

INCORPORATING BUSINESS GEOGRAPHICS INTO UNDERGRADUATE MARKETING: AN INITIAL EVALUATION

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ABSTRACT

Montana State University-Billings has developed a one credit market mapping lab that introduces business students to applications of business GIS. After a three year trial period we have collected assessment and evaluation data that supports the idea that basic applications of this technology can be successfully incorporated in the undergraduate marketing curriculum.

INTRODUCTION

Geographic Information Systems (GIS) is a technology with potentially broad but as yet unrealized applicability in business education. It allows social, economic, and physical variables to be "mapped" and analyzed on a spatial basis. It also facilitates complex manipulation and integration of large data sets - including census, market, and consumer behavior variables. GIS applications are increasingly found in a variety of settings and in a range of organizations. Large corporations have long recognized the value of this technology, and smaller organizations are also realizing its potential. (Longley and Clarke 1995; Baker and Baker 1993) Previously, GIS was a highly technical field, accessible only to specialists. Now the development of user-friendly PC packages and the availability of digital demographic data allow non-technical users relatively easy access to potentially powerful analytic tools.

Curriculum and educational developments in business schools have not kept pace with this technological evolution. It is estimated, for example, that less than 10 percent of business schools have GIS available in the classroom for students in any discipline (Murphy 1996). And there are a number of challenges facing any program that does seek to incorporate GIS (Association of American Geographers and GIS World 1996). Typically, when GIS is available, it is housed in the Information Systems or Computer Science disciplines, which often are far removed from the purview of other disciplines and end users. There are numerous ways in which this technology is being used to improve business decision making, particularly in relation to site location, demographic and market

analysis, and logistics. Yet GIS is still generally set up - and taught - as a technical subject, one that is isolated from applications in disciplines such as marketing and management.

Over the past four years Montana State University-Billings College of Business, with support from the Fund for Improvement of Post-Secondary Education (FIPSE), has been working on a project to change that. Our objective has been to introduce undergraduate business students to the uses and applications of GIS in business, focusing on the interests and needs of end users in marketing and management. This paper outlines that project, presents evaluation data, and briefly discusses what we have learned.

PROJECT DESCRIPTION

We began by thinking about the ways in which end users use this technology in business, and worked backward to determine basic knowledge and skills novices would need to effectively incorporate this technology into decision-making. The emphasis was on the end users, and the interdisciplinary applications of this technology to business decisions. We were not expecting to develop GIS experts; rather we sought to expose a large number of business students to desktop mapping and business demographics, and educate them about its uses. In other words, although we didn't know the language at the time, we were actually introducing students to business geographics.

We developed a one-credit computer lab, called Market Mapping, and attached it to the Marketing Principles course. By linking the mapping to the basic

marketing course, we were able to emphasize and incorporate marketing examples and applications, and reach all business students. The course was developed and taught by marketing faculty, using Scan/US, a simplified desktop mapping software. Scan/US is a highly functional mapping program that allows users to create thematic maps, ring studies and area analyses, and import data (via Excel), including geocoded files. However, it does not permit users to query a database or digitize data. The latter is not of particular concern in most business applications; the former is an important feature to fully realize the potential of a business GIS. Given our objectives of educating end-users about the potentials of business GIS, however, Scan/US was an appropriate software. In addition, it comes with an excellent database (including census and consumer spending patterns), with other data sources (such as Claritas prism categories) available. In terms of software, we traded some sophistication and power for accessibility and ease of use.

An additional challenge we faced was the lack of curriculum and teaching materials involving this technology. While there are manuals (and good support) for specific software packages, there are few broadly conceived educational materials that deal with GIS and business applications, and many of these are software specific. (Mitchell 1997; Harder 1997). And there certainly weren't any teaching tools addressing our audience: the inexperienced end user. In addition, since Scan/US is a business application software and has not been extensively used in classrooms, we found no teaching materials we could use. We were on our own, from the conception of the course and topics it should include, to developing the necessary materials to help students learn about business geographics in general and this software in particular.

