

**SEEING THE FOREST AND THE TREES:
INTEGRATING KNOWLEDGE USING LARGE SCALE SIMULATIONS
IN CAPSTONE BUSINESS STRATEGY CLASSES**

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ABSTRACT

This paper describes the results of using large scale simulation (LSS) to foster an integrative perspective among students in undergraduate business classes. Results indicate that the multiple methods and specific cross-functional requirements of LSS are capable of overcoming parochial, functional-level perspectives. However, because students are evaluated individually for some component of their grades, the authors caution that such reward structures pose specific challenges for successfully developing an integrative perspective using LSS.

INTRODUCTION

A primary purpose of business strategy, or policy, courses within the curriculum of most schools of management in the United States has been to afford students the opportunity to integrate the knowledge they have acquired in their prior coursework. This role is prominent in strategy courses offered at both undergraduate and graduate levels in business programs. Catalogs from business schools describe this (often required) 'capstone' course as one which develops approaches to defining and analyzing total organizational and top management problems and to formulating and implementing firm-wide objectives and strategies. The course typically assumes familiarity with the major functions and disciplines of business including accounting, economics, finance, manufacturing, marketing, organizational behavior and human resource management which are often stated prerequisites and represent the tools with which

students are prepared as they enroll in a capstone course. Course goals typically focus on enhancing students' ability to effectively integrate this knowledge as they examine issues with organization-wide impact.

This integrating perspective has increased in importance as the 'resource-based view' has come to be a dominant paradigm in strategic management. The resource-based view (Penrose, 1959) links firm performance to a firm's ability to develop competitive advantages based on core-competencies, capabilities and resources that are valuable, rare and difficult to imitate (Barney, 1991; Peteraf, 1993). Because imitation by competitors presents the greatest risk to a firm's competitive advantage, the degree to which a firm's competencies and capabilities are embedded in processes that operate across functional areas has been theorized to provide the best protection against such imitation. Imitation of cross-functional activities is difficult due to their inherent complexity and causal ambiguity (Barney, 1991).

If students of business are to learn how firms develop long-lived competitive advantages through inter-functional relationships, capstone strategy classes must provide students with the opportunity to integrate their knowledge of functional areas. Such courses must also permit students to actually experience cross-functional integration to understand how difficult it is to initially achieve within a firm and thus for competitors to subsequently imitate. This imperative calls for research that identifies pedagogical methods which are capable of fostering an un-

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derstanding of and appreciation for this cross-functional, integrationist perspective.

Prior research on the effectiveness of various teaching techniques regarding the integration of knowledge within a capstone business strategy class has not been very promising, however. Hemmasi and Graf (1992) show that the effectiveness of computer simulations to enhance knowledge integration ranked fourth among current students and fifth (next to last) among former students (current business practitioners) for the managerial skills they investigated. In another study, Teach and Govahi (1993) found that those managerial skills related to knowledge integration were rated by former students as most effectively developed with different teaching techniques. For example, the ability to see the 'big picture' was best developed using cases, while developing people and teams (which is essential for implementing cross-functional capabilities) was best learned through simulations. The conclusion one can draw from their study is that knowledge integration and application requires the use of multiple teaching methods.

Recently, the idea of large scale simulation (LSS) has been put forth as a mechanism whereby capstone courses can deliver an integrative experience (Parente, 1995). This paper reports on the use of LSS within a capstone undergraduate business curriculum. Analysis of data obtained from several classes of students enrolled in capstone business courses utilizing the LSS framework shows that among the various components of LSS, those with a specifically integrative quality are capable of getting students to recognize the interdependence between functional areas that lies at the heart of competitive advantage. Results also show that these components are capable of overcoming the parochial focus that students often develop as a function of their previous business school training, with its programmatic emphasis on majors in specific functional areas.

LARGE SCALE SIMULATION

According to Parente (1995), LSS integrates theory, simulation and role-playing into a coherent whole that seeks to provide an active, experiential learning environment. Through a combination of teaching methods, students are able to bring information from academia to the 'real world,' and obtain feedback which reinforces concepts and builds confidence in their perceptions of the skills and abilities they are developing (Parente, 1995).

In particular, LSS is comprised of a computer-based simulation in which student teams form mock corporations which manage anywhere from three to eight strategic business units (SBUs) over twelve quarters of simulated time. Each student in the corporation assumes the title and responsibilities of a Vice President of a specific functional area (finance, marketing, administration, production, research and development) or is CEO of the company. Students also assume responsibility for personally managing one or more of the SBUs in their company's portfolio over the course of the simulation.

