GIS Best Practices

GIS for Retail Business

February 2007

ESRI

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What Is GIS?

Making decisions based on geography is basic to human thinking. Where shall we go, what will it be like, and what shall we do when we get there are applied to the simple event of going to the store or to the major event of launching a bathysphere into the ocean's depths. By understanding geography and people's relationship to location, we can make informed decisions about the way we live on our planet. A geographic information system (GIS) is a technological tool for comprehending geography and making intelligent decisions.

GIS organizes geographic data so that a person reading a map can select data necessary for a specific project or task. A thematic map has a table of contents that allows the reader to add layers of information to a basemap of real-world locations. For example, a social analyst might use the basemap of Eugene, Oregon, and select datasets from the U.S. Census Bureau to add data layers to a map that shows residents' education levels, ages, and employment status. With an ability to combine a variety of datasets in an infinite number of ways, GIS is a useful tool for nearly every field of knowledge from archaeology to zoology.

A good GIS program is able to process geographic data from a variety of sources and integrate it into a map project. Many countries have an abundance of geographic data for analysis, and governments often make GIS datasets publicly available. Map file databases often come included with GIS packages; others can be obtained from both commercial vendors and government agencies. Some data is gathered in the field by global positioning units that attach a location coordinate (latitude and longitude) to a feature such as a pump station.

GIS maps are interactive. On the computer screen, map users can scan a GIS map in any direction, zoom in or out, and change the nature of the information contained in the map. They can choose whether to see the roads, how many roads to see, and how roads should be depicted. Then they can select what other items they wish to view alongside these roads such as storm drains, gas lines, rare plants, or hospitals. Some GIS programs are designed to perform sophisticated calculations for tracking storms or predicting erosion patterns. GIS applications can be embedded into common activities such as verifying an address.

From routinely performing work-related tasks to scientifically exploring the complexities of our world, GIS gives people the geographic advantage to become more productive, more aware, and more responsive citizens of planet Earth.

GIS for Retail Business

Successful businesses use GIS software. Organizations can go beyond standard data analysis by using GIS tools to integrate, view, and analyze data using geography. These applications can be used across an entire organization, in the field, and on the Internet.

Retail business processes, including market analysis, site selection, merchandising, distribution, delivery, and facilities management, involve geographic relationships. GIS enables retailers to understand and visualize these geographic relationships and improve productivity, effectiveness, and efficiency in these processes.

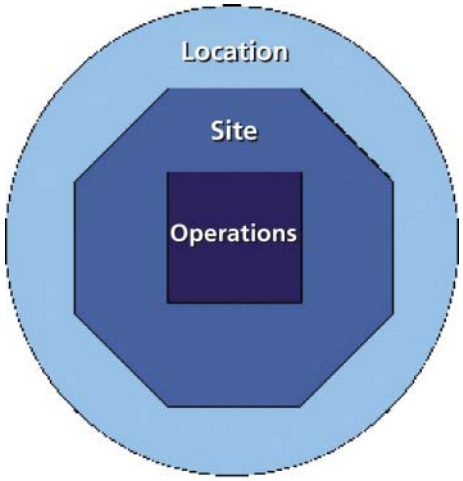
Predictive investigators such as market and customer analytics are also enhanced by GIS. Many different forms of real-world and modeled data can be used with it to understand the demographic, competitive, and psychographic interaction of consumers, suppliers, and the geographic space in which the data is distributed.

The beauty and power of GIS is that it allows companies to consider many possibilities, understand potential, review the impact of different investments, store and produce configurations, and analyze changing trends in the retail landscape. No other software technology has such a far-reaching potential. Find out what ESRI customers have known for years—that GIS grows their business success.

Site Selection Approaches

How do you choose a successful retail site? "Location, location, location," that oft-repeated mantra as the ultimate reason for retail site selection success, is true up to a point. Typically, retail success means placing a site in an area of high demand potential and high visual exposure. There are other important components to retail site selection success, but no site will be successful without giving due consideration to the elements that drive sales around the store.

Site selection is an issue for many different kinds of businesses. Retailers, franchisors, banks, savings and loans, and health care and service providers of all types face the common issue of placing sites in close proximity to their customers and prospects. In addition, commercial Realtors use site selection techniques to prove the suitability of a property for a specific concept to prospective lessors. There are many ways to address site selection from the original "kicking-the-dirt" method to sophisticated modeling techniques. GIS provides the framework in which all these techniques can be utilized. But first, let's look at what factors contribute to successful site location.



Site Success Factors.

Successful Site Factors

What elements contribute to the success of a site? In general, the factors that contribute to the success of a site can be categorized as (1) operations, (2) site, and (3) location. There have been several attempts to ascertain the relative importance of each of these three major categories, but each is important in its own right and can sink a business if not carefully controlled.

Operational factors are generally those elements that can be controlled inside the walls of the building. Such things as store management, customer service, merchandise mix, cleanliness, displays, decoration, and layout are examples of important operational elements.

Site factors are elements related to the unique physical layout of the building and the property surrounding it. Elements such as parking spaces, signage, square footage, landscaping, accessibility, ingress/egress, center type, and whether a freestanding or connected building are all important site elements.

Location factors that contribute to site selection success include demographics, consumer demand, traffic counts, traffic generators (shopping centers, hospitals, airports, stadiums), daytime population, competition, complementary businesses, and lifestyle.

All three of these factors can be quantified and stored as a geodatabase within a GIS. GIS facilitates the analysis of new sites using baseline success available from existing sites. GIS also allows for the ongoing management and reevaluation of existing sites and all their physical components.

Site Selection Techniques

The Intuitive Expert

Site selection usually begins with an entrepreneur who invents a successful concept and begins to expand that concept geographically by opening new stores. Those who succeed at expanding their operations initially use little, if any, quantitative methodology for site selection. Instead, they are "intuitive experts," being able to identify successful sites by the "look and feel" of the property and neighborhood. Some intuitive experts will drive the neighborhood and kick the dirt; others fly over the town in a leased airplane looking for the next best place to expand. Since the number of locations is still small, the owner is also able to monitor the day-to-day operations of the handful of stores in the organization, thus ensuring operational integrity. But as the original owner's span of control expands, it becomes more and more difficult to control all aspects of his chain. Problems start to occur, one of which will be the opening of a poorly performing site.

Site Comparison

One of the most basic techniques in site selection is to find sites that are just like existing sites. This technique involves running radii or drive-time reports around a chain or franchise's existing sites to establish some baseline demographic measures. Which variables, such as age, income, ethnicity, traffic, daytime population, etc., are considered keys to success are determined by the real estate department of the chain. Each time a new site is considered, reports are run on the site and the key variables are examined or compared to those of existing sites. These reports are generated from sources such as ArcGIS Business Analyst and Business Analyst Online. ArcGIS Business Analyst also incorporates a "same as" wizard that automates the process of site comparison. Many commercial Realtors also include these reports in their property marketing literature for prospective lessors.

Site Scoring

As a further refinement to site comparison, companies will use site scoring models to rate potential sites. Site scoring models, such as ESRI's Scorecard, use correlation between existing sites' sales revenues and the demographic, business, and other variables in their market areas. Careful consideration is given to factors such as store age, concept, and square footage to ensure that the sites in the sample are as similar as possible. The results of the analysis usually yield a set of between 6 and 10 report variables that have either a highly positive or highly negative correlation to the sales revenues of a company's existing locations. These variables and their significant ranges are listed in a Scorecard and used to score each potential site. Sites scoring well "pass," and sites scoring poorly "fail" the test. Scorecards are wonderful for risk mitigation and helping companies avoid potentially bad sites, but they do not quantify or identify potential sales at a site.

