

# THE MANAGEMENT AND EVALUATION OF SHOPPING CENTER MALL DYNAMICS AND COMPETITIVE POSITIONING USING A GIS TECHNOLOGY

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## **Overview**

Relatively stable demand of the 1990s, the over-supply of retail space and the growth of new format “big-box” retailers combined to lessen the opportunities for “easy growth” of the shopping center industry through construction or renovation. This has placed increasing importance on operating performance. Center managers and development companies have responded with new tenant mixes, alterations to the “shopping experience,” and a variety of advertising and promotional initiatives. However, it has become harder to monitor or to determine what the impact of these various initiatives has been on overall center performance and/or the performance of individual tenants. This realization emphasizes the need for more sophisticated management decision support systems.

This research examines the application of Geographic Information Systems (GIS) technology to the management of the

regional shopping center. The paper will examine the potential of GIS in tracking and relating changes on a variety of issues that are central to mall management. These will include the competitive position of the mall in the market, the distribution and demographic profile of the center's customer base, the physical characteristics of the center, center- and/or retailer-initiated marketing activities, and spatial variations in tenant operating performance. The value of GIS technology has been demonstrated at the corporate level in the development of various retail spatial strategies. These have included such applications as the mapping and analysis of market areas and penetrations, retail site selection and network planning, and the targeting of direct mail campaigns (see *Business Geographics*, 1993–1995, Volumes 1–3).



In the shopping center industry, GIS has been restricted primarily to understanding and profiling trade areas and to relating market coverage to mall advertising and promotion. This study will explore the value of GIS from a variety of other perspectives. The research will develop a GIS prototype for increasing the efficiency of mall management and will evaluate the performance dynamics of the shopping center at a number of spatial scales. The inherent spatial capabilities of GIS permits this type of management system to be developed. The technology will be applied in a number of ways. First, a spatially-referenced data base will be developed to evaluate the competitive position of the case mall within the retail environment. Second, using customer survey data, the market coverage and penetration of the mall will be examined. Third, the GIS will generate a series of temporal data bases that will capture variations in tenant sales performances over a two-year period. The spatial variations in tenant sales will be examined and evaluated using the querying capacities of the software. Finally, the system will examine the impact of various mall management “controllables” on individual tenant sales. These will include such activities as mall promotions, architectural changes, and the locational impact of tenant changes on the performance of the shopping center. Here, the analysis will focus on the sensitivity of tenant sales performance with respect to their distance from mall promotions and tenant store expansion.

To develop this prototype, a major shopping center developer was approached who agreed to supply monthly sales data for the in-line

tenants in one of their properties provided the center was not identified. The case study center, located in a major metropolitan market, is one of Canada's largest super-regional shopping centers. The two-level center occupies a 56-acre site and has a total retail area of over a million square feet of which approximately 500,000 square feet are allocated to CRU tenants. The tenant mix of the center includes three major department stores and over 230 stores and services.

## ■ The Potential Role of GIS in Shopping Center Research

Aronoff (1989) defined Geographic Information Systems (GIS) as "a computer based system that provides four sets of capabilities to handle geo-referenced data: input; data management (data storage and retrieval); manipulation and analysis; and output." Geographically-referenced data must have a physical dimension, a spatial location, and be mappable. One main advantage of GIS is its ability to investigate problems at a variety of spatial scales. By developing a GIS capability, a shopping center developer can examine properties at a variety of levels. For example, investment portfolios can be viewed nationally and compared to a wide array of socio-economic and amenity benchmarks. At a metropolitan level, a series of spatial overlays can simultaneously integrate a network of shopping centers, the location of competitors, the distribution of target markets, the market demographics, and the impact of highways, barriers, new formats or proposed new entries on the trade area of selected centers. At the level of the shopping center property, the GIS can summarize and analyze issues related to tenant mix and mall promotion. What makes GIS so appealing is the system's ability to respond to a variety of "what if?" questions. The sophisticated GIS-user can take the system from a simple mapping procedure to a strategic management information system.

It should be recognized that the application of GIS to retail and real estate decision support systems is in its infancy. While the technology dates to the 1960s, most early applications were associated with natural resource, municipal/public service, and military applications. They were linked to a variety of disciplines such as geography, surveying, geodesy, geology, civil engineering, forestry, and land use planning (Weller, 1993). Initially, most GIS work was associated with the university and government communities and only recently has the private

sector began to explore and integrate GIS technology into its management information systems. In the service economy, firms in the financial, fast food, and grocery store sectors were among the earliest adopters. Most of the early applications in the shopping center industry have related to mapping trade areas and linking customer data bases to socio-economic, spatially-referenced data bases. What was lacking was the integration of GIS technology with location-specific, performance data associated with the tenant mix of the shopping center.

Contemporary developers and their mall managers face a myriad of strategic and operating decisions, ranging from initial site selection to mall configuration and tenant mix to managing lease receivables. These decisions can be facilitated by relevant, timely, accessible information. The "information system" supporting these decision-makers is undergoing change; for example, some shopping centers have moved from monthly sales reports to daily sales reports. However, most managers continue to struggle with reconciling many different kinds of reports and filing systems. A typical mall manager will receive monthly reports on occupancy costs, marketing research, lease payments due, etc. He or she will likely have a "little black book" with names and phone numbers of mall tenants, maybe a file drawer full of leases and another with correspondence, and so on.

Every mall manager is concerned about managing tenants, categories, areas, and of course the whole center. How is a category doing versus a previous month? Which tenants need attention and maybe assistance relative to their category performance? Whose leases are coming up soon? Whose occupancy costs as a percentage of sales indicates trouble? Did that change in advertising strategy increase mall traffic? When that new store came in, what happened to the performance of its neighbors? And so on. As size increases, so does complexity in the management of the mall. This suggests that managers of regional centers may appreciate almost any improvement in their decision-support systems.

## ■ Methodology and Analysis

This research project involved three stages of data collection. The first stage focused on the development of four inter-related spatial data bases that measured the competitive retail environment in which the shopping center under consideration is embedded. Here, the largest and most complex data set captured information on the location, size, and tenant mix of the shopping center system. This digital data base, obtained

from the local municipal planning department, was geo-coded and then was used to generate a series of map files that portrayed the competitive shopping center system. The three additional data bases measured the location and size of the new format retailers in their immediate environment, the floor plans and tenant mix of the four major regional malls in the area, and the spatial distribution of retail sales in the area.

The second part of the study used GIS to delimit the “test” shopping center’s trade area. Here, a data base of over 64,000 customer records supplied by the developer was geo-coded by postal code using a postal code conversion file. This customer data base was then linked to the trade area’s demographics by using a data base supplied by Compusearch Micromarketing Data and Systems. This allowed an analysis and evaluation of the center’s target market.

