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Americas Conference on Information Systems (AMCIS)

December 1999

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Recommended Citation
Sheetz, Steven; Tegarden, David; Tegarden, Linda; Gynwali, Devi; and Poppo, Laura, "A WWW-Based Group Cognitive Mapping Approach to Support Case-Based Learning" (1999). *AMCIS 1999 Proceedings*. 50.
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A WWW-Based Group Cognitive Mapping Approach to Support Case-Based Learning

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Introduction

One of the most difficult learning tasks is to solve complex, abstract, and unstructured problems. In many business problem domains, advanced students are required to perform numerous tasks that involve such higher-order cognitive processing as analyzing the arguments presented, making inferences, drawing logical conclusions, and critically evaluating all relevant alternatives, as well as the consequences of the decisions. This is especially true in the business school capstone courses, such as strategic management.

The failure of lecturing for addressing the needs of students' learning in strategic management has led most instructors to use the case method for teaching analysis in this unstructured situation (Alexander, O'Neill, Snyder, & Townsend, 1986). While case analysis and discussion-based teaching significantly increases student learning, some assert that it rarely develops students' capability to handle unstructured problems (Lang & Dettrich, 1982). Instructors often provide structure to case assignments by restricting students' analysis and discussion to specific areas of the problem domain or using highly focused questions to guide students in their search for solutions. Both of these methods presume or impose structure and thereby eliminate or reduce the need for students to experience the task of structuring an unstructured problem. Furthermore, case-based discussion typically leads to "bullets" of understanding which ignore the critical, underlying causal relationships among factors that contribute to the company's current situation. Shaw, Brown & Bromily (1998: 44) assert that "if the [strategic] plan doesn't specify critical relationships among factors, it can't demonstrate that we really know what we're doing or where we're going. We can't see the whole picture." Consequently, traditional case analysis methods do not appear to adequately develop students' ability to understand complex strategic situations.

We explored cognitive mapping as a tool for case analysis. A cognitive map is a representation of both the content and structure of a person's knowledge of a particular context or domain (Weick & Bougon, 1986). Due to cognitive limitations, decision-makers oversimplify their view of the situation and thus fail to recognize critical elements relevant to situation (Axelrod, 1976). Such simplifications are costly as they yield less accurate images, less sophisticated strategic choices, and ultimately less satisfactory outcomes of the choices. The process of cognitive mapping requires individuals to go beyond immediate and obvious facts regarding the situation being examined. Thus, enabling them to identify and synthesize many strategic factors impacting the situation, to examine interrelationships among these factors, and to develop a more complex and holistic understanding of the strategic situation (Axelrod, 1976; Huff, 1990). Cognitive maps do not overcome cognitive limitations, but instead serve as a form of external memory that maintains the whole picture, allowing decision makers to focus on key relationships among the strategic factors.

In this study, we explore the following question: can the WWW-based group cognitive mapping approach prove useful in evaluating student understanding of complex strategic situations? The comparison of cognitive maps developed by instructors and students should enable instructors to more fully evaluate students' understanding. Measuring the similarity of the instructor and student maps provides useful insights of student understanding of difficult material. Differences indicate areas that students don't understand and where additional instruction is necessary.

Method

Cognitive mapping is a set of techniques for studying and recording perceptions. Researchers report a variety of cognitive mapping techniques to support the analysis of corporate strategic planning (Eden, 1992; Fiol and Huff, 1992; Huff, 1990; Weick and Bougon, 1986). We employ a cause mapping approach (Eden et al., 1992). Cause mapping requires the participant to carefully think through the key elements and how they influence each other. Examination of causality could also reveal faulty

reasoning (Hall, 1984) and thus provide the opportunity for corrective actions. From the strategic management perspective, cause maps could help to examine cause-effect linkages between an organization's strategies, environment, and performance (Narayanan & Fahey, 1990).

The sample for this study consisted of three instructors, who teach the senior-level strategic management course, and 79 senior business students in the course at a major eastern university. The cognitive mapping procedures were conducted in group sessions. The instructors formed a single group and the students were assigned to 12 ad hoc groups. Both the students and the instructors had previously used cognitive mapping procedures.