Gravity Modeling

Site selection becomes even more complicated when a company begins inserting new sites into a market that already has existing sites. Not only must competition be considered, but cannibalization of existing store trade areas becomes an issue as well. Dr. David Huff pioneered the use of gravity models to address such issues. Gravity modeling is the idea that the probability of a given consumer visiting and purchasing at a given site is some function of the distance to that site, the site's attractiveness, and the distance and attractiveness of competing sites. Attractiveness is typically defined by size but may also be defined by a store's merchandise mix and its appeal to a certain lifestyle. Gravity models, enabled in a GIS such as ArcGIS Business Analyst, provide users with the ability to do what-if analyses for prospective site locations. They quantify the extent of a new site's share of a market as well as provide a

vivid, visual picture in the form of a map of the impact of a new site location. Gravity models have proved to be a durable tool in evaluating new site location.

Multiple Regression Modeling

Searching for a way to predict store sales has led to the use of multiple regression analysis in site selection. This technique seeks to identify how all the variables at a site interact with one another to produce a specific sales outcome. The success of this technique depends on the practitioner's ability to accurately quantify all the factors—operations, site, and location—that can affect sales. It can be problematic to quantify subjective variables such as customer service, merchandise mix, landscaping, and signage. But when applied correctly, this technique can accurately predict, to a given margin of error, the expected revenue of a potential site. These models may be loaded into a GIS and used to predict the sales potential of prospective sites.

However, multiple regression models have their drawbacks. They can be expensive; take a long time to develop; and be compromised by the introduction of a new concept, merchandise mix, or competitor. Time, or change, is the worst enemy of a multiple regression model. These models must be rebuilt at least annually to retain their predictive capabilities. Changes over time in any of the variables affect the overall interaction of all the variables and, thus, the predictive power of the model. They also suffer from being a "black box" that many in an organization won't understand or trust.

Customer Profiling

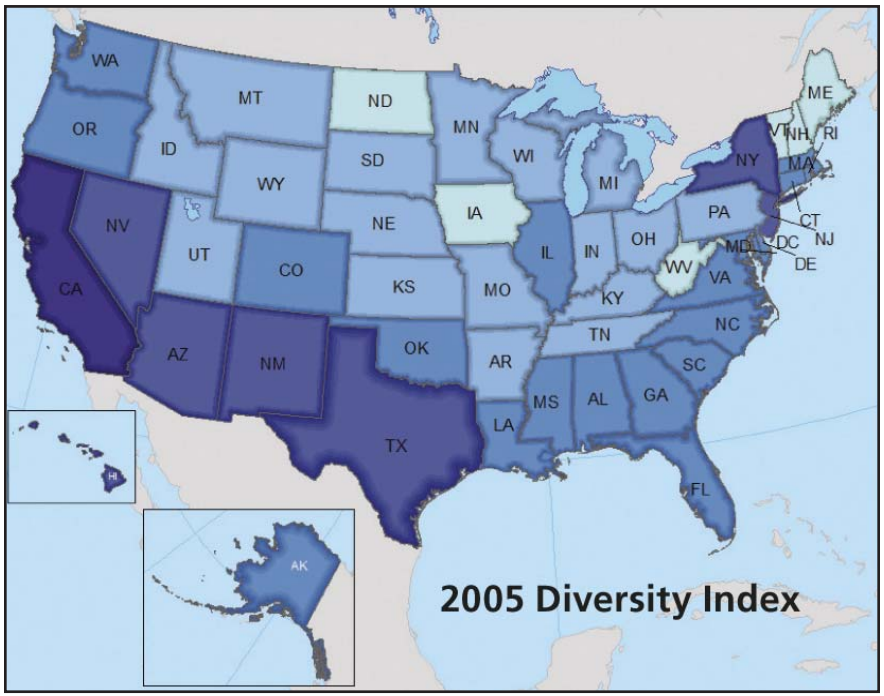
Most retailers have little customer information available because of the cash-and-carry nature of their businesses or the lack of systems to collect customer data. Consequently, the preceding site selection tools rely wholly on factors that do not include actual customer information. However, customer profiling is, perhaps, the foremost tool for finding that next successful site. Where customer addresses can be collected—whether through surveys, delivery records, credit card transactions, loyalty programs, etc.—customer profiling is possible. ESRI's ArcGIS Business Analyst and Community Coder software enable businesses to use Community Tapestry, the foremost geodemographic segmentation system, to profile their customers. The Community Tapestry segmentation system—www.esri.com/ tapestry.html—provides an accurate, detailed description of U.S. neighborhoods. U.S. residential areas are divided into 65 segments based on demographic variables such as age, income, home value, occupation, household type, education, and other consumer behavior characteristics.

A Tapestry profile creates a distribution table of a company's customers by Tapestry segment. Typically, 6 to 10 segments will contain the majority of a company's customers. Since Tapestry is based on geography (census block groups or ZIP+4), users can easily scan markets and rank prospective sites based on the number of Tapestry households or individuals that match their key segment profile. Tapestry has the advantage of allowing companies to not only understand where their best customers are located but also what they read, watch, and listen to. Thus, media campaigns to generate store traffic can be planned for grand openings and existing stores. In addition, Tapestry cross-references other products and services that a company's target segment may use. This information can be used to adjust the merchandise mix for the whole chain or individual stores based on the Tapestry segments. Comarketing opportunities with specific products and services or other retailers can also be identified using Tapestry.

Conclusion

Most businesses that deal with site selection issues travel a continuum from a sharp entrepreneur's intuitive expertise to advanced modeling techniques. What works well for one company may not work as well for another. Different companies have different concepts, cultures, and levels of sophistication. The site selection process must be trusted by both the managers and the analysts in an organization. It must also fit the strategy of the organization as well, whether it is new site risk mitigation, market backfilling, or sales revenue optimization. Whichever method is preferred, using GIS has proved to be a superior method to manage the process of site selection for businesses all over the United States.

Maptoid



The Diversity Index summarizes racial and ethnic diversity for an area. States with the most diversity are CA, HI, and NM. States with the lowest diversity index are WV, VT, and ME.

(Reprinted from the Winter 2005/2006 issue of *BusinessGeoInfoNews*)

