

A Modularized Approach to GIS Instruction in Business School Curricula: The GIS Tutorials in Marketing Project

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Abstract

While the potential for integrating GIS applications into business disciplines and business education (Business GIS) has long been recognized, progress toward this objective has been tediously slow. This paper examines that progress in a specific business discipline, marketing. It also describes an approach to accelerate the integration of business geographics into marketing education, a series of course-specific business geographics tutorials scattered throughout several marketing courses. This allows students to develop business GIS skills in a task-specific context within related courses in a single discipline. It allows students to develop these skills over time while avoiding undue concentration of business GIS instruction in a single course.

I Introduction

The potential applications of GIS tools in marketing have long been recognized. However, dissemination of these tools into the discipline and into university marketing education has been relatively slow. This paper examines the reasons for this delay and describes an approach for integrating GIS instruction into several courses in the university marketing curriculum.

II The Potential for GIS Applications in Marketing

Miller, Mangold and Holmes (forthcoming) discuss potential GIS applications in the field of marketing. Among them are the traditional functions of retail site selection (O'Malley and Patterson 1997), customer profiling (Totty 2002), market area analysis (Mitchell and McGoldrick 1994) and sales force/technician/customer service routing (Weigel and Cao 1999, Boyle 2002). Further, Web-enabled GIS tools can add value to corporate Web sites, allowing users to identify nearby locations, get directions to a retail location and/or buy products online for physical pick-up at a nearby retail location (Heng, Kong, Pang, Shi and Ling 2003). In addition, the communication potential of maps and their integration with tables, reports and graphs can enhance the communications effectiveness of marketing reports systems (Akright 2005, Hess, Rubin and West 2004). This capability, coupled with the integration of enterprise information systems into GIS applications provides a fresh, spatial perspective on enterprise

data. Finally, GIS tools embedded in business intelligence systems allow managers to evaluate spatial information along with more traditional management information simultaneously and communicate results more effectively (Baker and Baker 1999, Dewett and Jones 2001, Dennis and Carte 1998, Drummond 1998, Smelcer and Carmel 1997)..

III Disappointing Progress

Despite this potential, business schools have been slow to integrate GIS instruction into their classes. In their 2005 survey of business school instructors, Brickley, Micken and Carr (2006) received 236 responses from a mailing to 2,500 business school faculty. Though 60% of respondents reported familiarity with geographic segmentation systems or GIS software, only 40% addressed segmentation in classes in any form and only 17% address GIS software. When asked how these topics were covered, only 14% of schools reported assignments using geographic segmentation tools and only 6% reported assignments with GIS software. The remainder of instruction was in the form of textbook references or class descriptions by instructors.

The good news for the marketing discipline is that 73% of the respondents in the Brickley, Micken and Carr (2006) survey are from marketing departments and that each of the performance measures above is higher for marketing departments than for business schools at large. Even here, however, the bulk of GIS instruction is in the form of textbook or lecture descriptions rather than practical applications.

IV Constraints to Implementation in Business Education

Why the slow adoption rate? Miller, Mangold and Holmes (2004) cite factors such as hardware and software costs, steep faculty learning curves for GIS tools, crowded content in marketing curricula and competing demands for attention from other information technology tools such as Customer Relationship Management systems as barriers to progress.

The respondents in the Brickley, Micken and Carr (2006) study confirm this list. Over 50% of respondents cite unfamiliarity with GIS concepts and/or software as a constraint. About 39% cite programs with no room for new electives or courses with no room for new learning activities as barriers.

On the other hand, hardware and software costs are viewed as a constraint by only about 21% of respondents. On the hardware side, this reflects a continuing trend toward lower costs for the significant computing capability demanded by GIS packages. On the software side, it may represent awareness of low or now cost GIS viewer options as well as generous licensing policies of providers such as ESRI relative to higher education users.

This set of constraints poses several problems to increased dissemination of GIS instruction. Even as infrastructure barriers are being lowered, the logistical barriers of course time, faculty resources and competing information technology demands are increasing. Clearly then, the need is for solutions which can address these logistical constraints and improve the ratio of faculty who are aware of GIS applications to those who teach them.

IV The GIS Tutorials in Marketing Project

Project Overview

The GIS Tutorials in Marketing project is a series of seven GIS instructional tutorials, each designed to be taught in a different course in the marketing curriculum. The collection will be published, along with introductory and instructional materials, as part of the ESRI Press series of GIS tutorial collections in several fields. These include health care and criminal justice in addition to marketing. Each tutorial contains a dataset in ESRI personal geodatabase format, a set of five instructional tasks which use GIS tools to solve marketing problems and a report template which provides a systematic mechanism for accumulating results from each task into an MS Word report complete with map, graph and table exhibits. The

Each tutorial is designed to take about 2-3 hours for students to complete over a period of about one week each. While the tutorial tasks can be completed in university computer labs, ESRI's student software policy allows students to install ArcView 9.1 on their own systems as well. This frees up both class time and lab time and provides flexibility in how much of each instructors choose to dedicate to the

assignments. The project also includes a tutorial introducing students to the ArcView system and another which provides an overview of the Community Tapestry segmentation system, a lifestyle segmentation tool which is used in two other tutorials.

When fully implemented, the projects tutorials will provide about 8-9 weeks of GIS instruction, roughly half a course, spread out over seven marketing courses. Thus while the commitment from any individual course is modest, the overall effect is a substantial block of GIS instruction in the marketing curriculum. Moreover, as students are solving marketing problems with GIS tools, these activities do not replace other course content, but supplement it by illustrating practical applications.

Finally, as the demands on each course is modest, faculty teaching these courses need learn only the GIS tools relevant to the assignment in their courses. This limits the training demands on valuable faculty time.

Why Marketing?