In addition, each corporation produces a number of written documents and oral presentations which describe the plans, operations, and results of its various businesses and the corporation overall. These documents and presentations, called *deliverables*, are analogous to the types of reports managers are responsible for in actual businesses.

The deliverables can be subdivided into two primary categories. The first are those that emphasize the skills associated with a particular functional area. For example, students who are human resource majors often occupy the position of VP of Administration and the Job Descriptions deliverable describes the tasks that each of the functional VPs will perform, both as vice president and within their team in the class. This deliverable draws heavily on the topics that students learn in their human resources class about job design, an area that is especially im-

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portant to HR majors. Typically, the completion of this deliverable is delegated to the student in the simulated company who possesses the most knowledge about HR and job design issues (and who will, in all likelihood, occupy the VP of Administration position). In addition, the grading structure for the course allocates a larger proportion of a student's overall grade to the particular functionally-oriented deliverable associated with the position the student holds on his or her team. Functionally-oriented deliverables, by position in the simulated corporation, are listed in the first 6 rows of Table 1.

The second category of deliverables are those that require the adoption of an integrative approach. These deliverables require information and expertise from several different functional areas. They also require active participation and cooperation among students to complete the deliverable. For example, the Board of Directors report is an oral presentation requiring all company officers to speak during the presentation. Rehearsal is required so that the information is deliverable professionally and time limits are respected. In addition, the content of the Board presentation requires that all officers serve in the SBU manager role as they report to the Board on SBU performance and future plans. This information should be consistent across SBUs so that it is readily comprehensible, the plans reinforce competitive advantages at the SBU *and* corporate levels and the overall performance of the firm is enhanced.

This consistency further requires that team members share information and collectively decide on resource allocation decisions across the various businesses for the coming simulated year. It emphasizes the roles that specific functions played in creating SBU competitive advantages that led to the past year's performance. The remaining two integrative deliverables exhibit similar integrative characteristics in both substance and processes. The integrative deliverables constitute an equal proportion of each student's overall grade and

student's overall grade and are listed in the last 3 rows of Table 1.

HYPOTHESES

Successful implementation of the LSS approach should be reflected in students' recognition of the difference between integrative and functional deliverables. That is, coupled with current strategic management theory, students who are taught using the LSS approach should come to realize the importance of cross-functional integration to business success and the development of the capabilities and competencies that underscore a firm's competitive advantage. Consequently, within the LSS approach, this realization should be reflected in different perceptions of the importance of the various deliverables to the overall goals of the course. To this extent, we expected that students in LSS classes would evaluate the integrative deliverables as being much more important at the end of the course. That is, after being exposed to the LSS throughout the semester, students' perceptions of the importance of integration should change and be reflected in their evaluation of the portions of the course that specifically highlight this issue.

H1: Importance ratings for integrative deliverables should increase from the beginning to the end of the course.

The true success of the LSS approach, however, is that it appears to be capable of actually overcoming the parochialism that sometimes pervades the various functional areas (Dearborn & Simon, 1958). Students majoring in particular functional areas tend to see the world strictly through the lens offered by their major.

The LSS approach, through an emphasis on cross-functional, integrative experience, attempts to break down this parochialism. We would, therefore, expect that students' perception of the importance of the integrative deliverables would not differ due to the functional lens

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they bring to their capstone course. Thus, we expected to see no differences in rated importance of the integrative deliverables as a function of students' academic training:

H2: Importance ratings of the integrative deliverables should not differ by academic major.

Although we expected no differences in the rated importance of the deliverables as a function of major, the reward structure of the course could exert an influence. Students within most business programs are evaluated on an individ-

ual basis for some (often the majority) portion of their grade. It is likely that differences in students' perceived importance of the deliverables in an LSS framework would reflect their perceptions of the degree to which the deliverable contains a higher individual component regarding their grade.

H3: Importance ratings of the functional deliverables should differ by functional position.