The cognitive mapping procedures were conducted in a computer teaching lab as part of the final exam for the course. The data collection procedures used in this study were comprised of five steps: concept identification, category identification, concept categorization, category importance rating, and causal relationship identification. We used a WWW-based group cognitive mapping system implemented in Java & SQL in conjunction with an Access database to implement the cognitive mapping data collection procedures. An advantage of using a computerized approach to cognitive mapping is that sample size can be sufficiently large enough to statistically test the significance of the levels of agreement between the instructors, the students, and between both groups. Furthermore, without computerizing the cognitive mapping approach, this type of evaluation would not be practical.

We measured similarity of the instructors and students perceptions four separate ways. First, we used content analysis (Emory and Cooper, 1991; Kerlinger, 1964) of the concepts placed in the categories to derive and compare a set of definitions for the categories of the instructors and students. Second, similarity of the cognitive maps were evaluated using givens-means-ends analysis (Bougon et al., 1977). Givens are identified by having mostly outflows of causal influence, means as having about the same number of inflows and outflows, and ends having more inflows than outflows. Third, we used "domain analysis" to compare the similarity of the maps using the cognitive centrality measure (Eden et al., 1992). Cognitive centrality is defined as the total number of relationships that the category has with other categories in the cognitive map. The greater the number of relationships in which a category participates, the greater the cognitive centrality and the greater the importance of the category. Finally, we compared the similarity of the instructors' and students' views based on the explicit ratings of the importance of the categories.

Results

Students and the instructors placed their concepts into the categories developed by the instructors. Based on a content analysis of the categorizations, the underlying semantics of the categories were similar for the students and instructors.

The cause map showing the 19 relationships identified by at least two instructors is presented in Figure 1a. (Positive relationships are shown in black while inverse relationships are shown in white. Furthermore, relationships can be one of three strengths: slight, moderate, or strong indicated by the thickness of the arrows.) Using givens means ends analysis, two causal themes were identified in the instructors' map. The first theme depicts the influence of the CEO on business level strategy and company performance. The second theme represents the impact of the competitive environment on firm performance. Together, the themes represent business level strategy in the context of the competitive environment. Figure1b presents the cause map showing the 14 relationships identified by at least 33% (27) of the 78 students. To assess student understanding, we compared the relationships identified by the students and the instructors. Two relationships were considered a match when their origin and destination categories were identical. Based on this comparison, the instructors' map and the students' map were similar. Furthermore, both themes were represented.

We tested the agreement of students and instructors on the relative importance of the strategic factors using the category importance ratings. Very high agreement, Kendall's W = .821 (p=.004), existed among instructors on the relative importance of the categories. Students also moderately agreed on the relative importance of the categories, Kendall's W = .478 (p=.001). Both of these values were significantly different from zero agreement. Very high agreement, W = .882 (p=.054), existed between average ratings of students and instructors in terms of the relative importance of the categories, this was significantly different from zero agreement. Comparing the rankings of the students and instructors showed that the top and bottom groups of categories were nearly identical for both groups.

We tested the agreement of students and instructors on the relative importance of the strategic factors using the category cognitive centrality calculated from the their cognitive maps. High agreement, Kendall's W = .626 (p=.037), existed among instructors for this implicit measure of the relative importance of the categories. Students also moderately agreed, Kendall's W = .386 (p=.000), on the relative cognitive centrality of the categories. Both of these values were significantly different from zero agreement. Very high agreement, Kendall's W = .902 (p=.047), existed between the

students and instructors in terms of the relative importance of the categories based on cognitive centrality. This agreement was significantly different from zero.

Conclusion

This study finds that the WWW-based group cognitive mapping approach used in this study enabled instructors to evaluate students' understanding of strategic principles. This implies that this approach to case analysis may be effective in teaching students how to structure unstructured problems. Also, incorporating a computer-based cognitive mapping approach into this course enhanced the instructor's ability to evaluate student understanding of the important aspects of strategic management. Furthermore, using cognitive maps as teaching tools enables students to think in terms of second and third level effects of actions that influence strategic factors in the business environment instead of only uncovering primary effects.

References are provided upon request from first author.