Why select marketing as the primary discipline for integrating GIS instruction into business school curricula. First, many of the most commonly used business applications are taught in marketing courses. Second, according to Brickley, Micken and Carr (2006), the number of marketing faculty addressing GIS issues is higher than that of other disciplines. Third, relevant GIS applications appear across the marketing curriculum. Brickley, Micken and Carr (2006) respondents in marketing programs report six different courses in which GIS content is taught.

This last point is significant in that it enables a multi-course approach to GIS instruction. This, in turn, allows faculty in several courses to integrate relatively modest GIS content while not sacrificing other course material unduly. This is important because the alternative, a full blown GIS course in the discipline, is offered in less than 6% of responding business schools (Brickley, Micken and Carr (2006).

Place in the Marketing Curriculum

A sample marketing curriculum is illustrated below in Figure 1. Though curricula obviously vary across schools, concern for AACSB curriculum standards have created a generally common structure which is reflected in this model.

Beyond university general education requirements, business schools typically seek to build a common set of business core competencies upon which advanced studies are based. Typically, these will include at least one marketing class required of all students. It is particularly important to offer a GIS tutorial for this course, as it is taken by all business students.

Beyond this common core of business competencies, marketing departments typically require a basic set of marketing courses. The four listed in this model are common, but not universal. Each student then completes his/her program with a selection of marketing electives. Often, elective courses are grouped in concentrations on one area marketing such as retail management, sales management, logistics, marketing research or promotion management.

In Figure 1, the globe symbol indicates that the GIS Tutorials in Marketing project includes a tutorial designed for that particular course. Taken as a whole, then, the project would integrate GIS content into the general marketing course taken by all students, the most common marketing requirements for majors and several elective courses in the curriculum. Not only does this provide significant GIS content, it clearly emphasizes the importance of these technologies across the discipline.

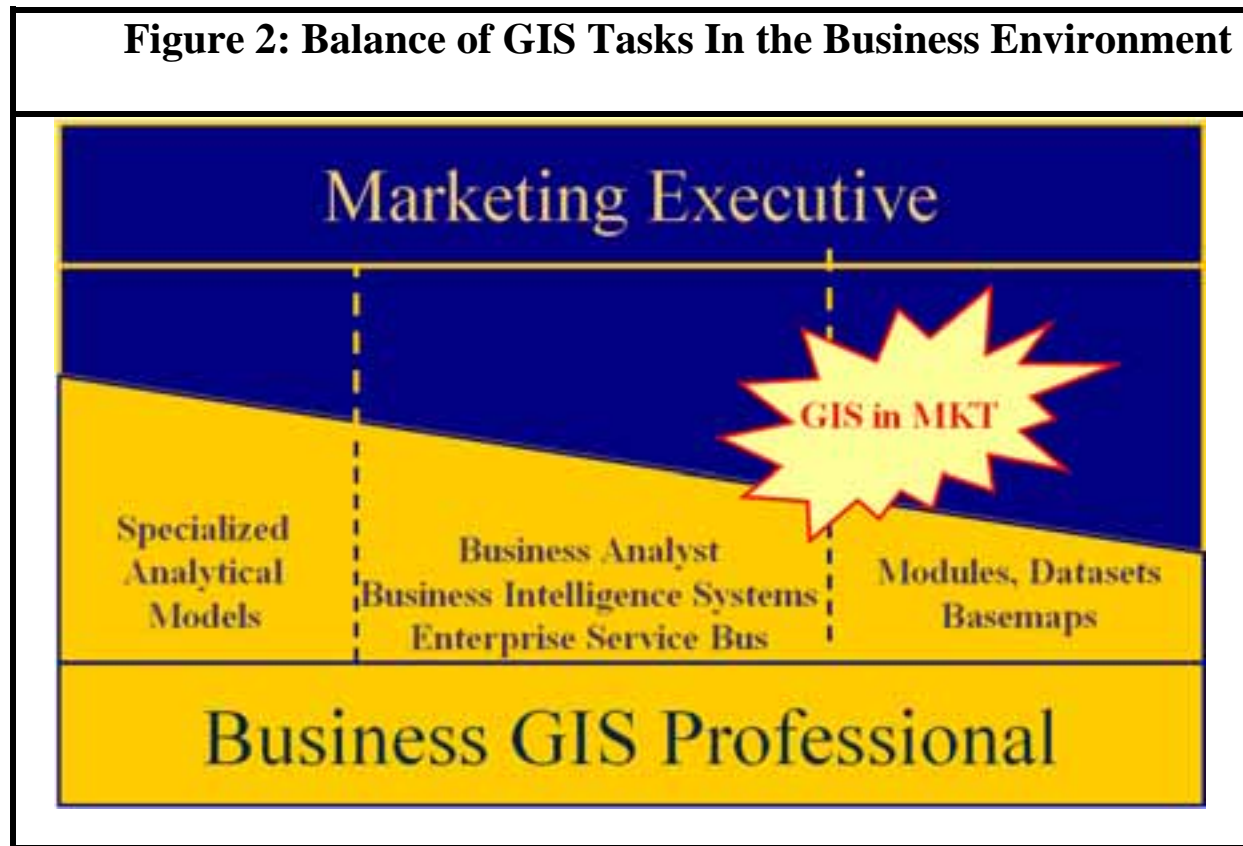
Figure 1: Typical Structure of Business School Marketing Curricula



Approach

The GIS Tutorials in Marketing project emerged from the question, “What should every marketing graduate know about GIS technologies?” Our answer to that question, in turn, is based on our perception of the GIS skills marketing managers should have. As these technologies continue to develop, we believe that marketing managers will encounter GIS technologies in several different ways, as depicted in Figure 2. This model depicts GIS applications in marketing as shared functions between marketing executives and business GIS professionals. As the model moves from left to right, the active use of the GIS tools by the marketing executive increases. The specialized analytical models at the left of the chart indicate applications in which business GIS professionals develop tools for specific tasks, while marketing executives supply a minimal range of inputs. At the right, the business GIS professional supplies the marketing executive with a set of basemaps and datasets, with the marketing executive performing most