Table 1 DELIVERABLE CATEGORIES

Position	Deliverable	Category
CEO	Interviews	Functional
CFO	Annual Report	Functional
VP Administration	Job Descriptions	Functional
VP Marketing	Corporate Strategic Plan	Functional
VP Operations	Operations Plan	Functional
VP R&D	Environmental Position Paper	Functional
<i>No primary position</i>	Board of Directors Presentation	Integrative
<i>No primary position</i>	SBU Strategic Plan	Integrative
<i>No primary position</i>	Case Study	Integrative

METHODOLOGY

The LSS approach was used as the pedagogical method in undergraduate Business Strategy classes at two institutions between the Spring 1994 and Summer 1996 semesters. A pre- and post-semester survey was completed by 705 respondents (59% male; 41% female).

Teams were organized during the second week of the semester following interviews. Pre-semester surveys were completed during the third week of class before teams (mock corporations) have had the opportunity to develop norms. Students were presented with the list of deliverables and asked to rank them in order of their perceived importance. Rankings could range from 1 (= most important) to a high of 16

(= least important). Thus, lower numbers represent higher importance ratings. Students completed a post-semester survey after fulfillment of all course requirements. Students were given the same list of deliverables and asked to rank them again using the same scale.

Course grading was accomplished through the use of a matrix (position by deliverable). While the number of total points was the same for all positions (i.e., all students could potentially earn the same number of total points), each of the six positions had at least one deliverable for which the team member occupying that position received more points than any other member. This deliverable was considered the position's *primary, functionally-oriented deliverable*. The three integrative deliverables carried the same number of points for all team members. Table 1

provides the description and purpose of the de-

liverables and indicates whether each is of a

Table 2

DELIVERABLES WITH SIGNIFICANT DIFFERENCES IN PRE- & POST-TEST RANKING

Deliverable	Pre-Test Mean Importance	Post-Test Mean Importance	t-value	P <
Board Presentation	6.84	5.17	-7.27	.000
SBU Strategic Plan	5.18	4.12	-3.56	.000
Case Study	8.62	7.84	-2.69	.008

RESULTS

H1: Student rankings of the importance of the integrative deliverables were expected to increase from pre-test to post-test. In Table 2 it can be seen that all three integrative deliverables were assigned a higher importance at the end of the semester than at the beginning and the difference was highly significant (all $p < .01$).

Five of the six defined *functional deliverables* did not exhibit a significant difference between pre and post ranking. Taken together, these results support H1.

H2: If the functional lens were applied to the view of the deliverables, we expected to see post-test rankings of functional deliverables by major to demonstrate significant between-group differences. Five majors were identified. The percentage of students in each was: Accounting (29%), Marketing (25%), Finance (19%), Management (19%) and MIS(8%). An ANOVA by major as well as post-hoc testing revealed no significant between-major differences in ranking of the deliverables.

Only the pre-test ranking of the Annual Report showed any significant difference by major. Accounting majors ranked this highest, but the difference disappeared in the post-test ranking.

Thus, since there is no significant difference in the students' post-test ranking of the deliverables by academic major, H2 is accepted.

H3: We analyzed the difference in rankings by functional position instead of major. As can be seen in Table 3, four of the six functional deliverables showed no significant differences in importance on the pre-test across the functional positions. On the pre-test, the Annual Report and the Operations Plan were evaluated differently across the functional positions ($F(5,574)=3.53, p < .01$; $F(5,559)=4.71, p < .001$ for the Annual Report and the Operations plan, respectively). Post-test results show that differences in rankings for five of the six deliverables were significant at the .05 level while the Annual Report was significant at the .10 level. None of the integrative deliverables showed any difference in importance ranking across the functional positions.

Students' perceived importance of the functional deliverables was greater at the end of the semester than at the beginning. The reward structure of additional points for the primary position of each functional deliverable appears to have an impact. Therefore, H3 is accepted.

Table 3 ANOVA BY SIMULATION POSITION

Deliverable	Primary Position	Pre-test			Post-test		
		F-ratio	Sig.	Mean	F-ratio	Sig.	Mean
Interviews	CEO	.92	n.s.	10.31	2.68	.02	10.23
Annual Report	CFO	3.53	.01	4.38	2.05	.07	4.59
Job Description	VP Admin.	1.53	n.s.	8.15	3.16	.01	8.24
Corp. Strat. Plan	VP Marketing	1.24	n.s.	4.24	2.57	.03	4.00
Operations Plan	VP Operations	4.71	.00	5.55	3.06	.01	5.31
Envir. Pos. Paper	VP R&D	2.02	n.s.	8.95	9.84	.00	9.84
Board Meeting	None	1.55	n.s.	6.93	1.94	n.s.	5.17
SBU Strat. Plan	None	1.64	n.s.	5.34	1.21	n.s.	4.29
Case Study	None	.54	n.s.	8.75	.89	n.s.	7.94

