When the instructions facilitated this, they seemed more able to involve themselves in their learning experience and perceived higher value from it.

The results confirmed our subjective estimates about the value of the simulation enhancement. This particular game is a very useful teaching tool, but because of the limitations and idiosyncrasies of the program, its value cannot be realized without considerable effort. Our reporting environment creates conditions that focus students' attentions on factors in the simulation that are supportive of the course. We feel that our reporting environment transforms the basic simulation into an unusually fine vehicle for learning by undergraduate students of sales management.

There are limitations to our study. The four experimental groups occurred sequentially over time, thus there could have been effects of history. Attitudes and teaching evaluations are indications of the student's responsiveness, but do not assess whether there are any differences in learning. The study should be replicated across matched classes using measures of learning as did McKinney (1967). Any replication should also consider attitude changes within a single class over the course of a semester. Nonetheless, we feel that evidence we have reported is strongly suggestive of increased involvement on the part of student participants as the reporting environment becomes more structured. Further research should be conducted to determine whether increased involvement results in increased learning by the students.

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