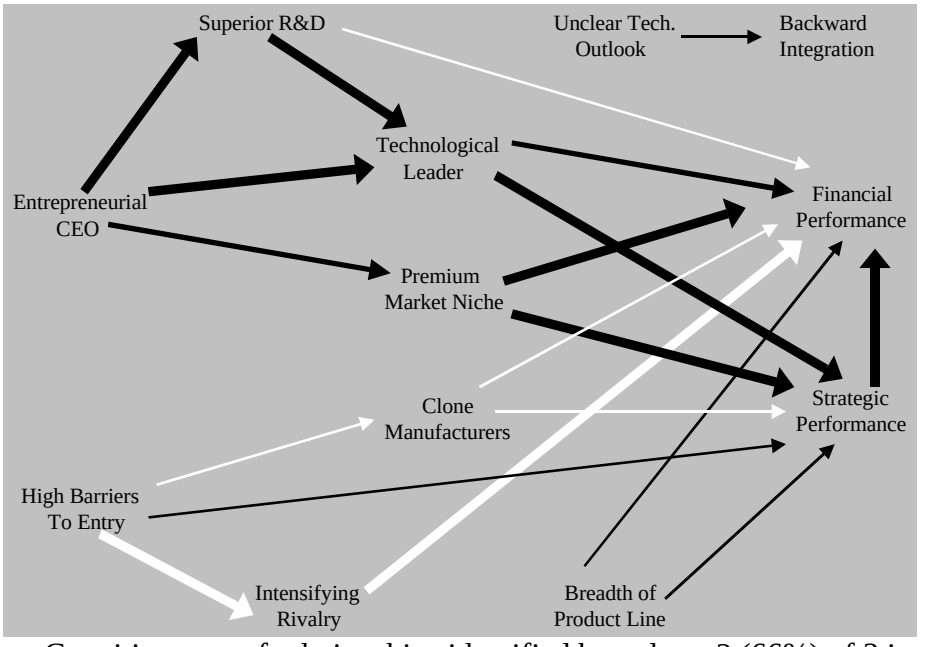

Figure 1a: Cognitive map of relationships identified by at least 2 (66%) of 3 instructors.

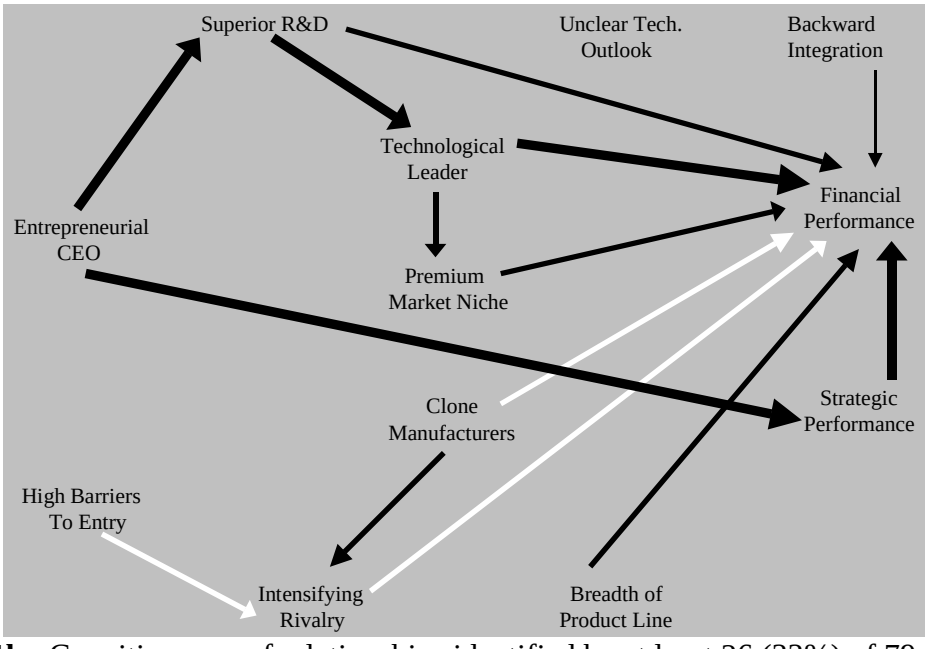

Figure 1b: Cognitive map of relationships identified by at least 26 (33%) of 79 students.