DISCUSSION

This paper reported on the use of LSS as a pedagogical tool for helping students to integrate their prior knowledge and develop an understanding of the importance of the integrative nature of businesses in today's competitive environment. By combining a number of pedagogical techniques and placing students within a simulated business setting comprised of the various functional areas found in businesses, LSS appears capable of making the interdependent nature of these functions more salient than the use of any single technique. It appears to offer an effective way to both deliver an integrative experience and permit students to appreciate how crucial integration is to the success of a business.

Our results showed that over the course of a semester, students were able to recognize the importance of integrating capabilities across functional areas and the interdependence this both requires and creates.

A key aspect of the integrative nature of the LSS approach is that it is capable of reducing the parochialism that can accompany an emphasis on functional specialization. Our results showed that by requiring students to complete assignments which stress the integrative nature of business organization, the LSS approach appears to be able to encourage students to see beyond the narrow boundaries of individual concerns. As such, the LSS approach offers students an opportunity, in a classroom setting, to begin to develop the skills necessary to foster integrative environments in the organizations they will eventually join.

However, differences did emerge regarding students' perceived importance of some deliverables as a function of the specific role (or functional position) they played on their simulated corporation. In these cases, there was a match between the position which rated the deliverable as most important and the functional area on which the deliverable focused.

The differences found in the rated importance of the functionally-oriented deliverables points to

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a key challenge faced by the LSS approach (and in businesses). This challenge is to find a way to reward people individually for their efforts while at the same time maintain a focus on the inter-relatedness of the various business functions and the overall success of the business. The deliverables that each functional position rated as most important emphasized the knowledge and demands of that functional area, *and* constituted a larger proportion of the overall grade for students in those positions than for the other members of their simulated corporation. Students clearly recognized this correspondence and responded to it.

The LSS approach attempts to balance the necessity for recognizing individual achievement with the importance of emphasizing the integrative nature of business. By requiring that students work in teams for the entire semester, it continually puts cooperation at the center of students' concerns. Rather than focus on integration for one section of the course, the integrative deliverables are spread across the course, with the Board of Directors presentation occurring fairly early in the term, the strategic plan toward the latter third of the course and the case analysis at the end. In this way, it continually reinforces integrative concepts and requires that students revisit them throughout the semester. While the functional deliverables do reward individual achievement differentially, the integrative deliverables constitute equal portions of all students' grades, reinforcing the key role of interdependence among teams and functional areas.

This study represents a first attempt to examine aspects of the LSS approach for their effect on how well LSS is able to foster an understanding of the importance of cross-functional integration in business settings within an academic environment. The results reported provide some promising evidence that this pedagogical technique can achieve one of the key objectives of capstone courses in business curricula. Students exposed to the LSS approach appear to be able

to recognize specific functional issues while also understanding the necessity of fitting them into the demands of the larger organization. LSS appears to represent a teaching methodology that can help business schools produce graduates who are better able to make significant contributions to their future employers more quickly. Students appear to emerge with a solid capability to see both the forest and the trees.

REFERENCES

- Barney, J. B. (1991). Firm resources and sustained competitive advantage. Journal of Management, 17, 99-120.
- Dearborn, D. C., & Simon, H. A. (1958). Selection perception: A note on the departmental identification of executives. Sociometry, 21, 140-144.
- Hemmasi, M., & Graf, L. A. (1992). Managerial skills acquisition: A case for using business policy simulations. Simulation & Gaming, 23(3), 298-310.
- Janis, I. (1972). Victims of Groupthink. Boston: HoughtonMifflin.
- Parente, D. H. (1995). A Large-Scale Simulation for Teaching Business Strategy. In D. Crookal & K. Arai (Eds.), Simulation and Gaming Across Disciplines and Cultures (pp. 75-82). Thousand Oaks, CA: Sage Publications, Inc.
- Penrose, E. T. (1959). The Theory of Growth of the Firm. London: Basil Blackwell.
- Peteraf, M. A. (1993). The cornerstones of competitive advantage: A resource-based view. Strategic Management Journal, 14, 179-192.
- Teach, R. D., & Govahi, G. (1993). The Role of Classroom Techniques in Teaching Management Skills. Simulation & Gaming, 24(4), 429-445.