The final part of the methodology used proprietary information supplied by the developer. At this stage, the floor plate and distribution of the in-line tenants for the center was digitized from the leasing plans provided by the developer (Map 10). Concurrently, members of the shopping center management team were interviewed to explore the nature of their decision-making processes. Questions focused on issues related to the types of performance measures used, the nature of the performance data shared with the tenants, and types of information that would be useful in improving landlord-tenant relationships (e.g., getting the co-operation and commitment of mall tenants to participate in mall promotions and activities such as sidewalk sales). Would the results generated by the GIS be useful in “selling” the center’s marketing plans to its tenants?

Next, based on these data, several performance indicators were generated for each tenant. These included sales per square foot, sales per front foot, year-over-year sales comparisons, gross and percentage rents, and a relative index of sales category performance. This data base also was examined on a month-to-month basis and the various indices were recalculated and related to various management concerns. These issues included the location and type of mall promotions, changes in tenants, and/or modifications to the design of the center. The data and results of the analyses were summarized and presented in categorical form to preserve both the confidentiality of the developer and the various mall tenants. This part of the research allowed an examination of the following types of questions. What new management efficiencies can be developed with the incorporation of a GIS into the mall manager’s support system? What new types of new information can a GIS bring to the developer’s decision-making capabilities? Does the incorporation of GIS queries improve the shopping center management’s ability to improve the performance of the center?

## ■ Towards a Prototype Shopping Center Management System

The GIS management system developed in this paper links the shopping center developer's operational data bases, various spatial data sets developed specifically for the research, and various digital map files. Currently, many excellent "off-the-shelf" GIS packages are available. These include ARCVIEW, MAPINFO, and ATLAS GIS. Typically, the costs of these micro computer-based systems range between \$600 and \$1400 and they are readily accessible, from a cost point of view, to most regional shopping center management teams. By incorporating a GIS into the developer's strategic decision support system, several benefits can accrue. For example, the GIS can be used (1) to portray data that otherwise are difficult to obtain quickly; (2) to visualize data that are presented typically only in a spreadsheet form; (3) to examine changes in the retail environment; and (4) to simulate a series of "what ifs." GIS should not be viewed as a causal modelling procedure. The GIS will not be valued if the mall manager can look up center information more conveniently in a "little black book." To be effective, the analytical capacities and potential of the GIS must be successfully integrated into the normal business practices of the shopping center management team.

The prototype GIS developed in this research examined the performance of the shopping center at various spatial scales. First, the competitive position of the case shopping center in the immediate retail environment was examined. Second, the GIS was used to map the distribution of mall customers and to link this distribution spatially to trade area demographics. Next, a "*Mall Manager Querying System*" was designed to examine tenant performance and the dynamics of the tenant mix. Finally, the system evaluated a series of typical management questions.

### *Competitive Analysis of the Retail Environment*

The competitive environment of the shopping center under study was examined by evaluating the location, size, and tenant mix of all the shopping centers and new format retailers in the immediate trade area. Table 1 provides a summary of both the nature and degree of competition in the local retail environment. The table suggests that the area is well served by several small convenience centers of less than 50,000 square feet and exhibits the well defined hierarchy typical of most Canadian cities. The case center falls into the largest size category (>800,000 square feet) with a total selling area of over one million square feet and 230 mall tenants.

**TABLE 1. THE COMPETITIVE STRUCTURE OF THE RETAIL ENVIRONMENT**

<b>A: SHOPPING CENTERS</b>			
Center Size (sq. ft.)	Number of Centers	Number of Stores (sq. ft.)	Average Center Size
<50,000	254	2995	14,938
50-99,999	36	733	67,753
100-199,999	9	238	114,457
200-399,999	12	884	267,216
400-799,999	2	175	459,623
>800,000	3	718	928,215
Total	316	5723	14,174,041

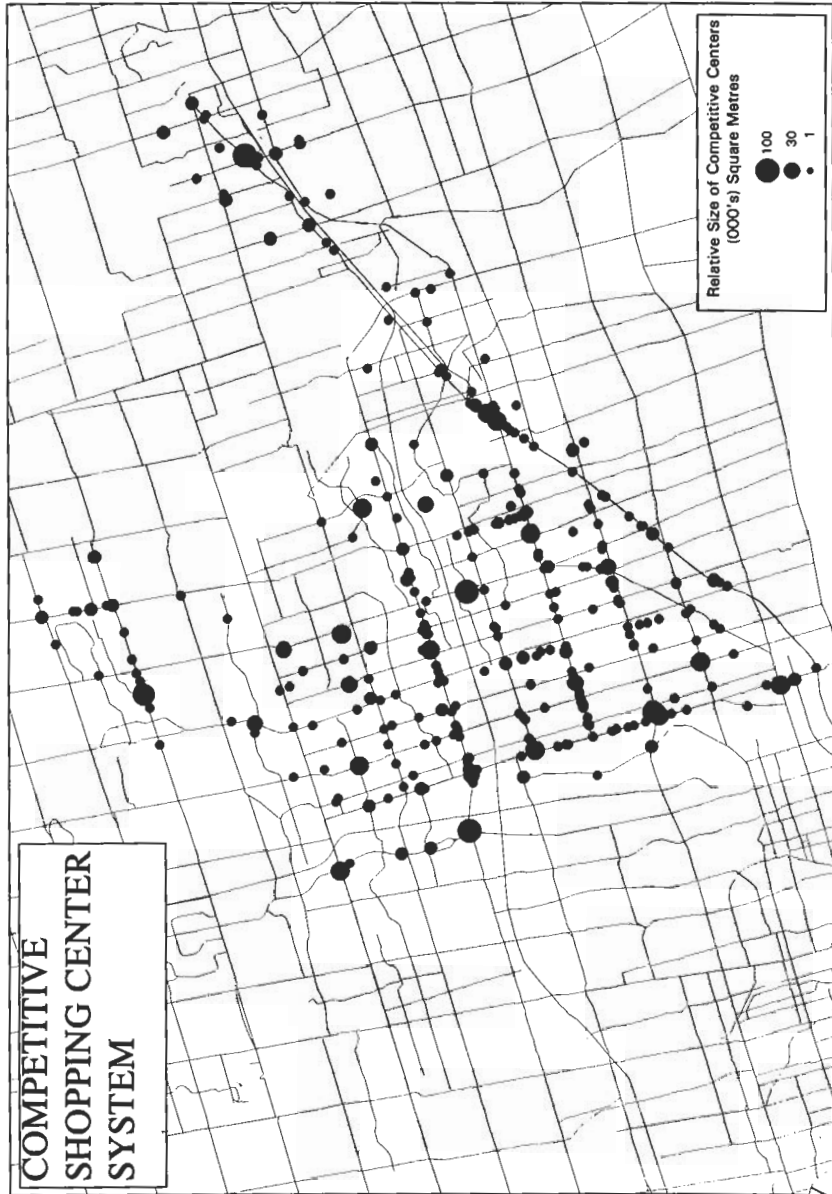
  

<b>B: NEW FORMAT RETAILERS</b>		
Store Size	Number of Stores	Square Footage
<10,000	9	30,000
10-29,999	25	484,000
30-49,999	8	310,000
>50,000	11	1,218,000
Total	53	2,042,000

A major new competitive retail force in the trade area is the new format/power retail phenomenon. Since 1990, the trade area has seen a significant major increase in the number of "big-box" category killers and superstores (Jones, Evans and Smith, 1994). These free-standing units are located throughout the trade area and are concentrated in selected product categories - i.e., food, office products, electronics, furniture, and toys. Currently, the 53 new format/power retailers provide over two million square feet of direct competition to the shopping center system.