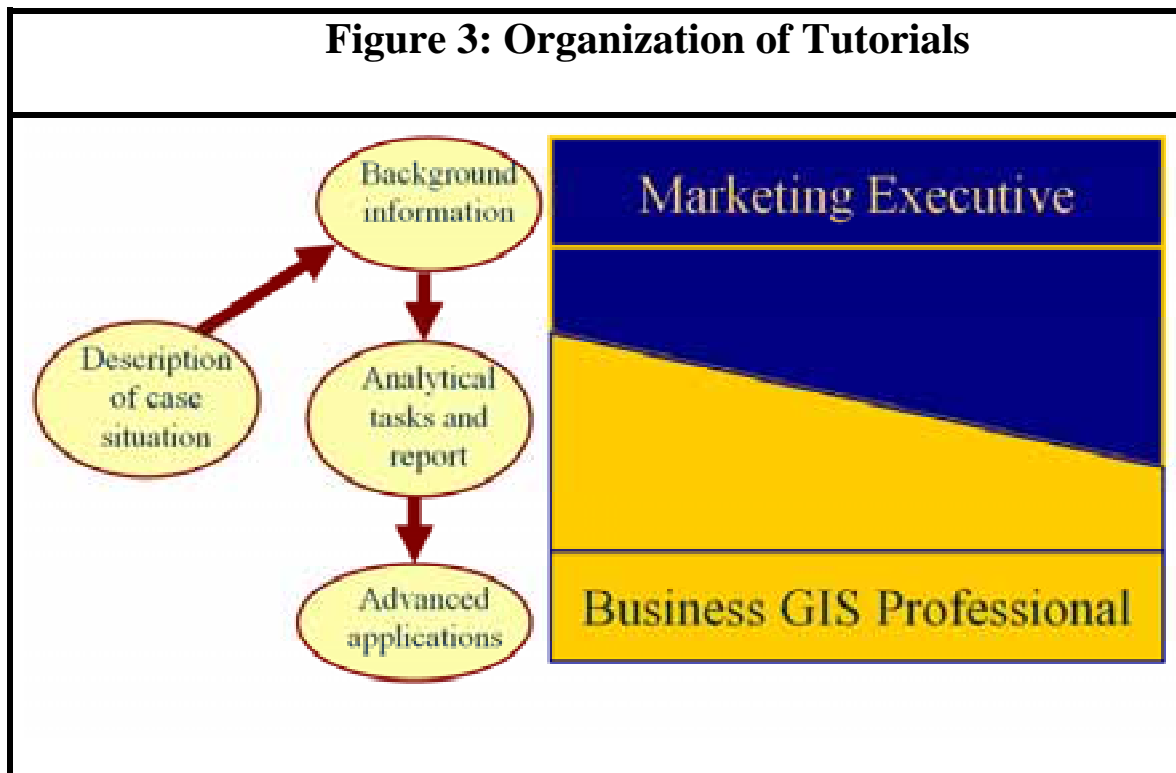
of the actual analysis. Clearly this involves more extensive knowledge of the technology. The GIS in Marketing star marks the level at which the tutorials in this collection are designed. They anticipate an active role for the executive in data analysis and mapping, but relatively little participation in the more fundamental tasks of preparing datasets and basemaps for analysis.



Given this perspective, each tutorial is designed to simulate this type of interaction between marketing and GIS professionals. The goal is to show how closely marketing tasks and GIS tools can work together. Thus, each tutorial begins with a case situation which presents the student with a marketing problem. The background information section connects the exercise to the content of a specific marketing class and provides additional information to prepare students for the exercise.

The heart of each tutorial is the next section in which students perform analytical GIS tasks related to the case problem and write a report using an MS Word template, supplied with the tutorial. The final section identifies additional GIS tools in the relevant field of marketing, pointing out GIS potential

beyond the scope of the introductory exercises. Figure 3 illustrates how the components of each tutorial relate to the interaction between marketing and business GIS professionals we envision.



Overview of tutorials

The objective of the GIS Tutorials in Marketing project is to spread GIS instruction over several courses in the marketing curriculum. Table 1 lists a common set of marketing courses, the marketing application in the related tutorial, the organization and situation involved in the marketing case for each tutorial and the GIS applications relevant to the solution of the marketing problem. Taken together, the tutorials provide a substantial base of GIS skills all addressed at important topics in key marketing courses.

Table 1: Program Tutorials, Related Courses and Learning Objectives

COURSE	MARKETING APPLICATION	ORGANIZATION AND SITUATION	GIS APPLICATION
Principles of Marketing	Demographic Segmentation	A camping equipment firm wishes to implement its segmentation strategy in Florida uses progressively more detailed demographic analysis to target its promotional efforts	Using thematic maps to analyze geographic distribution of target market and to select retail outlets for outdoor shows
Consumer Behavior	Demographic, Lifestyle and Purchasing Behavior Analysis	A Chicago furniture store wishes to match Tapestry lifestyle patterns with consumer buying trends	Using Community Tapestry and Market Potential Indices data to refine marketing strategies
Promotion	Business to Business and Business to Consumer Promotion Strategy	An organization of local food producers in Lexington, KY wishes to identify firms for business-to-business promotion and customize business-to-consumer advertising to generate demand for locally produced food products	Using spatial and attribute selection to target food outlets and restaurants. Using Community Tapestry data to customize consumer advertising
Marketing Research OR eCommerce	Creating Customer Profiles Using Socioeconomic and Demographic Data	An electronic retailer wishes to create a demographic profile of electronic newsletter subscribers in New York via geodemographic overlay	Using geodemographic overlay to attach demographic information to user records, analyzing the results to create a customer profile
International/Global Marketing	Country Market Assessment	A managerial training firm wishes to assess international marketing opportunities using World Bank demographic, socioeconomic data and Hofstede's cultural indices	Using socioeconomic and demographic data for preliminary country screening and Hofstede cultural indices for final country selection
Sales Management	Sales Territory Definition	A wine distributor in Portland, OR wishes to design sales territories which balance prospects and sales potential	Using editing functions to create, revise and refine sales territories balanced in number of prospects and sales potential
Retail Management	Site Selection	A San Francisco book retailer wishes to select a new store location based on customer analysis of existing stores and market area characteristics of available properties in San Francisco.	Using San Francisco demographic data, customer information and several trade area models to select the best site for a new store