Food Producers Go to Market With GIS

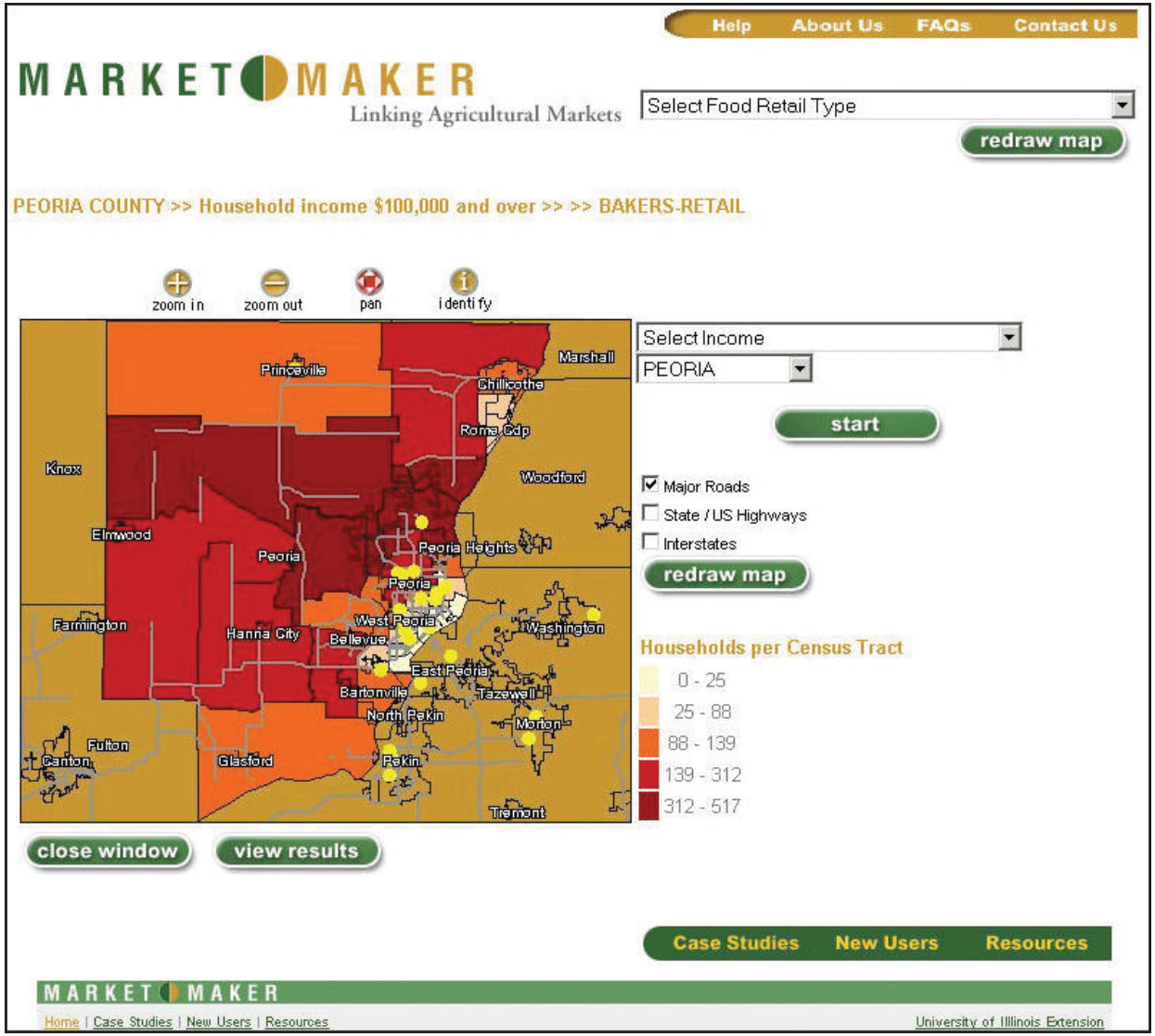
New Illinois Web Site Provides One-Stop for Strategic Marketing Information

Thanks to a collaborative effort between the University of Illinois Initiative for the Development of Entrepreneurship in Agriculture (IDEA), the Illinois Department of Agriculture, and the Illinois Council on Food and Agricultural Research (C-FAR), food producers, buyers, sellers, and distributors in Illinois now have an online marketing tool.

The idea for an Internet marketing tool was an outgrowth of previous C-FAR projects exploring market opportunities for value-added meat products. The goal was to provide a one-stop shop for strategic marketing information for producers and food retailers alike. There is an abundance of marketing data available via the Internet and through various trade magazines, but to a novice user it can be a bit overwhelming. As a result, IDEA and C-FAR explored the idea of an Internet tool that would provide users the ability to query various types of data and produce reports and maps. The goal of the project was to distill and organize the information into an easy-to-use interactive site using state-of-the-art mapping tools that would let users visualize strategic marketing information.

Darlene Knipe, principal investigator for the project, contacted GIS Solutions, Inc., an ESRI Business Partner in Illinois, to explore the possibilities of developing the strategic marketing tool. GIS Solutions recommended an ArcIMS application. After submitting a project bid, GIS Solutions was selected to develop the project.

The Web site, called MarketMaker (www.marketmaker.uiuc.edu), is an interactive site developed in ArcIMS and designed to find supply chain partners, improve knowledge of where food consumers are located, and determine how they make food-related purchasing decisions.



Users can explore with MarketMaker to find a new market for their products.

"We had to be able to answer questions such as who were the consumers who were most likely to buy the kinds of products we were evaluating," explains Peter Goldsmith of the University of Illinois Department of Agricultural and Consumer Economics and a member of the MarketMaker team.

Getting Marketing Information

The MarketMaker Web site includes census, demographic, and business data that the user can query. Mapping and data entry processes were built using Active Server Pages (ASP) and ArcIMS. Census and additional data is stored in SQL Server, and spatial data is currently stored as shapefiles. Users are able to search available data using ActiveX Data Objects (ADO) and ASP, which return a list of businesses meeting the search criteria. A link to the mapping page enables users to map business locations or display detailed information incorporating census tract information.

A registration page provides new businesses with the ability to submit their information to the MarketMaker database. New records are reviewed by a MapObjects application that automatically geocodes the addresses and appends them to the existing shapefile. If the new address cannot be matched, then geocoding is performed at the ZIP Code level.

Users can view summarized details on a map to show concentrations of consumer markets and strategic business partners. "Providing this kind of information in a map-based format makes much more sense than business lists and statistical tables," states Pat Curry, a project coinvestigator.

Following are some examples of how people are using the MarketMaker site:

- A cattle producer from western Illinois wanted to sell a branded beef product to high-end consumers in the Chicago area. He believed the best potential customers would be households in which income is in excess of $100,000, and he used MarketMaker to answer three questions: (1) Where are the highest concentrations of high-income households in the greater Chicago area? (2) What are the names of the grocery stores that serve those high-end neighborhoods, and where are they located? and (3) What are the names and locations of meat processors?

- A producer from the northwest region of Illinois had several recipes he wanted to share. Two in particular were his pickled jalapenos and salsa. He has had offers to sell his product in stores, but he does not have the capacity to make these products in bulk. It would require him to have a certified kitchen, which is very costly for someone just starting out. His next option was to look for a packing company to do the work for him, and he used MarketMaker to find a suitable company.

The Next Phase

Since there is no complete list of Illinois farmers producing and marketing food-related products, the University of Illinois Extension educators will be reaching out to the producers statewide to include their ventures in MarketMaker. There is no charge associated with having a business listed.

(Reprinted from the Winter 2004/2005 issue of *ArcNews* magazine)