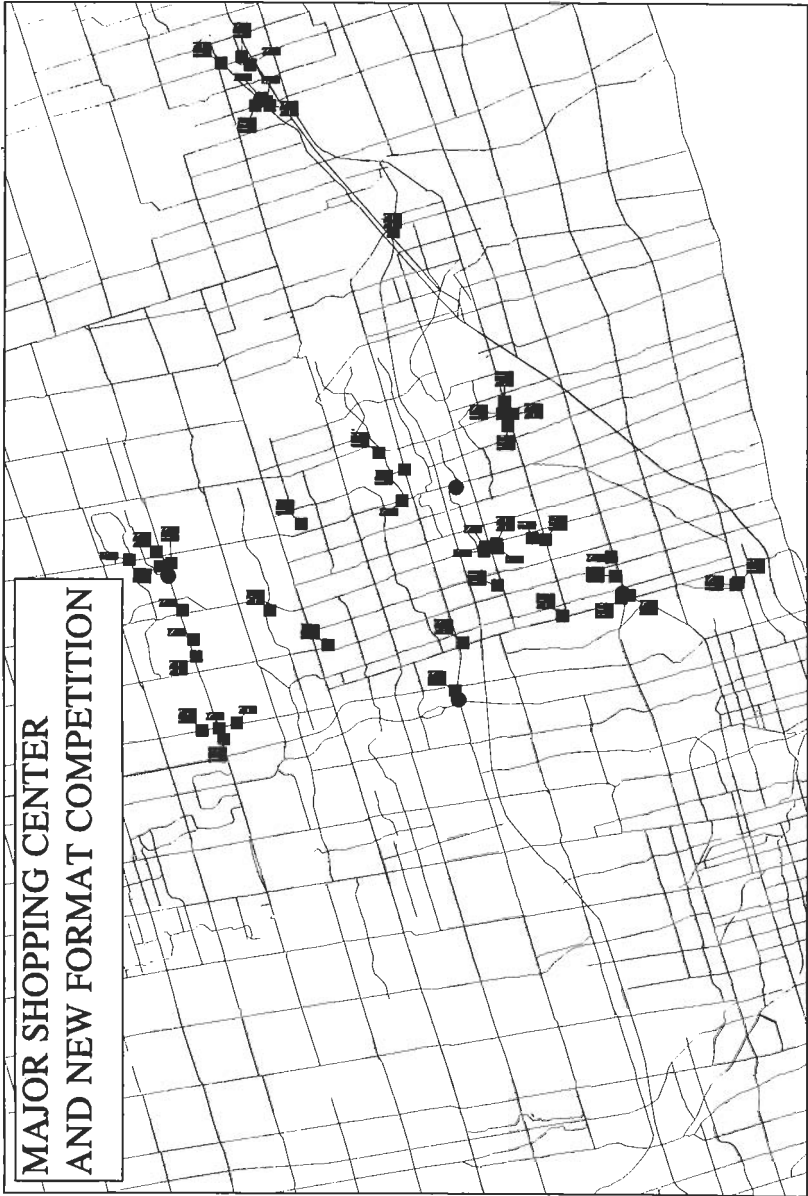
By linking the competitive data bases to the GIS software, a series of maps were generated that summarize the center's competitive retail environment. Maps 1 and 2 show the distribution of both the existing shopping centers and new format retail systems. By linking these maps to an underlying shopping data base, the resulting map becomes a strategic management tool from which the center management can obtain information concerning any shopping center competitor. For example, Map 3 shows how shopping center and tenant information can be spatially linked by "clicking" a cursor on the map. Alternatively, the system can be used (1) to spot competitive malls and to obtain information concerning their tenant mix; (2) to run a quick comparison of the tenant mix of the studied center with its major competitors (Map