Sample tutorial: Outdoor Living in Florida

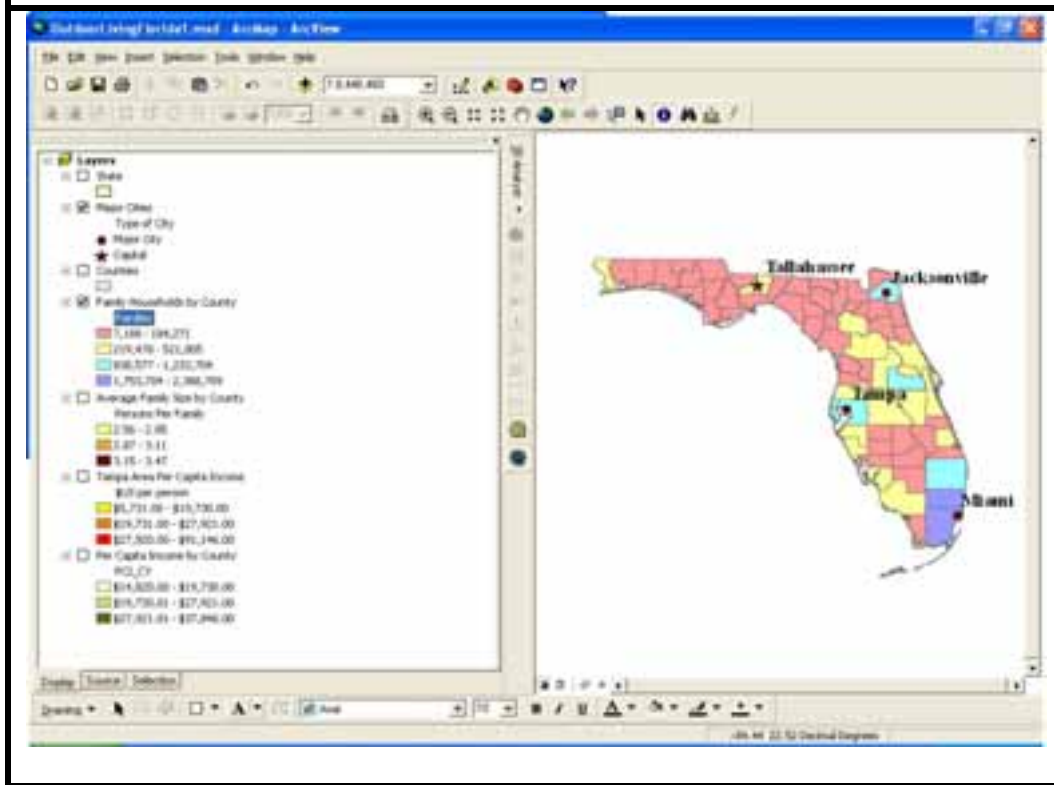
The Outdoor Living in Florida tutorial accompanies the Principles of Marketing course, the introductory course in the marketing curriculum. It is also the marketing course most commonly required of all business students. Thus, it presents an opportunity to expose many business students, not simply marketing students, to GIS tools

This tutorial covers implementation of segmentation strategy. Market segmentation, the proposition that markets consist of groups of customer with differing sets of needs that should be met with differing marketing strategies, is a fundamental tool of the discipline. Here it arises in the case of camping and recreational equipment producer which is introducing a new model aimed at middle income families new to the camping experience.

Armed with a description of the target market and demographic data for various geography levels in the state of Florida, students use GIS tools to target portions of the state for each of the three components of Outdoor Living's promotional campaign in the state.

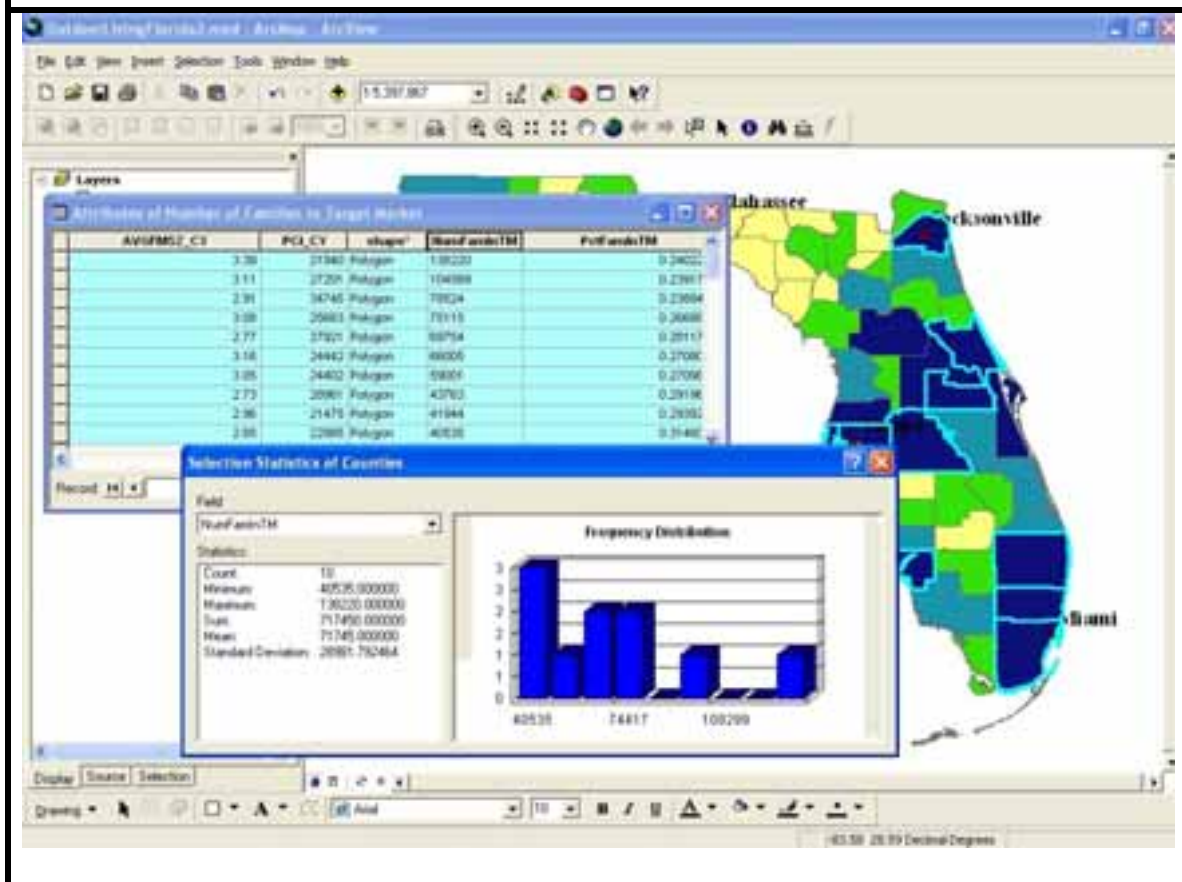
Their first task is general exploration of Florida's demographic characteristics using thematic maps as a tool. Here they learn as well about various levels of geographic units and their relationship.