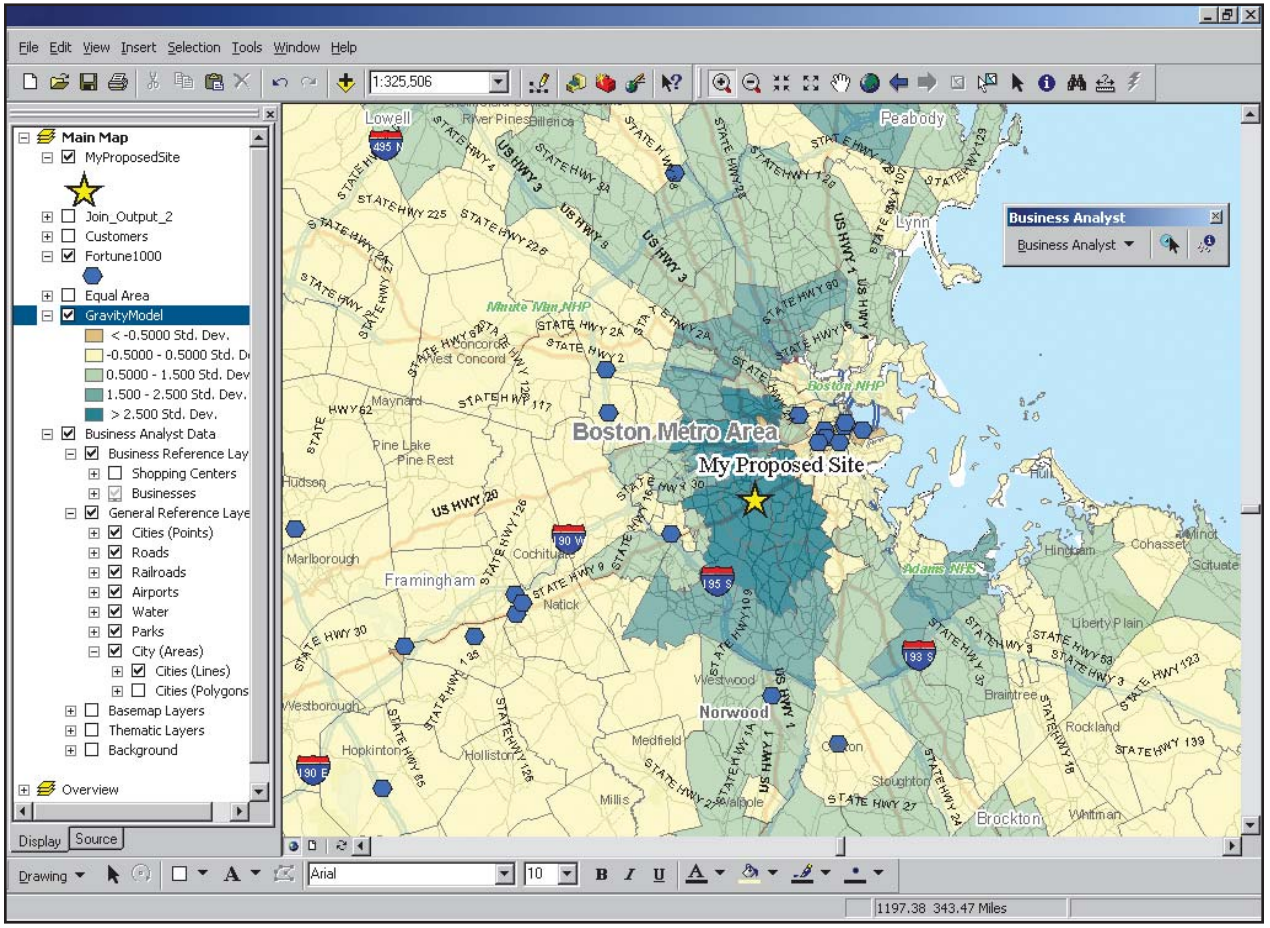
Parameter Estimation in the Huff Model

By David L. Huff

Editor's note: Dr. David L. Huff pioneered several spatial analysis techniques, most notably the Huff Model, which was introduced in 1963 in an article in Land Economics *entitled "A Probabilistic Analysis of Shopping Center Trade Areas." The model has been used for tasks such as predicting consumer spatial behavior, delineating trade areas, locating retail and service facilities, analyzing market performance, simulating different market scenarios, and forecasting sales.*

The Huff Model has endured the test of time—more than 40 years. Its widespread use by business and government analysts, as well as academicians, throughout the world is remarkable. With the development of GIS, the model has received even more attention.

The model's longevity can be attributed to its comprehensibility, relative ease of use, and applicability to a wide range of problems. The model is conceptually appealing. Its logical underpinning makes sense, and the output can be communicated easily and understandably. The model is relatively easy to make operational because the necessary computations are straightforward once the values of the variables and the parameters have been specified. Finally, its applicability to a wide range of problems and its ability to predict outcomes that would be difficult, if at all possible, without the model have made its use widespread.



The Huff Model has been widely used for predicting consumer spatial behavior, delineating trade areas, locating retail and service facilities, analyzing market performance, simulating different market scenarios, and forecasting sales.

However, despite the general applicability of the model, it has not always been employed correctly and its full potential has not been realized. After a quick review of the model, the remainder of this article will address these two issues.

Review of the Model

The model is based on the premise of the probability that a person confronted with a set of alternatives will select a particular item is directly proportional to the perceived utility of each alternative. Choice behavior can be viewed as probabilistic. As a result, it is unlikely that any given alternative will be selected exclusively unless no other alternatives exist. This proposition can be expressed symbolically as shown in Figure 1. The probability that an individual (i)

$$Pij = Uj \Big/ \sum_{j=1}^{n} Uj$$

Figure 1: Choice behavior.

will select the alternative (j), given the utility of j, is relative to the sum of the utilities of all other choices (n) considered by individual (i). In order for the model to be applied, the utility of each alternative must be defined empirically.

The first geographic application of the model was an attempt to predict consumer patronage patterns for different classes of products. The utility of a store was defined as the ratio of the square footage of the store's selling area to the distance from a consumer's residence to the store. Each of these variables was weighted by an exponent (i.e., parameter) that was estimated empirically by surveying the shopping preferences of individuals in the study area.

It was posited that the size of the store was more important for some products than others. Consequently, the value of the exponent could be expected to be larger for these products. Conversely, the exponent for distance was assumed to be negative. Convenience products could be expected to have a larger exponent while specialty goods would have a much smaller exponent. The probability that a consumer located at i selecting store j can be estimated using the formula in Figure 2.

$$Pij = Sj^{\alpha}\ Dij^{\beta} / \sum Sj^{\alpha}\ Dij^{\beta}$$

Figure 2: Consumer store selection.

In this formula, Pij is the probability of a consumer located at i choosing store j. Sj is the square footage of store j; Dij is the distance from i to j; and a and b are parameters that were estimated based on the actual survey data. This calculation was done using an approximation solution since the application of conventional statistical procedures was considered impossible.

Once the parameters were estimated, not only could the probabilities of patronage be estimated but also the expected purchases from subareas within the study area as shown in Figure 3. In this scenario, Eij is the expected purchases from area i to store j and Bik is the amount budgeted by consumers in i for product k.

$$Eij = Pij\ Bik$$

Figure 3: Patronage and purchases.

Lack of Statistical Verification

Analysts using the Huff Model typically incorporate some measure of accessibility (e.g., road distance, travel time, cost) as well as a variable that reflects the attraction of a given destination. The weights (i.e., parameters associated with these variables) are often assigned arbitrarily. They are rarely estimated statistically. As a result, the statistical significance of these variables is unknown. Obviously the lack of statistically validated variables and parameters can produce erroneous results. Without an accurate statistical assessment, analysts are using the model to make predictions based on unverifiable inputs. As a consequence, the results are subject to error.

Why Calibration Is Omitted

There are three reasons why more analysts do not calibrate the model statistically. First, the nonlinear properties of the model are perceived by some users to be much more difficult to calibrate because the model must be linearized with respect to its parameters before standard

statistical estimation methods can be applied. A number of researchers, including Lee G. Cooper and Masao Nakanishi (see Market-Share Analysis: Evaluating Competitive Marketing Effectiveness, 1988), have been interested in this problem. This has resulted in major breakthroughs that now make it possible to use standard techniques such as ordinary least squares for calibrating the model.

The necessity (and the difficulty) of incorporating origin-based data as opposed to destination-based data supplies another reason why the model is often not calibrated statistically. Actual choice behavior (the variable to be predicted) must be obtained empirically from residents of geographic subareas located within some larger study area, and choices must be obtained for all alternatives considered by these residents. Unfortunately, most companies collect data only on their facilities (i.e., destination data). As a result, patronage data for competitors is usually unknown. The task of obtaining actual shopping preferences for different products can be time-consuming, as well as expensive, because it requires surveying at the household level.

The lack of GIS software packages that are equipped for this type of analysis also inhibits the correct application of the model. To perform this type of analysis, the software must

- Be able to execute the necessary operations of the model.
- Include a statistical package that can generate the statistics necessary for assessing the significance of variables used to predict choice behavior and indicating how well the model predicted actual choice frequencies.
- Possess mapping capability that enables analysts to examine errors of prediction as well as other geographic patterns that might be suggested by the data.
- Be designed for use by non-GIS specialists as a decision making tool.