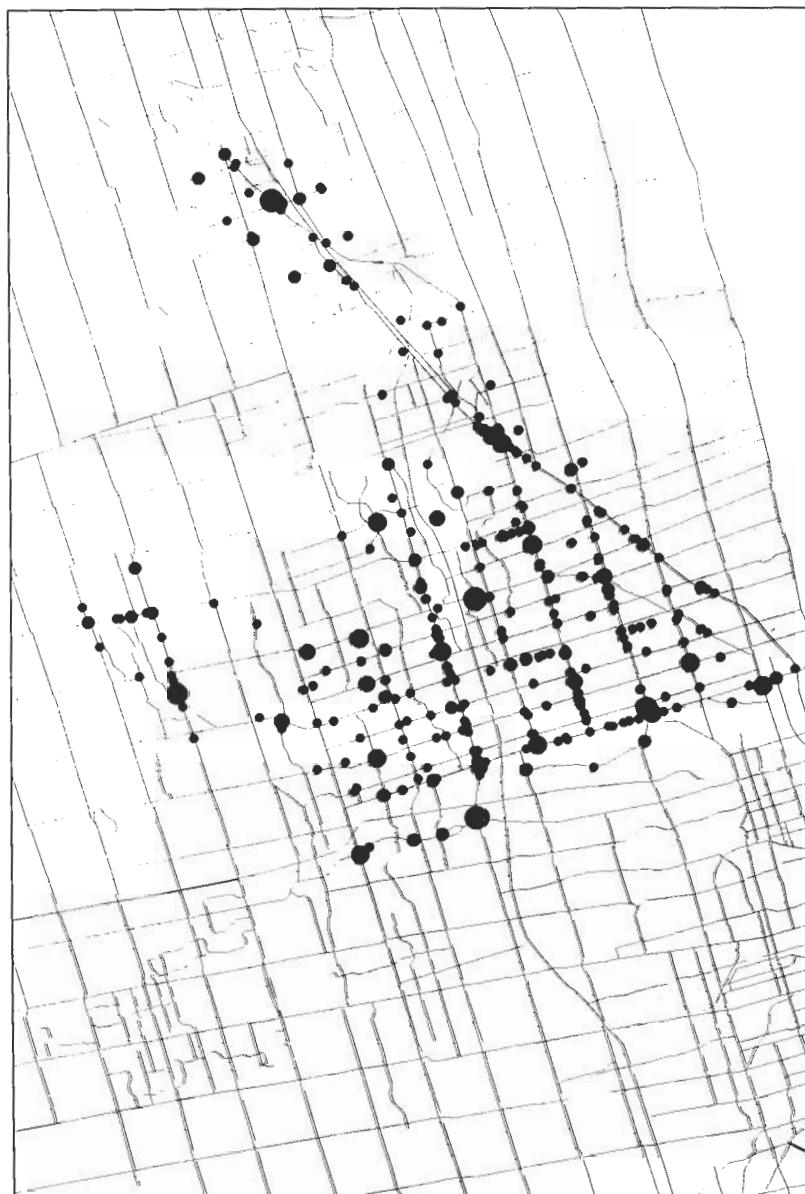
Map 1





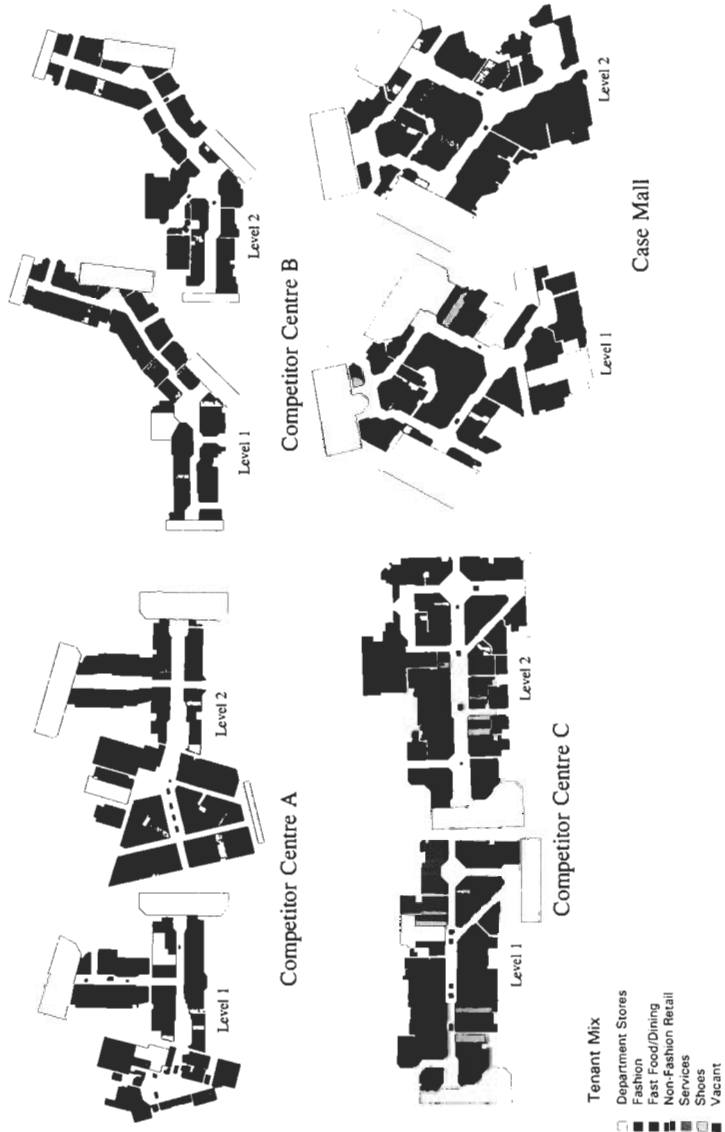
Map 2



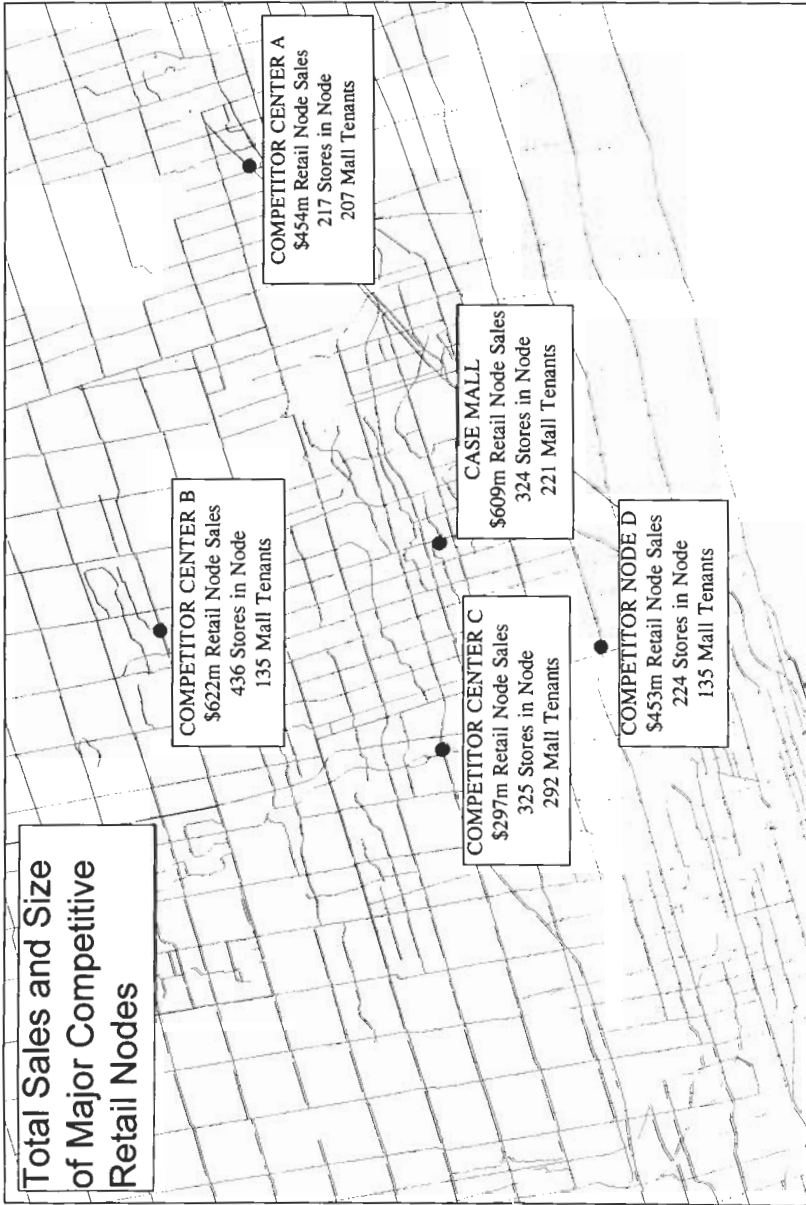


Map 4

### MAJOR MALL COMPETITOR STRUCTURAL ANALYSIS



Map 5



4); or (3) to search for the locations of "hot retailers," new entries, ethnic retailers, or major independents in the trade area. Finally, Map 5 illustrates how by linking two geographically-referenced data bases (the shopping center data base and a retail sales data base that was collected at the 3-digit postal code level) a map of market shares can be produced.

### *Customer Spotting, Trade Area Definition and Demographic Analysis*

The use of GIS in customer spotting and demographic analysis is well documented (Reid, 1993; King, 1993; and Moloney, Lea, and Kowalchuk, 1993). This paper will highlight some possible uses and extensions of these types of approaches for the management of a shopping center. Four types of market analysis will be undertaken: (1) customer spotting; (2) primary market area delimitation; (3) market penetration analysis; and (4) target market identification.