Figure 4: Thematic Maps of Florida Demographics



The second task in the tutorial is to select the ten counties in Florida with the highest number of target market families. These counties will be the focus of Outdoor Living's advertising campaign through local broadcast and print media. Students manipulate data tables to make their selections and maps to illustrate them.

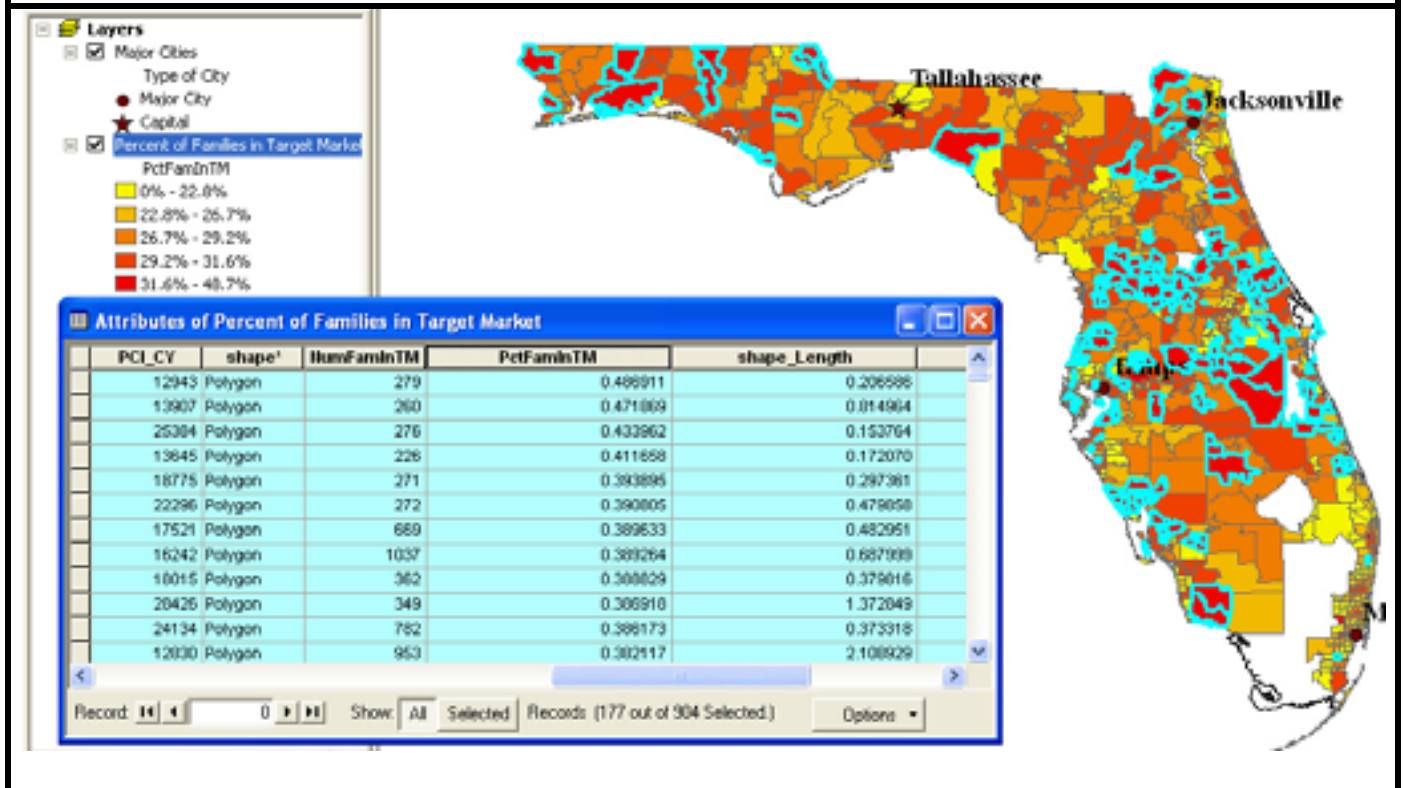
Figure 5: Selection of Counties for Advertising Campaign



The second component of the advertising campaign is a direct mailing offering incentives to families to visit participating retailers and evaluate the new camper model. To maximize the response rate for the campaign, Outdoor Living wishes to target the ZIP codes with the highest percentage of families in the target market. Further, budget constraints limit the number of families to be included in the mailing.