Enhanced Capabilities of the Model

As mentioned previously, many variables in the Huff Model can be included and the associated parameters determined statistically so that the impact of a variety of variables can now be assessed that would not have been possible previously. In general, predictive variables can be classified as being either controllable or noncontrollable.

Controllable variables, such as advertising and promotion, pricing, and store format, can be controlled or influenced by the company. Noncontrollable variables, such as accessibility, population distribution, income, and competition, are typically beyond the firm's control. Traditionally, some of these variables are examined visually on thematic maps or pin maps and subjective conclusions advanced as to the probable impact of these variables. However, being able to examine these variables statistically adds immeasurably to the accuracy of such conclusions.

Increasing Business Usage

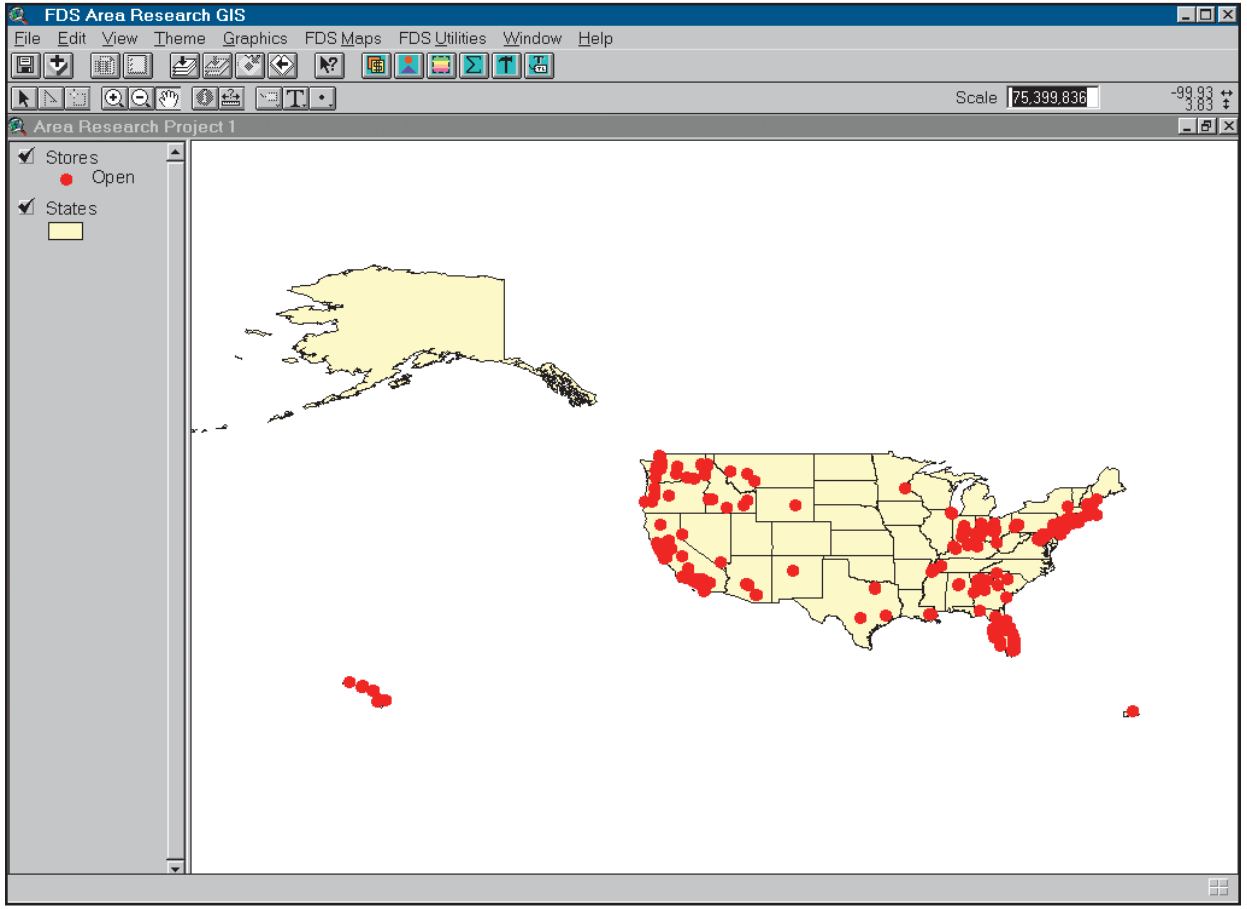
Most executives have not been shown how their revenues could increase by investing in software, modeling, and data. An increasing number of executives understand and appreciate the value of thematic maps and address matching and the importance of trade area analysis, customer profiling, and target marketing. This information is ideally suited for display on maps and can be related to without difficulty.

The benefits of modeling are not always recognized by business decision makers—modeling is different and much more difficult. Decision makers, in general, lack the proficiency to comprehend the technical aspects of model development and use. In addition, most software distributors do not realize that companies do not want to spend money for research and development. What is required to get modeling adopted by more businesses is a logical and defensible cost–benefit analysis of its benefits and an appreciation that the bottom line is what matters in business.

(Reprinted from the Fall 2003 issue of *ArcUser* magazine)

Federated Department Stores Uses GIS for Advanced Market Research

ArcView Application Provides Fast, Efficient Data Integration, Analysis, and Display



The initial active view in the Federated GIS application is a national view of the stores (excluding Guam). From this starting point, the user can begin the desired spatial analysis.

Today's technology helps businesses make sense out of a sea of data to better understand who their customers are, where they are located, and where opportunities may exist. However, even in the brave new business world, nothing is perfect. Disparate data repositories, varying data formats, software complexity, and other hurdles can make it difficult to get the most out of customer information.