The basic market area measures used in the analysis were based on the over 60,000 shopping center customer records tagged at the level of the six-digit postal code. By using a six-digit postal code conversion file (PCCF), each customer record was assigned to its appropriate postal geography. This spatially-referenced data base allowed us to examine the distribution of over 53,000 customer locations. These data were plotted and a map depicting the "drawing power" of the center was produced (Map 6). Then the primary market area, based on the nearest 60% of the consumers, was defined using a simple query selection technique (Map 7). These two maps provide a spatial overview of the general trade area of the center, but more importantly they create a base for evaluating more complex management questions. Such queries could relate to the center's level of market penetration, the demographic profile of the center's customer base, and/or the location and market size of selected demographic or lifestyle target markets.

In the case of Map 8, the market penetration of the center was defined at the enumeration area (EA) level. Here the number of customer points allocated to any EA was divided by the number of households in each respective EA. This value was then multiplied by 100 to provide a standardized market penetration index. The resulting index allows management to examine the degree of market share in various neighborhoods and relate variations in the share to such local factors as the strength of the competition, accessibility, effect of direct mail advertising, or the nature of the demographic mix. Map 9 shows how the GIS can be used to identify the location of potential target markets. In this

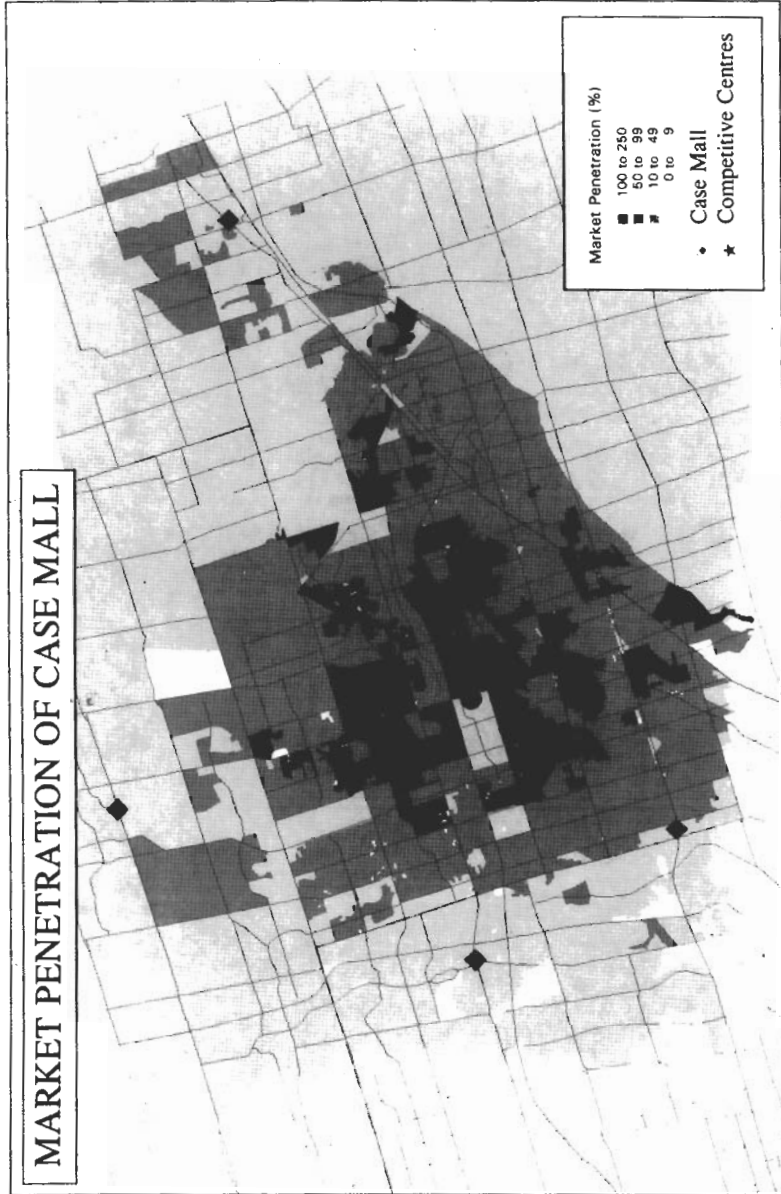
Map 6



Map 7



Map 8





Map 9



case, the spatial distribution of one customer segment was plotted. The particular lifestyle group selected (*U2 as defined by Compusearch's Psyte Clustering System*) relates to middle income, ethnic family neighborhoods in large urban areas. Queries of this type can be used by the mall management in the following ways: (1) to evaluate the potential of new tenants serving a particular market niche; (2) to provide marketing advice to existing tenants that do not have the skills or technology to undertake detailed geodemographic analysis; (3) to identify market/lifestyle segments that the shopping center is under-serving; and (4) to undertake "center" versus "trade area" profiling systematically on a regular basis. Such analyses in turn may lead to changes in promotional plans, in new ideas for community relations, and so on.

### *Mall Manager and Querying System*

GIS provides the shopping center manager with quick and reliable information about both the composition and performance of the tenants within the mall. Maps 10–13 illustrate how a GIS can satisfy these types of requests. Map 10 uses the shopping center floor plate as a "master screen." In the first instance, each location is labelled numerically and linked to a data base that records key data about each unit. Map 11 illustrates how "clicking on" a selected tenant reveals a variety of data such as store name, store type (SIC or category code), store manager's name, historical sales by month, rental information, and date of last correspondence. This data base can be very extensive, replacing the variety of notes and files in a paper-based information system.

Map 12 is an extension of the "*Mall Manager's Querying System.*" Here, a hypothetical customized request was made by the manager. In this case, the relative performances of fashion retailers on the first and second levels of the mall were requested. The query indicates that given the five performance measures requested, women's fashion retailers on the second level are larger, generate higher sales per square foot levels, and outperform the lower level women's fashion stores by approximately 10%.

Finally, Map 13 illustrates how the GIS can be used to archive tenant mix information. In this case, data that compare the retail structure of the mall between December 1992 and December 1993 were assessed. By using a GIS to depict this comparative historical information on both structural and tenant mix changes, mall management has a means of viewing and evaluating the internal dynamics of the mall on several dimensions.