Over the term of the three-year project a Step by Step Users Guide was written to help students work through the software. We developed materials (via Web resources) that introduce students to basic mapping concepts such as scale, cartographic principles, and data analysis. And we designed assignments that focused on pertinent business applications, including ring studies and market area analysis, building sales territories, and a retail location problem. Students were also required to complete a project that applied techniques learned in class. The final project had to include at least one thematic map and the use of geocoded files, along with analysis of demographic data, but the topic or problem was one of the student's choosing. These projects ranged from fairly simplistic undertakings to quite imaginative

presentations, and frequently incorporated assignments or projects from other courses. Course materials are available at the course website www.msubillings.edu/mktmap. Additional background information on the project and sample maps from class assignments has been presented elsewhere. (McNally 1999)

EVALUATION

Over 400 students took the market mapping class, and by the end of the project we had several hundred examples of student work. Evaluation data included pre and post course questionnaires (designed to gauge students' changing degree of familiarity with GIS and business applications), and assessment by external reviewers. The questionnaires included both quantitative and qualitative measures. The pre and post questionnaires were identical in content, except the post test had an additional question that asked how student expectations were met or exceeded, and asked for recommendations for changes. Other questions asked students to rate themselves relative to their knowledge of GIS, their computer skills in general, and familiarity with Scan/US. Several questions asked students to provide examples of business GIS and how it might be helpful to them. These qualitative data were coded based on number of correct answers. We asked students to put their name and section number on the questionnaires, and none were reviewed until semester grades were handed in. We were not always successful at matching pre and post questionnaires, either because names were omitted or because a student missed filling out one of the two. As of March 1999 we had 287 matched pairs of completed pre and post questionnaires.

Our initial paired comparison of pre and post test results, specifically on questions which directly address changes in knowledge and awareness of GIS capabilities, showed a pronounced difference between pre and post course ratings. For example, we asked students to rate themselves in terms of their knowledge of GIS. As might be expected, in the pre test 80% of the respondents indicated that they had not seen GIS in use or had seen it but not used it themselves. In the posttest, 60% considered themselves intermediate users, and over 80% of the respondents had at least a limited appreciation of the power and business applications of this technology. We also asked a series of questions about business applications of GIS. Again, there were dramatic gains from the pre to posttest. For example, prior to taking the course, only 16% of the students could identify even one

use of geographic analysis in business. By the end of the class, 58% could offer at least one correct answer. And the percentage of incorrect or "don't know" responses had dropped from over 70% to under 45%.

We also used more open-ended questions to solicit additional information from students, and responses to some of these questions were quite revealing. Students were free to answer (or not answer) the questions, and response categories were constructed based on what students wrote. For example, one question asked, "In what ways were your expectations met?" Over 50% of the students responded that their expectations were met or exceeded, particularly in regard to learning about GIS. Many students responded in some detail about how much they had learned about the power of GIS and/or Scan/US, and 10% gave specific examples of how they thought they could use this technology in another context (that is, at work or in another course).

We were expecting to see significant differences between pre and post-test evaluations, and the descriptive statistics seem to support this view. In order to test this expectation, we used chi-square, appropriate for proportions, to test for significance of the four questions discussed above. Table 1 summarizes these results.

The one credit exposure to business GIS obviously increased awareness about this technology and its applicability to business decision-making.

In addition to evaluating changing levels of student awareness and familiarity with business GIS, we wanted to assess student outcomes. That is, we wanted to learn how well students were applying these skills to analyzing business or marketing questions. Because there was no existing curriculum for this type of class, we also wanted data that we could use to help assess the course. To accomplish this, we recruited external evaluators who were totally uninvolved with the project, and asked them to evaluate students' final projects. We had five external evaluators, all of whom were familiar with GIS: four were faculty from other institutions (3 in geography; 1 in business and information systems), and one was a practitioner familiar with many applications of GIS. One evaluator was familiar with the Scan/US software, but the rest were not.