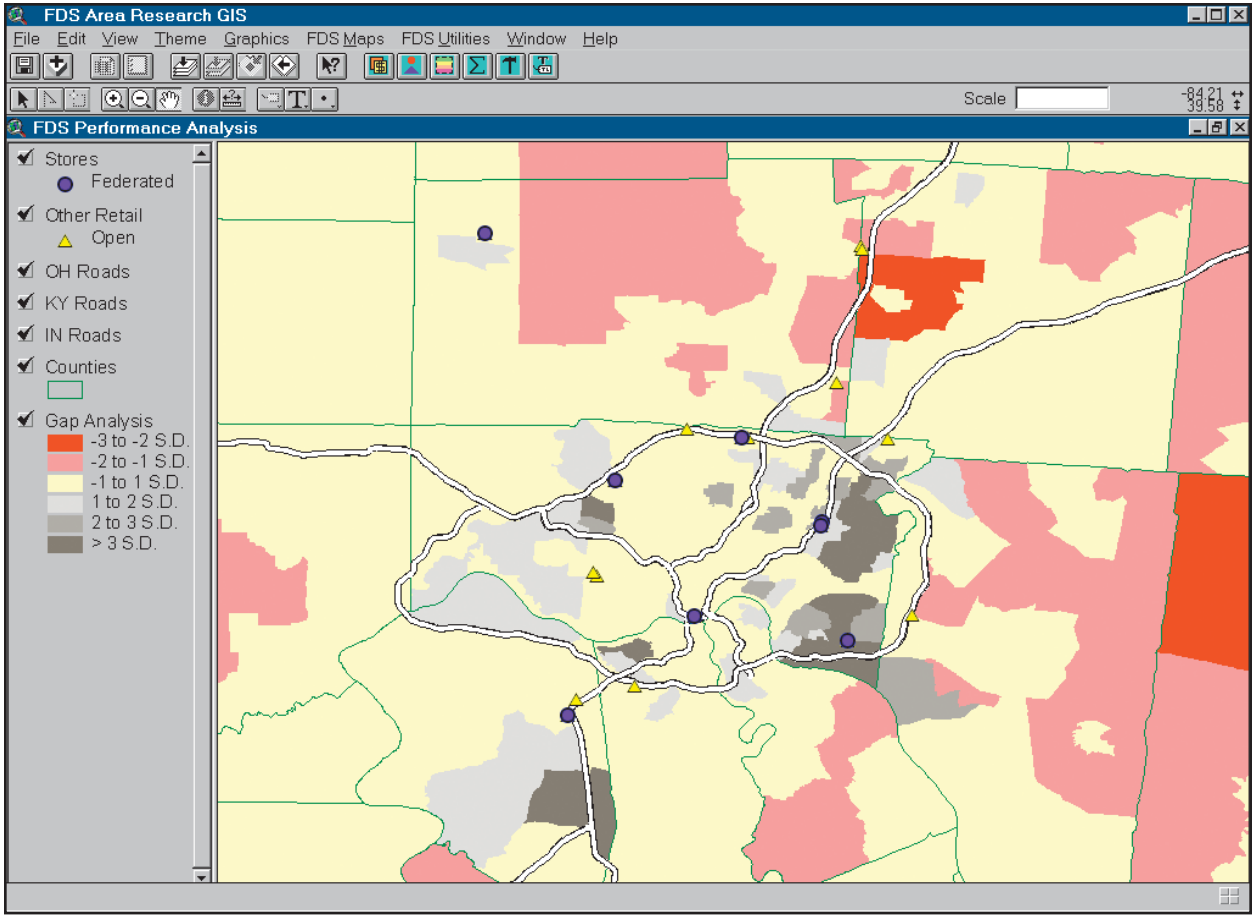
For Federated Department Stores, Inc., one company's challenge became its opportunity. The nationwide retailer developed a customized market research application using ArcView and Avenue. The desktop GIS provides a means of integrating proprietary databases and allowing market researchers with little or no GIS experience to quickly and accurately analyze existing markets. The result is an advanced solution turning customer and market data into valuable information.

Federated Department Stores

Federated Department Stores, Inc., is one of the nation's leading department store companies. Federated operates more than 460 stores in 34 states, Guam, and Puerto Rico. The company operates under the names Macy's, Bloomingdale's, The Bon Marché, Burdines, Goldsmith's, Lazarus, and Rich's–Macy's. It also operates macys.com, Bloomingdale's By Mail, and a network of online bridal registries operated in conjunction with WeddingChannel.com.

Federated's Area Research department provides a host of services for its corporate office and divisions including sales projections for new stores, remodels, expansions, and potential acquisitions; market and strategic analysis; map/report production; and more. Its staff of 13 includes six analysts, two database specialists, two project assistants, one cartographer, and two support staff.

To perform its analyses, the department uses a diverse array of data such as Access databases containing credit sales, vendor demographics, and other information gathered from proprietary, government, and industry sources including field research. Federated acquired GIS technology in the late 1990s to perform simple map production and analysis, but the system was underutilized. Few of the analysts had previous GIS experience, so the department was unable to fully explore the benefits of a GIS. In addition, the researchers had differing levels of computer skills and relied heavily on "institutional" knowledge acquired over the course of years of experience in the field.



An illustration of the gap analysis function in Federated Department Stores' GIS. The gray represents above-average penetration, and red shading represents areas of underpenetration. The yellow triangles are existing retail projects. The blue buttons and tools, along with the two menu options, comprise the Federated GIS application.

"We had researchers who had a good sense of individual markets from years of work experience, but did not have highly sophisticated computer skills," said Keith Wardrip, senior research analyst. "Federated also had a gold mine of customer data stored in proprietary databases, but not all of the databases were in one place or accessible by the previous GIS packages. Users had to switch between different programs and sources to access pieces of

various data. We needed a more efficient way to integrate this data to perform market research, and GIS provided a powerful tool. The critical step was to deploy an application that was user-friendly so that it would be used actively by everyone."

A New GIS Solution

Recognizing that challenge, a GIS team of five analysts was formed. The team was charged with hiring and guiding a consultant in the development of a proprietary application that could be used by all staff. Jeff Laird, with Bluegrass GIS, was hired and delivered the first customized application for Area Research in the form of an ArcView 3.2 extension. Jesse O'Neill and Keith Wardrip, both analysts with a GIS background, then learned the Avenue programming language, which enabled them to modify the application and add functionality as the department's needs changed.

After roughly one year of project steering and an additional year of development, a customized ArcView application was deployed within the department. The Federated GIS application combined a collection of tools and utilities with a customized interface for enhanced usability. The application could access proprietary data that was previously available only through Microsoft Access databases. This new level of data integration provided experienced staff with new and improved methods to speed up market evaluation. It also enabled new employees to more quickly familiarize themselves with Federated's markets including demographics, sales penetration, and competition.

Corporate In-Fill Strategy Project

The newly developed GIS could not have come at a better time. Simultaneously, a corporate-level initiative was being outlined to grow core department store business by identifying filler locations for small stores in existing markets. The Area Research department was asked to examine existing markets and identify areas of underpenetration. GIS was used to compare actual performance with market area potential, which was calculated by applying an expected sales per household measure to the households in a given geography. Thematic maps that depicted untapped potential were then created for each of Federated's existing markets.

When mapped, the data clearly showed areas of under- and overpenetration. For areas of underpenetration, further analysis could be performed to determine how best to boost sales, whether by adding a store or implementing new marketing and sales opportunities.

"This was the first major test of the usefulness of the new GIS functionality," says O'Neill. "The whole process was programmed into an easy-to-use dialog box. The user simply had to choose the expected sales per household and the area of interest to get a very detailed gap analysis map. The process highlighted areas with high concentrations of better-income households that had lower-than-expected sales."

The GIS-based report achieved its goals. Perhaps more important, the customized ArcView solution proved its worth to researchers transforming reams of data into valuable information as well as decision makers directing corporate strategies based on GIS-generated reports. The end result: a better and faster method for providing answers to business problems.

"The filler-store project showed GIS could be useful as an analytical tool, not just a data display tool. Not only were we able to perform analysis faster using a highly intuitive interface, but map production time was cut dramatically. The benefits were immediate."