The use of GIS as a spatial record-keeping system provides the shopping center management with a powerful, quick-response analytical

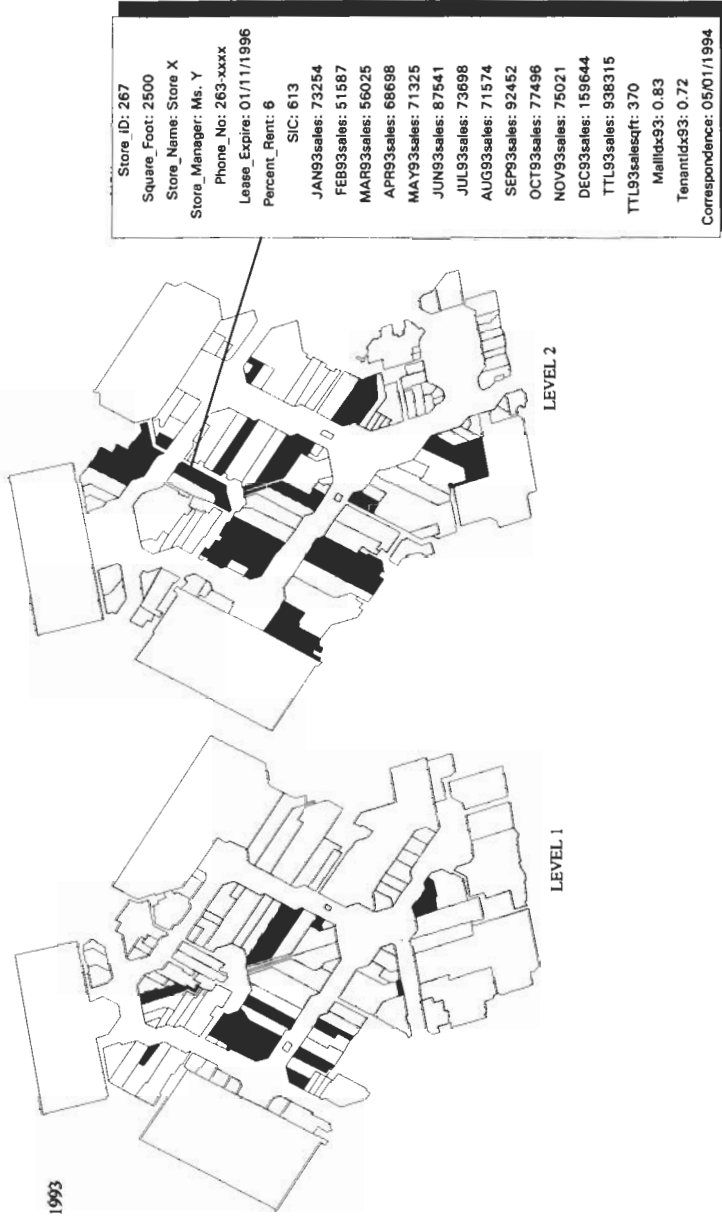
Map 10

SHOPPING CENTER FLOORPLATE



Map 11

MALL MANAGER TENANT INQUIRY



Map 12

MALL MANAGER TENANT INQUIRY: WOMEN'S FASHION



Map 13

**TENANT MIX COMPARISONS 1992-1993**

tool. Too often, shopping center developers and managers have had no cost-effective means of tracing the historical evolution of the tenant mix, structural changes, or the performance histories of their properties at a spatial scale. By incorporating a GIS-based management system into their day-to-day operations, shopping center managers have at

their disposal a spatially-based decision support system that can apply the data bases that are necessary to develop sophisticated tenant-based tracking and modelling systems.

#### *Tenant Performance Analysis*

To enable us to examine tenant performance, monthly sales data over a two-year period (1992–1993) were provided by the developer. Tenant performance was evaluated in terms of sales per square foot levels and by means of a derived index that compared the performance of tenants to their respective product category. These performance measures are available in this prototype either on a month-to-month or yearly basis. Maps 14–16 illustrate the type of sales per square foot analyses that are possible. Map 14 compares total sales per square foot levels in the center between 1992 and 1993. The two maps are alike, suggesting that the center over the one-year period experienced only minor changes in the performance of individual tenants. However, as the data are expanded over time, greater spatial variation would be expected. Map 15 provides greater detail. By examining the yearly percentage increase or decrease in sales per square foot levels a more useful set of information is provided. Clear patterns of high increases in sales performance emerge—particularly in the tenants close to major anchors. Map 16 displays how this type of information can be provided on a month-over-month basis. The GIS can be used to produce category reports such as sales by all stores of a given type for the past month (or any other specified period), a listing of best or worst performers, and sales results based on certain specifications (i.e., distance from the food court or distance from escalators). Finally, common queries can be automated in terms of graphs and tables. Other special requests would be more time consuming.

Maps 17–18 provide a more refined view of tenant performance. Here, each tenant's sales performance is evaluated relative to its product category. Tenants who are average performers for their category (i.e., women's fashion) would have a tenant category performance index of 1.0. Tenants who outperform their category would have indices greater than 1.0, while below average performers would have indices less than 1.0. Table 2 provides a summary of the average sales performance levels of the seven tenant categories that were used to derive this index.

Again, in this prototype, the GIS was used to produce two maps. The first compares changes in tenant category performance for the 1992–1993 period. The second examines the percentage increase or decrease in category performance over the same time period. These sorts of queries can be automated to display "exceptions"; for example, those tenants whose sales are particularly low or who are behind on rent payments could be color-coded for attention.