The evaluation instrument used a Likert scale, where 1 represented far below average, 3 represented average, and 5 far above average. We had three general categories of evaluation criteria, including visual presentation, written interpretation, and overall project.

And each of these general categories had specific sub-components. Because the course was an introduction to business GIS, emphasis in evaluating projects was on the visual presentation of data. However, we were also interested in having students write about and interpret their maps, and integrate the visual with the written. Each of these criteria was briefly described, and anchors for far below and far above average were provided.

We pre-tested a pilot evaluation instrument with six respondents, and modified it slightly before sending it out to the external evaluators. Evaluators used this instrument to review a random sample of 20 student projects. The sample was based on 5% of the number of students enrolled each semester. The order of the projects was randomized for three evaluators, put in chronological order for one, and put in reverse chronological order for the fifth evaluator.

Table 2 summarizes descriptive statistics for the ten criteria as assessed by the external evaluators across the twenty projects. Given the nature of this data, it is inappropriate to use statistical analyses that treat the data as if they possess mathematical properties they do not possess. This limits the kinds of inferences one can draw. However, the external evaluation offers insight into areas of relative strength and weakness in terms of student outcomes. For example, according to this table, student use of data received the lowest mean of the ten criteria, while map presentation was the highest. This outcome could be explained by the nature of the course and its sequencing in the business curriculum. The course focused on basic mapping techniques, and emphasis was on producing an understandable graphic. This, in essence, is what map presentation sought to measure. The use of data criteria was part of visual presentation. Here evaluators were asked whether data was used correctly and how well the map illuminated the problem. It may be that, since this was the first marketing course (and often the first upper division business class) for students, the lower mean for data use reflected this introductory level. It is also possible that this score reflects a weakness in spatial data analysis, a topic that may not have received enough time and attention in the course.

To better understand the data, cumulative percentages for above and below average (3 on the Likert scale) were calculated for each criterion across all evaluators and projects. The result is presented in Chart 1.

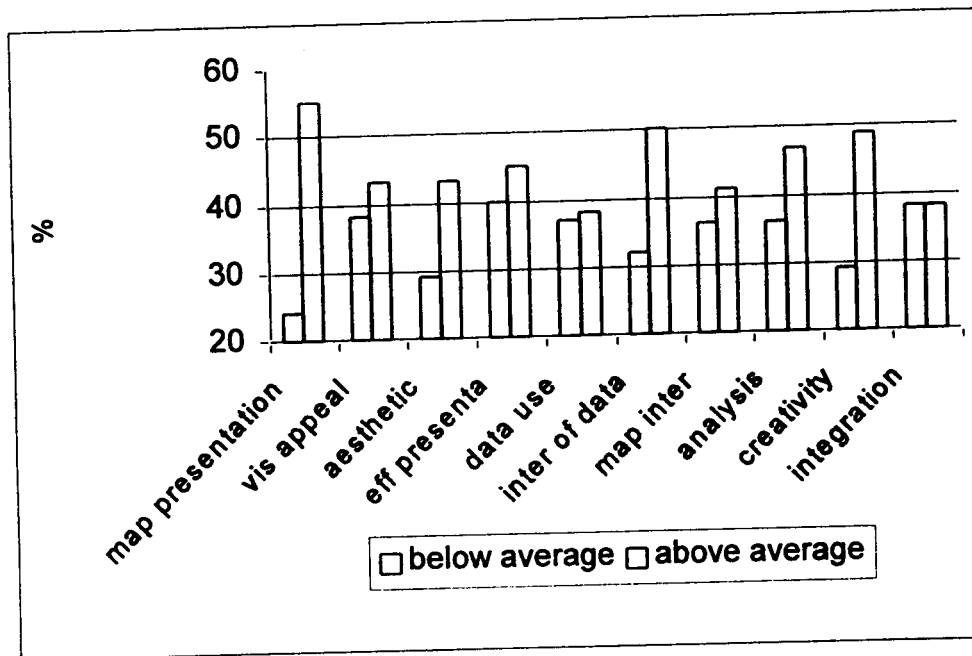
Table 1
Chi-Square Comparison of Pre-test and Post-test