In this task, students repeat their selection process, but do so using new geographic units and a new measure of target market presence. They also learn to adjust the selection process marginally to meet the financial constraints of the budget.

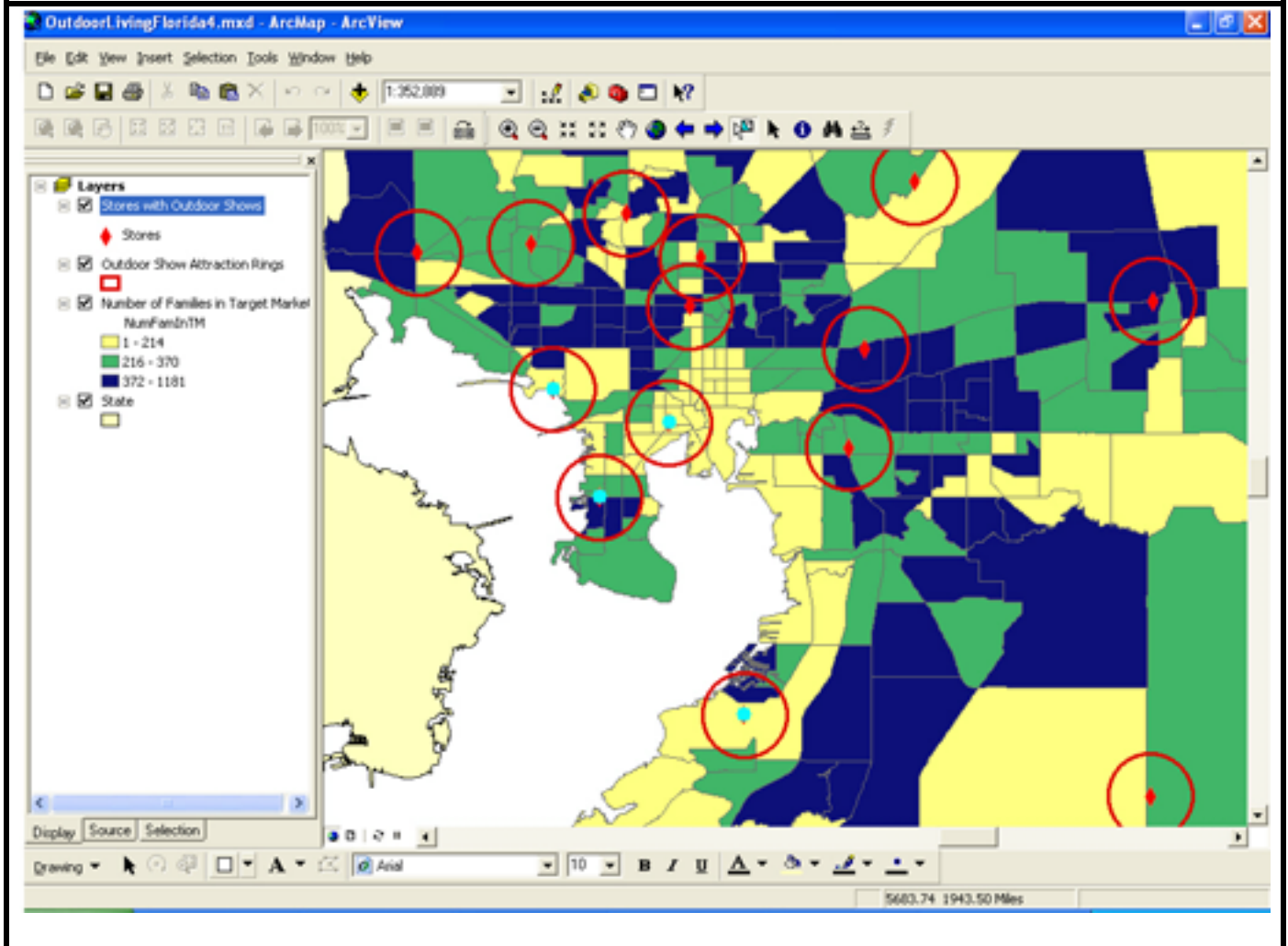
Figure 6: Selection of ZIPs for Direct Mail Campaign



The third component of Outdoor Living's promotional campaign in Florida is exhibits at outdoor shows sponsored by recreational equipment retailers. As these shows are local, the tutorial concentrates on the Tampa area in Hillsborough County. In this task, the selection process is entirely spatial. Students work with a thematic map of Tampa area depicting the number of target market families by census tract. Recreational equipment stores with outdoor shows are also depicted, each with a two mile buffer which is the estimated range from which new prospects might travel to an outdoor show.

Outdoor Living's budget will support four shows. The challenge is to identify four locations, each of which is located near a concentration of prospects and which, taken together, geographically balanced exposure to the Tampa area. While the first two selection processes produce uniform results, this one does not. Several combinations of stores meet the selection criteria.