Map 14

### TENANT SALES PER SQUARE FOOT ANALYSIS 1992-1993



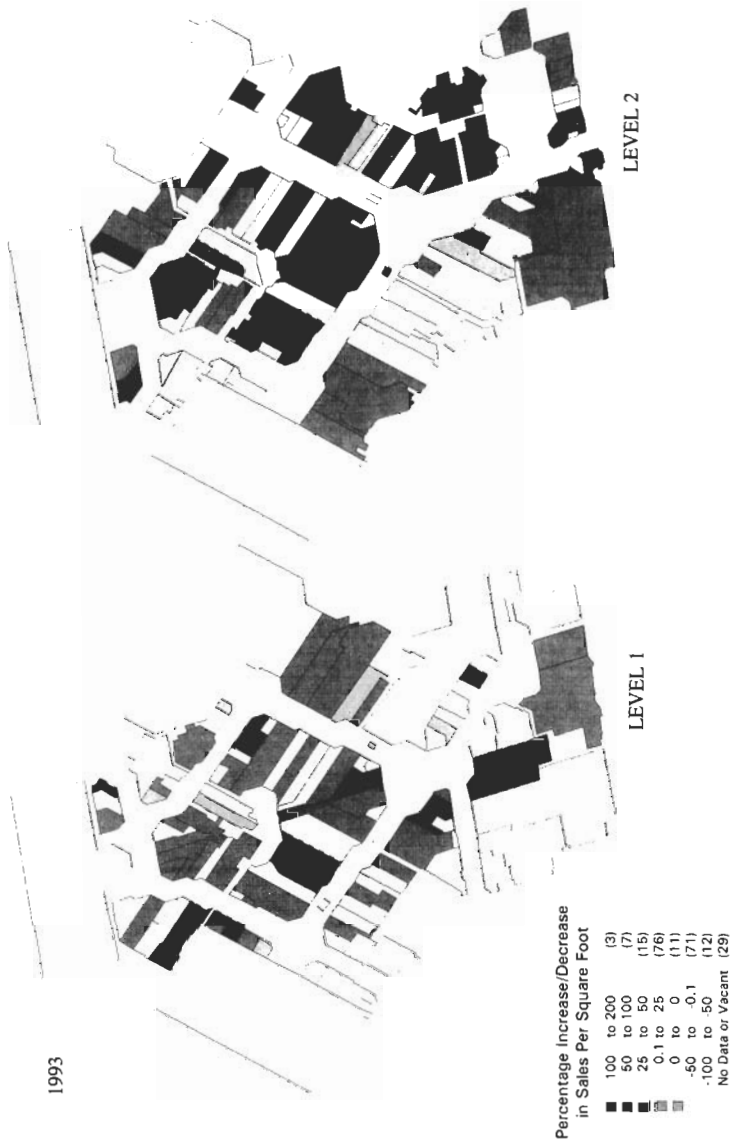


Map 15

TENANT SALES PER SQUARE FOOT ANNUAL CHANGE 1992-1993



Map 16  
 TENANT SALES PER SQUARE FOOT ANNUAL CHANGE  
 DECEMBER 1992 TO DECEMBER 1993



Map 17

### TENANT CATEGORY PERFORMANCE 1992-1993



Map 18  
TENANT CATEGORY PERFORMANCE CHANGE 1992-1993

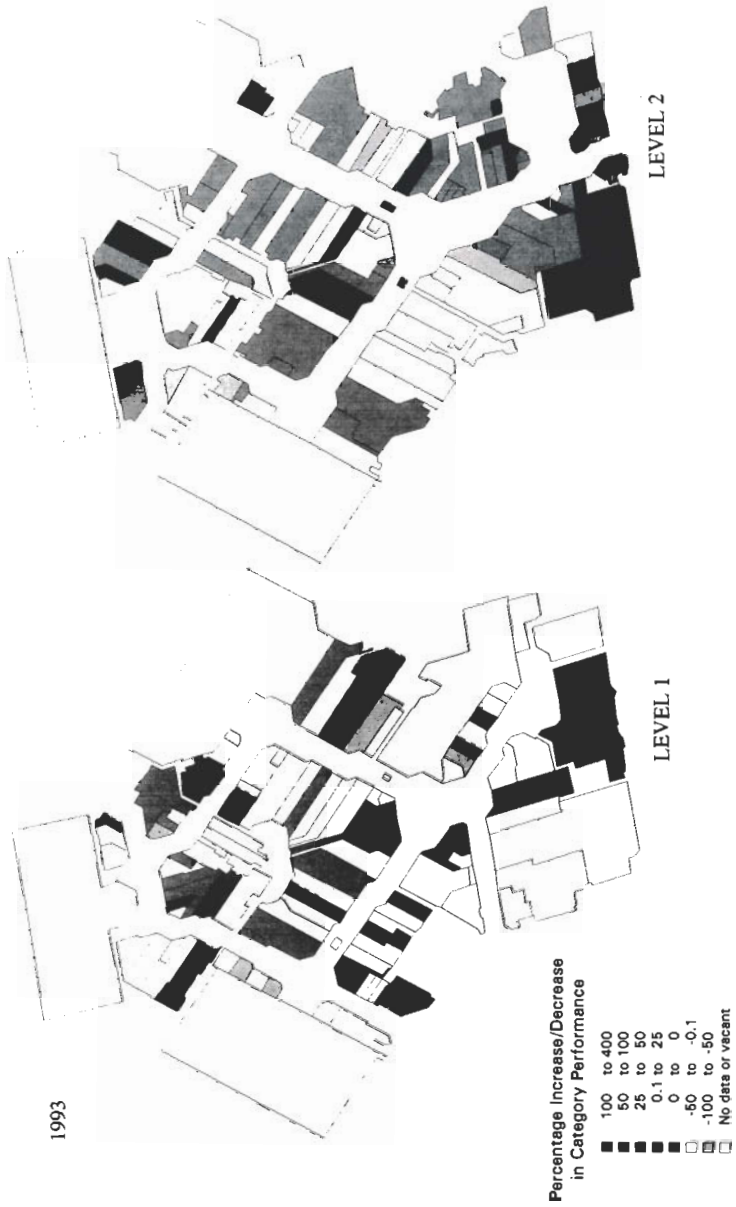


TABLE 2. TENANT PERFORMANCE COMPARISONS 1992-1993

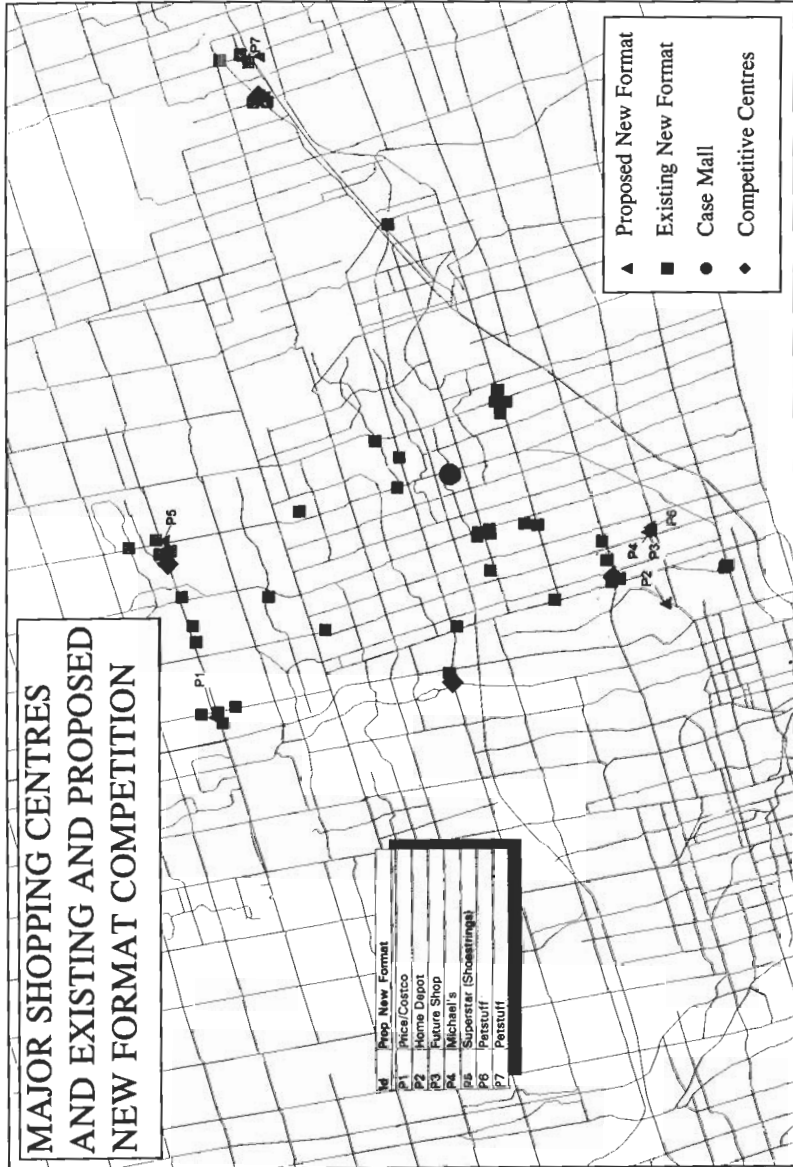
Tenant Category	Sales/Square Feet	
	1992	1993
Shoe Stores	\$499.17 (12)	\$560.67 (12)
Men's Fashion	\$407.08 (12)	\$394.54 (13)
Women's Fashion	\$397.17 (35)	\$425.82 (33)
Unisex Fashion	\$427.08 (24)	\$506.34 (24)
Non-fashion Retail	\$610.44 (75)	\$621.59 (73)
Fast-food/Dining	\$775.56 (27)	\$786.15 (27)
Services	\$623.00 (10)	\$408.78 (09)
All Tenants	\$533.59 (195)	\$530.78 (191)
Vacancies	(09)	(14)