Question #	Chi-Square value	P level
1	836/504	<.01
2a	469/448	<.01
2c	423/317	<.01
4	606/196	<.01

Table 2
Evaluators' Overall Assessment of Projects

Data	Pres.	Visual Appeal	Aesth.	Effec. Pres	Data Use	Inter Data	Inter Map	Anal- ysis	Crea- tivity	Integra- tion
Mean	3.48	3.17	3.12	3.05	2.97	3.22	3.02	3.16	3.31	3.05
St Dev	1.34	1.25	1.22	1.37	1.32	1.38	1.39	1.42	1.29	1.24

Chart 1
Evaluators' Assessment of Projects
Cumulative % Above and Below Average



Overall, more of the projects were found to be above average on the indicated criteria. However, there was considerable inter-evaluator difference in applying some

of these criteria. For example, there was agreement among evaluators that projects were above average in terms of map presentation, aesthetics, data interpretation,

map analysis, and creativity. But there was less concurrence on other criteria, most notably data use and integration.

Discussion/Conclusion

The pre and post course assessments clearly demonstrate that this class successfully introduced students to business GIS and selected applications of business geographics. Knowledge and awareness of GIS increased significantly by all measures. The responses to open-ended questions supported our perception that students were enthusiastic about this technology, excited about its potential applications, and more than satisfied with their experience.

The assessments of our external evaluators provided additional rich data. The final projects, which the evaluators assessed, represented a demonstration and application of the skills learned in this one credit course. These projects were varied in content, but all included thematic maps of demographic data, geocoded data, and written analysis. Overall, the projects were rated as at least average in terms of 9 of the 10 assessment criteria (mean scores), but there was considerable variability. When the scores on each criterion are aggregated into

above and below average, evaluators consistently found these projects above average in terms of map presentation, aesthetics, data interpretation, map analysis, and creativity. The findings in terms of integration and data use were mixed and more difficult to interpret. This outcome may be due, in part, to an inadequate definition of these two criteria in our evaluation instrument. But it also suggests that these areas may need more attention or emphasis.

This project was unique in its emphasis on educating the end-users. It was implemented as a one credit, hands-on experience with desktop GIS for all business students. At the end of the course students were able to successfully demonstrate mastery of some basic mapping skills, and were clearly more knowledgeable about this technology and its potential business applications. Since its inception, we have also seen a significant amount of "trickle up" with this technology, as applications of business GIS have appeared in other upper division courses and projects. We believe these are important findings, as they demonstrate that potential end-users can learn necessary basics of business GIS in a short period of time. This focus on end-users is not only possible, but also increasingly necessary as the business applications of this technology continue to expand, and the technology is increasingly available.

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**THE 2000 MARKETING MANAGEMENT ASSOCIATION
PROCEEDINGS**

Dear MMA Member:

It is my distinct pleasure on behalf of members, officers, and Board of the Marketing Management Association to present the MMA PROCEEDINGS of our 2000 Conference.

My congratulations to the 2000 MMA program chair, Ram Kesavan, and all contributors to this year's program- track chairs, authors, reviewers, discussants, session chairs and everyone who made their special contribution to a successful conference. I salute the members who contributed literally hundreds of hours toward putting together this outstanding effort. A special thanks to Robert Green and Dale Varble for their outstanding job of putting together the 2000 PROCEEDINGS.

Only papers passing triple muster by anonymous reviewers are accepted for presentation at the conference and for inclusion in the 2000 PROCEEDINGS.

Congratulations to John Cherry of Columbia College for receiving the 2000 MBAA Distinguished Paper Award. My congratulations to James Bovinet, C. Robert Newberry, Russell Smith, and Mark Young for receiving the Marketing Education Award. And congratulations to Robert Luke, Charles Pettijohn, and Linda Pettijohn for their work in receiving the Firooz Hekmat Award.

I trust this PROCEEDINGS will be a benchmark against which all future PROCEEDINGS will be measured.

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