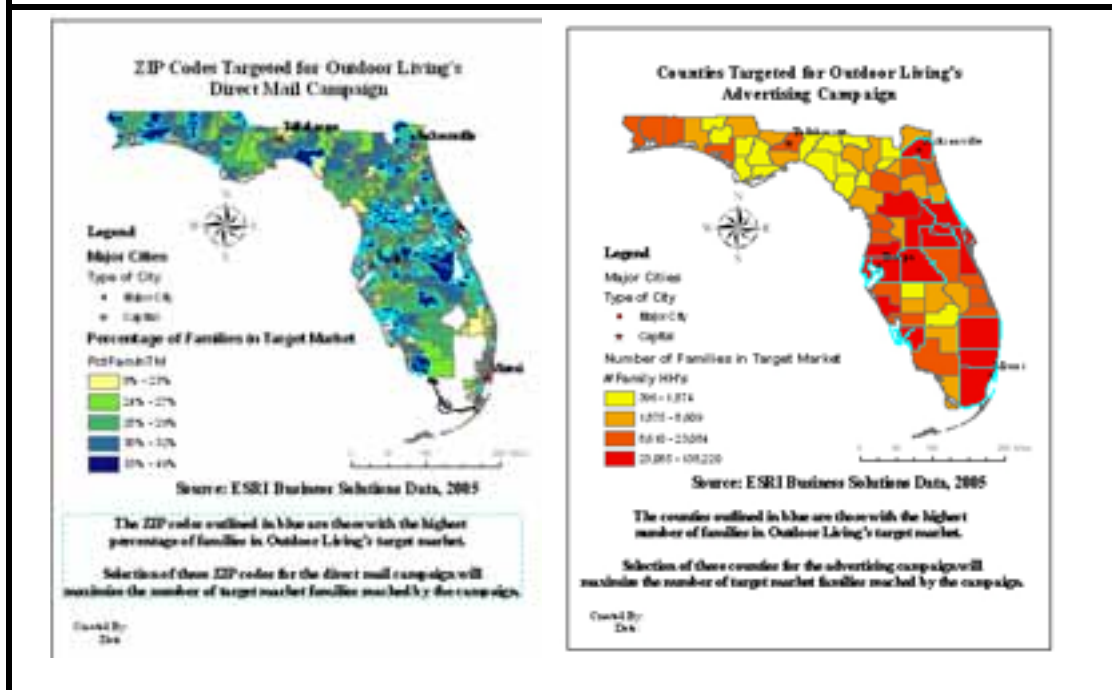
Figure 7: Selection of Stores for Outdoor Shows



As students complete each task in the tutorial, they answer a series of questions and accumulate their answers in a MS Word report template which presents the results of their analyses. This document also includes two map documents which illustrate their results and support their recommendations. Working with map documents in layout view, students are now focusing on the visualization and communication capabilities of GIS applications.

Once the map documents are complete they are integrated into the report template and submitted to the instructor with the final report. Thus, students have encountered a marketing problem, addressed it with GIS tools, formulated a set of recommendations and presented those recommendations in print format with the visual support of map documents.

Figure 8: Design of Map Documents as Report Exhibit



The final component of each tutorial is a brief description of advanced applications. This section discusses additional GIS capabilities relative to the marketing problems and describes organizations with relevant GIS implementations. This discussion serves to acquaint students with more advanced GIS applications which they will encounter in their careers. The hands-on experience acquired in the tutorial helps them appreciate the potential, and the limitations, of these implementations.

V Evaluation of Initial Implementation

As of Spring 2006, four of the tutorials in this collection have been tested in a total of six different marketing course taught by three different instructors. All the instructors report successful implementation in terms of manageability, successful integration of course contents and high levels of student success in completing assignments.

Table 2 reports student responses on a questionnaire soliciting their perceptions of these learning activities. The results are grouped into strategic, tactical and integrative items. Strategic items refer to the integration of activities into the course, their relevance and effectiveness in teaching important skills.

Tactical items cover logistical areas such as workload and adequacy of tutorial teaching materials.

Integrative items report overall satisfaction with the assignment and perception of its value.

The survey scale was a five point Likert Scale where 1 = Strongly Disagree, 3 = Neutral and 5 = Strongly Agree.

As a whole these results indicate a reasonable level of success in initial implementation. All values are on the positive end of the scale. Among the strategic questions, it is very positive that students learned about GIS tools (4.11) as well as course content (4.07) and that they judged the assignments appropriate for the course (4.29). These results indicate that the goal of integrating GIS and marketing instruction in a relevant way is being met.

Though not as strongly positive, student satisfaction with the structure (3.91) directions (3.86), information provided (3.91) and terminology (3.89) suggests that the tutorials are constructed fairly well. It is important to note here, however, that these responses are spread over several tutorials, which are continuously revised based on instructor and student feedback. One tutorial in particular is in its fourth generation of significant revision. Therefore, these results should be interpreted as modest gains toward an illusive goal, rather than achievement of some instructional Holy Grail. This is reflected in the integrative measure of overall satisfaction (3.82) which, though positive, lags many of the individual items.

In addition, several other items reveal potential areas for improvement. Students are fairly lukewarm about the amount of work involved (3.36) and the value of their learning relative to the time required (3.44). These views may well be related to two other items with modest results, the usefulness of knowledge and skill learned (3.64) and the ability to apply text material (3.66). Taken together, these values suggest that, though students see the general relevance of these tutorials, the specific connections to text material and important workplace skills have yet to be made. Increased emphasis on these areas in the delivery and administration of the tutorials is necessary to improve these scores.

Table 2: Student Evaluation of Four GIS Tutorials

Question	Mean	SD
Strategic Items		
This assignment helped me learn about course content.	4.07	.51
This assignment helped me learn about Geographic Information Systems.	4.11	.62
The amount I learned from this assignment made the time I invested in it worthwhile.	3.44	.82
This assignment enabled me to apply material presented in the textbook.	3.66	.80
This assignment was appropriate for the course.	4.29	.57
This assignment gave me an opportunity to develop my problem solving skills.	3.71	.80
This assignment gave me an opportunity to develop my computer skills.	3.65	.90
This assignment gave me an opportunity to develop my written communication skills.	3.43	.74
This assignment gave me an opportunity to develop my analytical skills.	3.85	.68
Tactical Items		
This assignment was a lot of work.	3.36	.95
I was given adequate information to complete this assignment.	3.91	.84
The directions for completing this assignment were clear.	3.86	1.01
The terminology used in this assignment was clear.	3.89	.80
Before starting this assignment, I was confident that I had the skills and ability to complete the assignment.	3.58	..92
This assignment was adequately structured.	3.91	.72
Integrative Items		
Overall, I am satisfied with this assignment.	3.82	.73
The knowledge and skills I gained from this assignment will be helpful in the workplace.	3.64	.76
If I were discussing this assignment with a friend, I would evaluate it favorably.	3.62	.89
1 = Strongly Disagree 3 = Neutral 5 = Strongly Agree		

VI Conclusions

In sum, both faculty and student evaluations support the conclusions that integrating GIS modules into marketing courses can be effective way of improving student learning of both marketing and GIS content. Doing so with discrete, highly focused GIS tutorials can achieve these objectives with a modest commitment of precious class time. In addition, the learning curve for marketing faculty is reduced, as they need only focus on the GIS skills required for the modules in the courses they teach, rather than developing the full range of skills necessary to create basemaps, datasets and instructional materials. This approach also takes advantage of the wider availability of GIS software through the use of site licenses and the student version of ArcView software. The results of initial implementation of this approach suggest its potential for enhancing the GIS skills of marketing students is quite high.