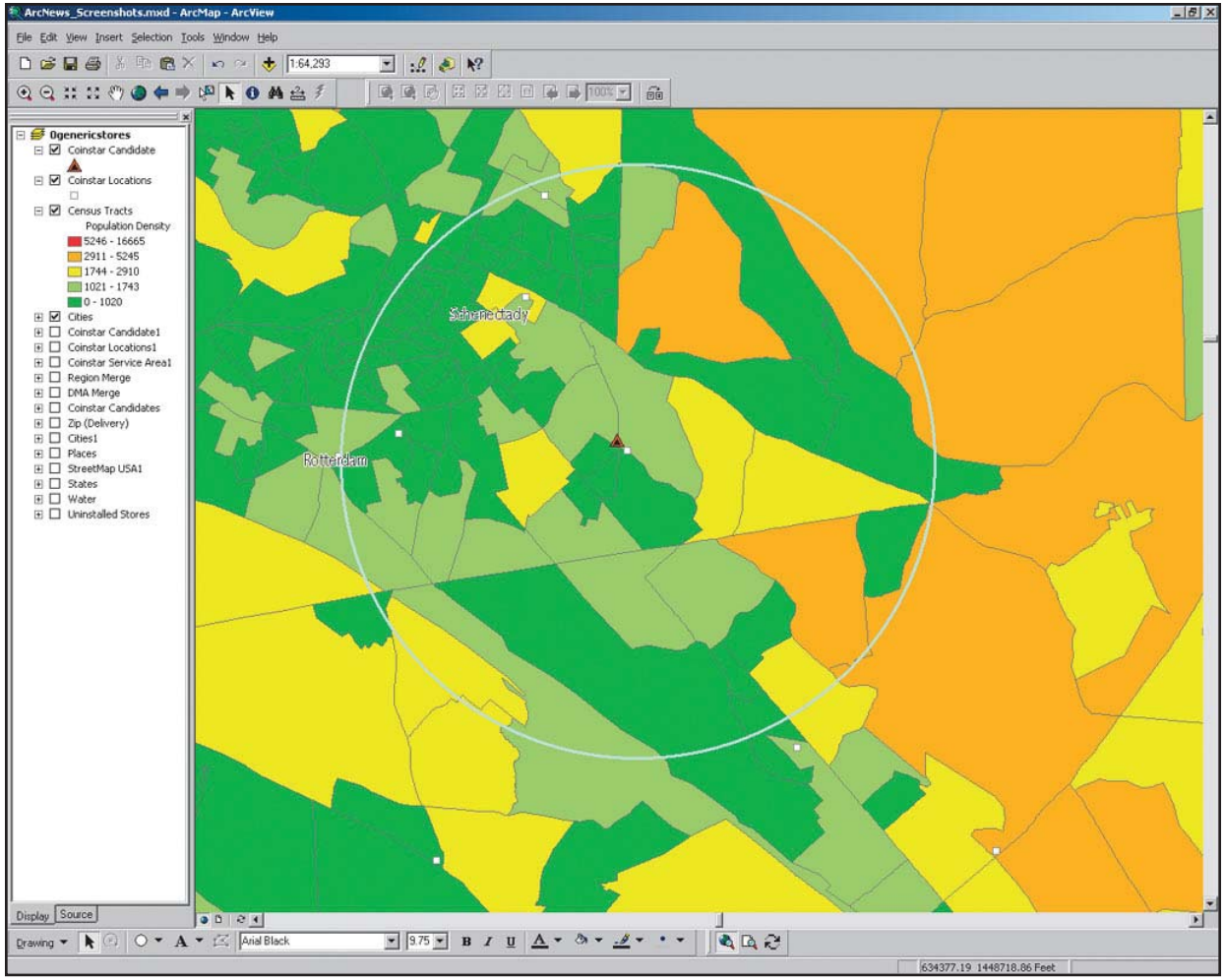
Federated's future GIS plans include the creation of an online store atlas, a series of maps that illustrate the company's store locations, and competitive retail nodes in existing markets. Publishing the maps on the company's Intranet site will facilitate dissemination within Federated and allow for easier map editing and updating.

(Reprinted from the Volume 6, 2003 issue of *BusinessSolutionNews*)

For Coinstar, GIS Provides Common Framework for Information Integration, Analysis, and Sharing

Geography Matters in Business Applications

Who would have thought a lucrative, successful business could be forged from the pennies, nickels, dimes, and quarters lurking throughout the corners of most households, automobiles, and other locations? Well, that's exactly what Coinstar has done with its self-service coin counting machines located at the front entrances of supermarkets nationwide. The Coinstar machines count a person's accumulated coins and dispense a voucher that can be exchanged in the store for cash or groceries. Based in Bellevue, Washington, Coinstar, Inc., today has a network of more than 10,500 machines currently available to about 165 million consumers in 48 states and the District of Columbia as well as Canada and the United Kingdom. Coinstar's record profits and growth demonstrate the company's success and innovation.



Current surroundings are important in determining the potential of a location.

As easy as it may seem, placing Coinstar machines at the right store location is extremely complex and is of vital importance. Maximizing the best location for meeting consumer needs is the difference between business success and failure. And as the Coinstar enterprise grows—from hundreds to thousands of locations—finding the best place for a new location and

evaluating how that new location impacts the rest of the existing enterprise becomes an even more arduous task.

Coinstar turned to database technology for collating reams of information that continually swelled with each new store. These databases were used to answer a number of questions regarding new store site selection questions. But the company still did not have an effective means for separate department officials—from marketing to operations to sales—to integrate, share, and leverage each other's data and work experience knowledge.

Several years ago Coinstar began to search for a solution that would better integrate information and allow easy access across the enterprise. After searching high and low for a solution, Coinstar recognized how GIS could meet these needs, provide powerful mapping, and provide a technology platform for growth into the future. The company began its first use of GIS via desktop software for basic, informative maps. What has resulted is a myriad of GIS applications used throughout the organization.

"Today we have a range of applications that has been applied to several different areas of the company," says John Chestnut, GIS specialist at Coinstar. "GIS has proven itself over and over again as a technology tool for many facets of our business. It's more than just computer mapping. It's real data integration, analysis, and visualization."

From Desktop to the Enterprise

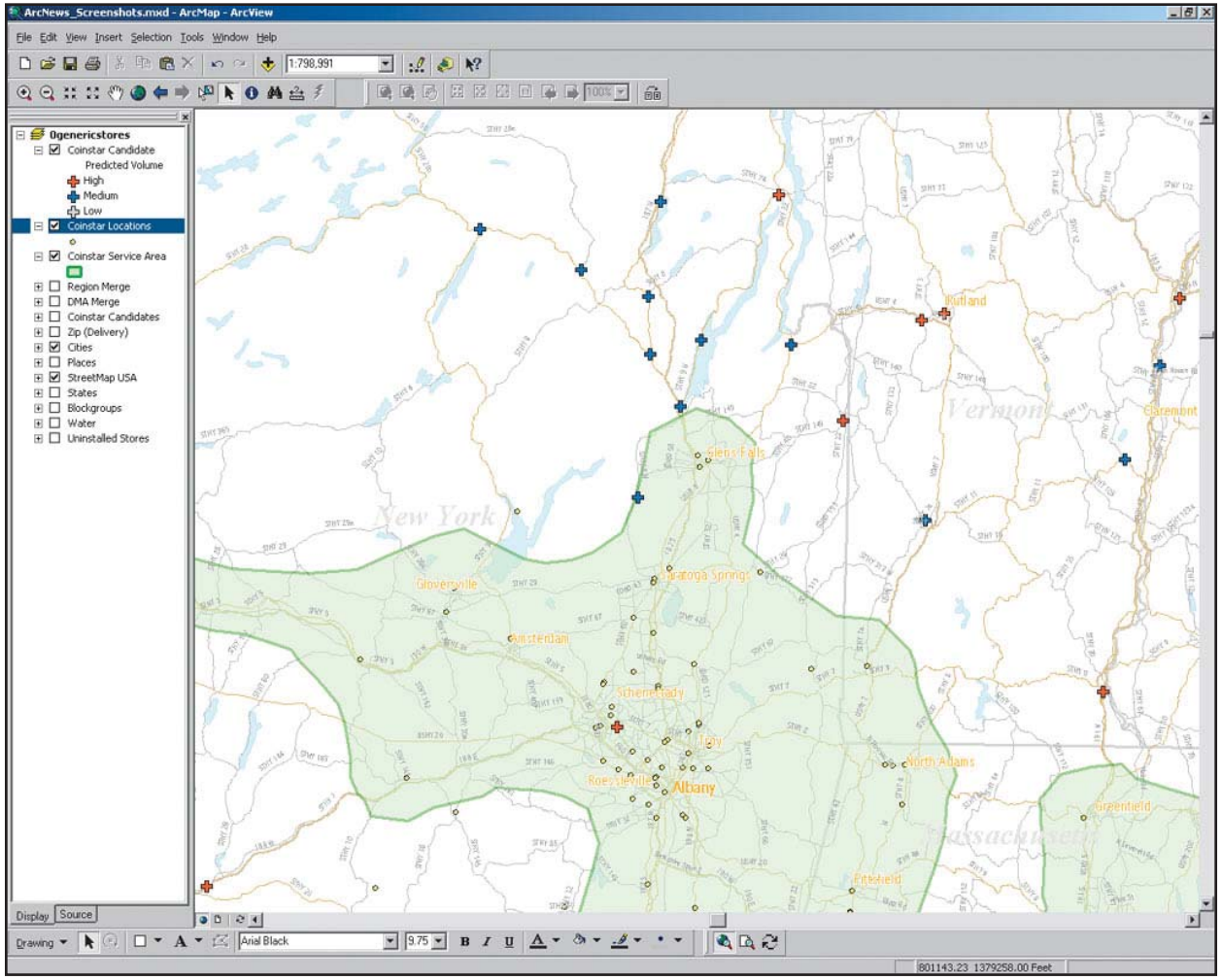
Coinstar went through an extensive evaluation process before selecting ESRI software. Different software packages were evaluated with non-GIS personnel in a number of departments to assess software ease of use, learning curve, Microsoft's ODBC compatibility, network access, cost, and other factors. Interviews with existing database users were also performed to get a firsthand understanding of the separate technologies. When the process was complete, Coinstar selected ESRI software because of its scalability, flexibility, open standards, and other features.

