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Identifying the Real Catchments of UK Shopping Locations

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Abstract

One of the problems facing many UK retailers is that of trying to understand the complexities of shopper flows between residential areas and retail destinations. This can be solved to a certain degree with the use of internally available customer data, but this only forms part of the picture – what about your competition?

There are a number of techniques being used for estimating catchment areas of retail outlets, but these vary across different retailers and markets. This paper provides an appraisal of the methods used to define retail catchments, and gives examples of best practice in how externally available data can be used to supplement existing customer information to improve business decision making.

Introduction

Catchment definition is an important part of site location and marketing decision-making and allows analysts to establish a relationship between retail supply and demand. It is important in understanding the effects of competition, and used to estimate impacts of changes to the retail network.

Developments in GIS technology and improvements in data availability have greatly enhanced the options available to analysts in extracting valuable information about existing or prospective catchments. The recognition of the value of customer data has removed some of the typical "counting chimney stacks" guesswork, and customer data can also be enhanced with a range of externally available data such as geodemographics and lifestyle based products. GIS software provides an ideal tool to visualise and analyse the resulting information, from the plotting of customer surveys to the use of shopper flow data in calibrating gravity models.

What is a catchment?

A catchment can be defined as "the area from which shoppers using a specific shopping destination are drawn". Popular rule of thumb definitions of catchments, such as a 20 minute drivetime, are rarely based on the analysis of observed information, and the resulting analysis is often very misleading.

Catchment definition is a question of establishing the quantity of catchment population i.e. measuring market size at a single point, and quality i.e. what types of customer live within this catchment. These requirements vary with size and type of offer, for example a Retail Warehouse Golf Store requires very different catchment quantities and qualities compared to a Bingo Hall.

The geographic extent of catchments is influenced by a range of demand and supply side factors. On the supply side there is the strength of the offer (in terms of quality, age, size, location, mix) and the strength and distribution of competing trading locations. On the demand side there are important factors such as location and quantity of population clusters and the types of people that live within the catchment. In addition there is also a trip cost which is determined by the nature of local transport facilities the quality of the road infrastructure, natural barriers such as rivers and in some cases, psychological barriers.

Nominal catchments

Nominal catchments are the most commonly used methods of catchment definition, and often the most misleading. Typically, they require the generation of either a drivetime or radial distance from a defined point and the output will usually be a map defining the extent of the "catchment" and a standard demographic report (see Figure 1). This report will provide information about the hypothetical catchment, such as demographics or lifestyle profiles of the area, and usually compares observed figures with a national base.