REFERENCES

- Akwright, James (2005). Successful Integration of Business Intelligence and GIS. Proceedings ESRI GeoInfor Business Summit. April 2005.
- Baker, Sunny and Kim Baker (1999). Mapping and data solutions for strategic visualization. Journal of Business Strategy, Vol. 20 Issue 5, 20-22
- Boyles, David (2002). GIS Means Business: Volume 2; Redlands. CA. Environmental Systems Research Institute, Inc.
- Brickley, Mark, Kathy Micken and Ben Carr (2006), Can GIS Play a Role in the Business Curriculum? Proceedings: Northeast Decision Sciences Institute, March, 2006.
- Dennis, Alan R. and Traci A. Carte (1998). Using Geographical Information Systems for Decision Making: Extending Cognitive Fit Theory to Map-Based Presentations. Information Systems Research, June, Vol. 9 Issue 2, 194-204.
- Dewett, Todd and Gareth R. Jones (2001). The Role Of Information Technology In The Organization: A Review, Model, And Assessment. Journal of Management, Vol. 27 Issue 3, 313-66.
- Drummond, Sara (1998). Mapping a Better Presentation. Commercial Investment Real Estate, Nov/Dec, Vol. 17 Issue 6, 32-36.
- Engelhardt, Jim (2002). E-business GIS For Oil and Gas. Geospatial Solutions, Sep, Vol. 12 Issue 9, 14-23.
- Erevelles, Sunil, Nanda Viswanathan, and Chris Huntley (1998), "The Use of GIS in Marketing" in *Great Ideas for Teaching Marketing*, Eds. Joseph Hair, Charles Lamb and Carl McDaniel, Cincinnati, OH, South-Western College Publishing.
- Evans, Martin; Clive Nancarrow, Alan Tapp and Merlin Stone (2002). Future Marketers: Future Curriculum: Future Shock? Journal of Marketing Management. July, Vol. 18 Issue 5/6, 579-96.
- Fung, D.S. and A.P. Remsen (1997). Geographic Information Systems Technology For Business Applications. Journal of Applied Business Research, Summer, Vol. 13, Issue 3.
- Godin, Lisa (2001). GIS in Telecommunications. Redlands, CA, Environmental Systems Research Institute, Inc.
- Goor, Wilpen L. and Kristen S. Kurland (2005), *GIS Tutorial: Workbook for ArcView 9*, Redlands, CA, Environmental Research Institute Inc.
- Grimshaw, David J. (1994). Bringing Geographical Information Systems Into Business. New York, Wiley.
- Harder, Christian (1997). ArcView GIS Means Business. Redlands, CA, Environmental Systems Research Institute, Inc.

- Harder, Christian (1999). Enterprise GIS for Energy Companies. Redlands, CA, Environmental Systems Research Institute, Inc.
- Heng, Li, C.W. Kong, Y.C. Pang, W.Z. Shi and Yu Ling (2003). Internet-Based Geographical Information Systems System for E-Commerce Application in Construction Material Procurement. Journal of Construction Engineering & Management; December, Vol. 129 Issue 6, 689-98.
- Hess, Ronald, Ronald Rubin and Lawrence West Jr. (2004). Geographic information systems as a marketing information system technology. Decision Support Systems, November, Vol 39, Issue 2, 197-213.
- Holmes, Terrence (2004). The Role of GIS in the Marketing Curriculum. Unpublished manuscript.
- Miller, Fred L., W. Glynn Mangold, and Terence L. Holmes (forthcoming), "Integrating GIS Applications into Business Courses Using Online Business Geographics Modules," *Journal of Education for Business*
- Mitchell, V.W. and Peter J. McGoldrick (1994). The Role Of Geodemographics In Segmenting And Targeting Consumer Markets: A Delphi Study. European Journal of Marketing, Vol. 28 Issue 5/6, 54-73.
- O'Malley, Lisa and Maurice Patterson (1997). Retailer Use Of Geodemographic And Other Data Sources: An Empirical Investigation. International Journal of Retail & Distribution Management, Vol. 25 Issue 6/7, 188-96.
- Ormsby, Tim, Eileen Napoleon, Robert Burke, Laura Feaster, and Carolyn Groessl (2004), Getting to Know ArcGIS Desktop: 2nd Edition, Redlands, CA, Environmental Research Institute Inc.
- Smelcer, John B. and Erran Carmel (1997). The Effectiveness of Different Representations for Managerial Problem
- Smith, Carlo D., John C. Langley and Ray Mundy (1998). Removing the Barriers Between Education and Practice: Tools and Techniques for Logistics Management. Journal of Business Logistics. Vol. 19 Issue 2. 173-95.
- Totty, Patrick (2002). Pinpoint members with new data-mining tools. Credit Union Magazine, April, Vol. 68 Issue 4, 32-35.
- Vlachopoulou, Maro, George Silleos and Vassiliki Manthou (2001). Geographic information systems in warehouse site selection decisions. International Journal of Production Economics, Vol. 71 Issue 1-3, 205-213.
- Weigel, Don and Buyang Cao (1999). Applying GIS and OR Techniques to Solve Sears Technician-Dispatching and Home-Delivery Problems. Interfaces, Jan/Feb, Vol. 29 Issue 1, 112-31