### *Impact Analysis*

One major strength of GIS is its ability to examine a series of management-generated scenarios. This section of the paper examines the application of GIS querying capacities in assessing three possible impacts on the performance of the shopping center. The first presents the use of GIS to evaluate competitive changes in the retail environment. The second uses the technology to examine the effect of a major tenant expansion on the performance levels of adjacent tenants. The third examines the use of GIS as a means of evaluating the impact of internal mall promotions on mall performance. It should be noted that these cases are illustrative of a variety of potential applications. Indeed, the value of a GIS management-based system is in large part directly related to the imagination and creativity of the management team.

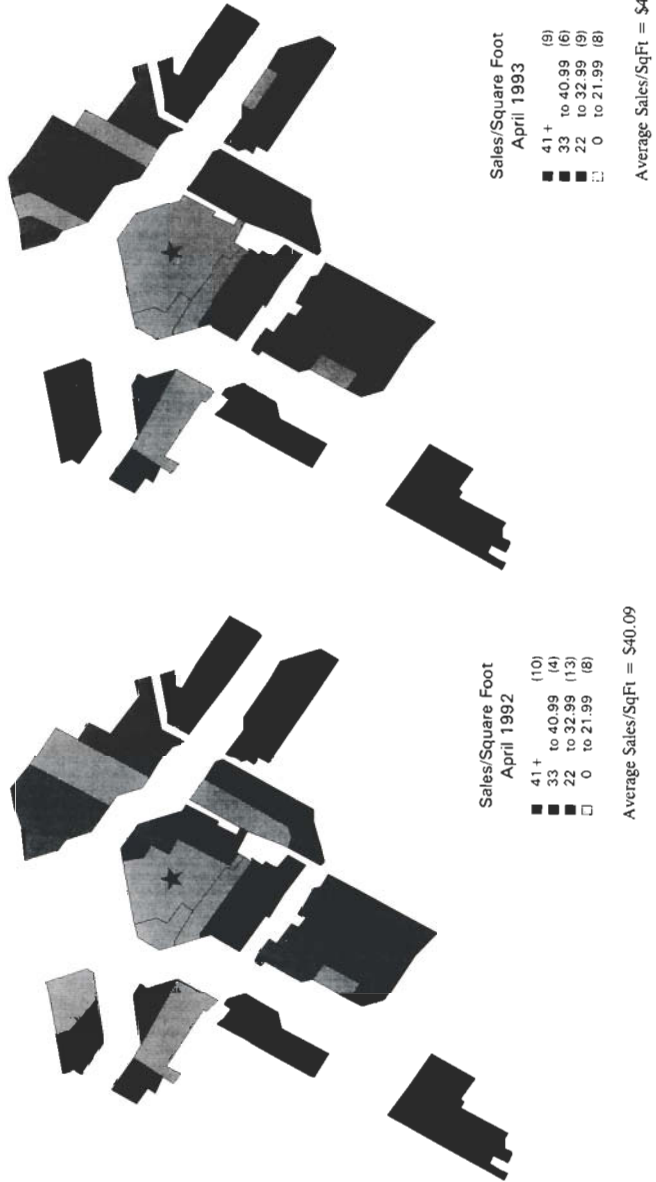
Map 19 highlights the location of seven potential new format retailers in the case center's trade area. By maintaining and updating this competitive inventory, the mall management team can monitor the changing retail system and input these data into various spatial modeling procedures (e.g., Spatial Interaction Models) to assess the potential impact of these structural changes on the sales performance levels of the shopping center. Questions that the mall management must typically address are the impact of a major new tenant entry, tenant expansion, or store closure on adjacent retailers. Map 20 examines the impact of a major fashion chain's expansion on a year-over-year basis. In November 1992, the store in question (highlighted by the \*) increased its gross leasable area from 4400 square feet to 7500 square feet. It was anticipated that, given the "drawing power" of this national fashion retailer, the expansion would significantly increase the performance of the tenants in close proximity to this location. The analysis suggests that in fact

Map 19



Map 20

# SALES IMPACT OF MAJOR TENANT EXPANSION



Map 21  
IMPACT OF MALL PROMOTION ON TENANT PERFORMANCE  
OCTOBER 1992 TO OCTOBER 1993





this expansion had minimal effect on the sales performance of the retailers in close proximity. This map is illustrative of the types of special analyses for which a GIS can be used.

The final analysis examines the impact of mall promotion on tenant performance. One common method used to increase customer traffic and, by extension, sales revenues, is the sponsoring of "in mall" promotions. Typical events include week-long antique and collectible shows, fashion shows, education weeks, and celebrity attractions. Again, a GIS can be used to detail the relative success of these events on particular tenants, retail categories, or parts of the mall. Map 21 examines the effect of one major advertising event that was held in October 1993 - the mall's twentieth anniversary. To celebrate this milestone, a variety of special events and "give-aways" were held and advertised through a major direct mail campaign. Most of the activity was centered in the lower level adjacent to the customer service area. The month also featured two other promotional events - family night and a three-day car show. One way of assessing the general impact of these events is to compare individual tenant sales performance levels between October 1992 and October 1993 (Map 21). This analysis indicates that 104 tenants reported an increase in their October sales on a year-over-year basis, while 88 tenants reported a monthly sales decline. The analysis also revealed well-defined clusters of tenants who experienced sales increases or decreases.

## ■ Conclusions

This investigation has examined the potential value of GIS technology as an aid in shopping center management. Mall management is a complex process that requires effective response to change. Change can take a variety of forms - changes in the competitive retail environment, modifications in market demographics, alterations in consumer tastes and spending behaviors, the emergence of new consumer lifestyle groups, and the growth, decline, or repositioning of specific retail tenants and chains. Shopping center developers need to incorporate more responsive and analytical methods into their systems for assessing and managing change. This research has examined the application of GIS technology as a platform that can be used to monitor, assess, and analyze the factors that contribute to mall performance at a variety of spatial scales. As such, the research can be viewed as a prototype GIS-based mall management decision support system. This study did not attempt to examine every possible application of GIS for shopping center management. For example, traffic counts, licence plate spotting, and continuity programs were not addressed.

There may be difficulties with the integration of GIS capabilities into the shopping center industry. Despite recognizing the importance of location, few developers have the in-house skills necessary to understand the value of spatial information, the complexities of spatial data sets, or the ability to manipulate or manage large spatial data bases. Further, there is a lack of trained graduates with a combination of both GIS and retail/shopping center management skills. It is our hope that these impediments will be overcome in the near future so that the potential of this technology may be realized by the industry.

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