Today the company uses ArcGIS Desktop (ArcView) and the ArcGIS Spatial Analyst and ArcGIS Network Analyst extensions. The hardware platform consists of Dell Optiplex GX240 P4-2 GHz and Dell Optiplex GX110 PIII-866 MHz using a Windows 2000 operating system. The company uses SQL Server for its database management system with Microsoft Access software. In addition, the company uses ESRI Portfolio software with ESRI data.

GIS Business Applications

GIS is used for a vast array of business applications. Prior to GIS, maps were not used across the enterprise for these many different applications. The few maps that were used were hand drawn on paper and contained handwritten notes and annotations. The maps could not be shared throughout the enterprise, and updating maps with new information was time-consuming and often inaccurate.

Coinstar today has two GIS staff members who perform analyses for several departments across the enterprise including marketing research and analysis, retail account development (sales), coin services, field operations, installations, and finance. Using GIS, Coinstar links separate databases from these various departments that manage data sets for stores, customers, market demographics, and more.



GIS plays a role in determining the serviceability of potential Coinstar locations.

Marketers, for instance, use ArcGIS Desktop and ESRI Portfolio and demographic data from ESRI to carry out site performance modeling and develop a performance predictor for various grocery store sites across the United States. This helps ensure constant high-level performance for existing sites. It also helps them understand what variables make up existing market areas

and where potential new markets exist. Thus, marketers know exactly where to carry out specific marketing campaigns such as direct mail.

There is a host of logistical planning applications better served through fact-based maps. Using ArcGIS Desktop and ArcGIS Network Analyst, the company can more quickly and accurately plan and route coin pickups. In addition, service technicians can better deploy resources for installing new machines using site location maps.

Sales staff can use demographic and customer-driven maps from ArcGIS Desktop and ArcGIS Spatial Analyst software to target new customers as well as show other Coinstar staff why certain locations should be pinpointed for new sales efforts. These maps can also be used to show potential clients why and how it makes sense to add a Coinstar machine to their store.

Perhaps the most profound use of GIS data and maps is one of the most basic: providing a common point of reference in the form of a map during meetings where various stakeholders evaluate the merits of a potential new location. Sales, marketing, service, and other professionals come together to share and discuss the many data sets and variables for evaluating a potential new client: Does the area contain demographic characteristics similar to successful sites? Is it within a service technician location, or does a new location need to be added? How will a new site impact routing of coin pickups? Will the new site impact sales at an existing site? The GIS map provides many layers of pertinent data overlaid and used as a reference point for communication. Separate departments have a common framework for collaboration.

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Successful Site Selection—Automatically!

Storage USA, Inc.

Overview

Everyone knows the real estate mantra of "location, location, location." Selecting the best site to locate a business is very difficult; if the wrong site is chosen, this decision can be costly. Storage USA predicts that the average cost of a new facility is more than *$4 million!* Cory Grubbs, financial analyst with Storage USA, says that "Locating sites where our product can best serve our customers is one of the more challenging aspects of the self-storage business."

Storage USA's main focus for more than 19 years has been to provide dependable, convenient, affordable, and safe self-storage service solutions for its residential and commercial customers. Operating from more than 500 locations nationwide and a network of more than 5,000 affiliates, Storage USA acquires, develops, and manages self-storage facilities in 34 states and the District of Columbia.

The Challenge

After Storage USA evaluates hundreds of potential sites annually, only a few proposed sites survive the rigorous site analysis process that includes performing demographic, competitor, and traffic volume analyses. Storage USA supports each site analysis with detailed tract, ZIP Code, and trade area maps. Creating these reports and maps manually for more than 30 sites each week was burdensome for Storage USA personnel. Manual site selection was far too time consuming and laborious. Storage USA realized that a new solution was needed to expedite and refine the data mining process and produce exact site maps and reports.

The Solution

Grubbs actively sought help from other providers. However, "other companies could not handle the amount of data that we wanted to analyze at one time. Their reports were canned and didn't include enough demographic detail. Their products simply failed to perform as the sales personnel promised." Storage USA also investigated the possibility of outsourcing these analyses but found that the cost would be prohibitively expensive—$150 for each report.

Storage USA turned to ESRI business GIS solutions for an automated solution to this demographic analysis and mapping challenge. Storage USA implemented Business Analyst software to generate custom demographic reports and maps in batch mode.

As part of the analysis process, Storage USA also uses data from ESRI. Data variables, such as home values, income ranges, and population density, are extracted for areas that Storage USA believes are optimal for potential self-storage facilities. If necessary, more statistical analysis is performed so that Storage USA can determine if the site matches the selection criteria and if competition and other supply/demand factors should be considered before selecting the proposed property.

"Instead of our having to manually generate hundreds of reports and maps each week, the entire process was streamlined by incorporating an ESRI data "plug-in," a custom script that can generate more than 500 reports and maps at one time. This application enabled Storage USA to efficiently produce presentation-quality reports and maps using only the demographics they wanted to analyze. According to Grubbs, "Each report and map looks like someone spent hours putting it together."

Results

Using a custom integrated solution designed by ESRI, Storage USA increased the number of reports and maps generated each week and halved the production time. This time-saving automation allowed other internal Storage USA departments to perform other analysis projects. Now, additional requests and projects can be turned around in shorter time frames.

Using data and software from ESRI, Storage USA has increased the efficiency and accuracy of its site selection process, provided the ability to create custom applications and the flexibility to run them with existing ESRI products, and reduced the potential risk of erroneous site selection.

"The biggest impact on our operations," says Grubbs, "has been the ability to successfully automate 90 percent of our site analysis process."

Since 1969, ESRI has been giving customers around the world the power to think and plan geographically. The market leader in geographic information system (GIS) solutions, ESRI software is used in more than 300,000 organizations worldwide including each of the 200 largest cities in the United States, most national governments, more than two-thirds of Fortune 500 companies, and more than 5,000 colleges and universities. ESRI applications, running on more than one million desktops and thousands of Web and enterprise servers, provide the backbone for the world's mapping and spatial analysis. ESRI is the only vendor that provides complete technical solutions for desktop, mobile, server, and Internet platforms. Visit us at www.esri.com.

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