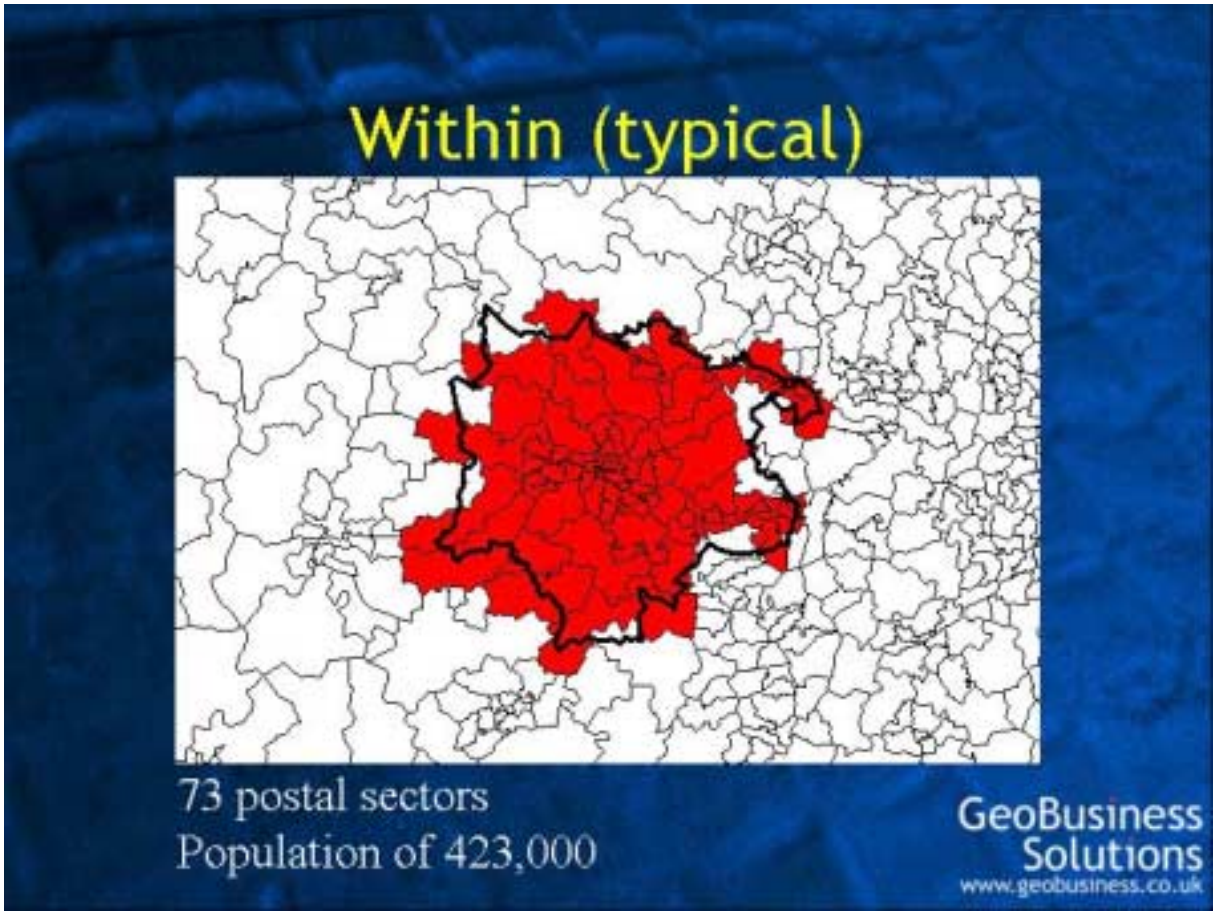
Basic Demographics	Total				
Resident Population	85,408				
Adult Population	67,463				
Number of Households	34,810				
Population by Age	**Total**	**%**	**Base%**	**Index**	
0-15 years	15,818	18.5	21.1	88	
16-19 years	4,511	5.3	6.4	83	
20-24 years	6,629	7.8	6.0	130	
25-29 years	7,672	9.0	10.1	89	
30-34 years	6,571	7.7	4.5	171	
35+ years	44,202	51.8	51.9	100	
Car Ownership	**Total**	**%**	**Base%**	**Index**	
No car households	7,966	23.1	34.1	68	
One car households	14,935	43.3	45.0	96	
Two car households	9,467	27.4	17.1	160	
Three car households	2,139	6.2	3.8	163	

Figure 1 – Typical drivetime map and resulting report

The choice of using either drivetime or radials in catchment analysis usually comes down to two things: budget and catchment size. Most desktop GIS have the functionality to create radials (buffer) around a point, but drivetime functionality is usually an additional module that involves extra cost. Retail schemes that are typically attractive to car borne customers i.e. retail parks and regional shopping centres commonly use drivetime or drive-distance as a means for catchment analysis. For retail offer that has considerably smaller catchments, such as convenience stores and pizza delivery outlets, the catchments are usually analysed in relation to straight-line distance, or radials.

Care must be taken when using drivetime based “catchments” as a number of factors can influence the results. Drivetime software varies greatly in terms of specification, particularly in relation to the accuracy of the underlying road network, the weights applied to each road link, and methods used to handle off network travel.

The report based outputs can also vary according to how the GIS selects the underlying geography to produce demographic information (see Figure 2). In addition, the granularity of the geographical units at which the demographic information is held (usually Enumeration District or Postal Sector), can also have a significant influence on the resulting demographics. It is generally recommended that for small catchments a more refined geographical unit is used to produce demographic output, for example enumeration district or full postcode.



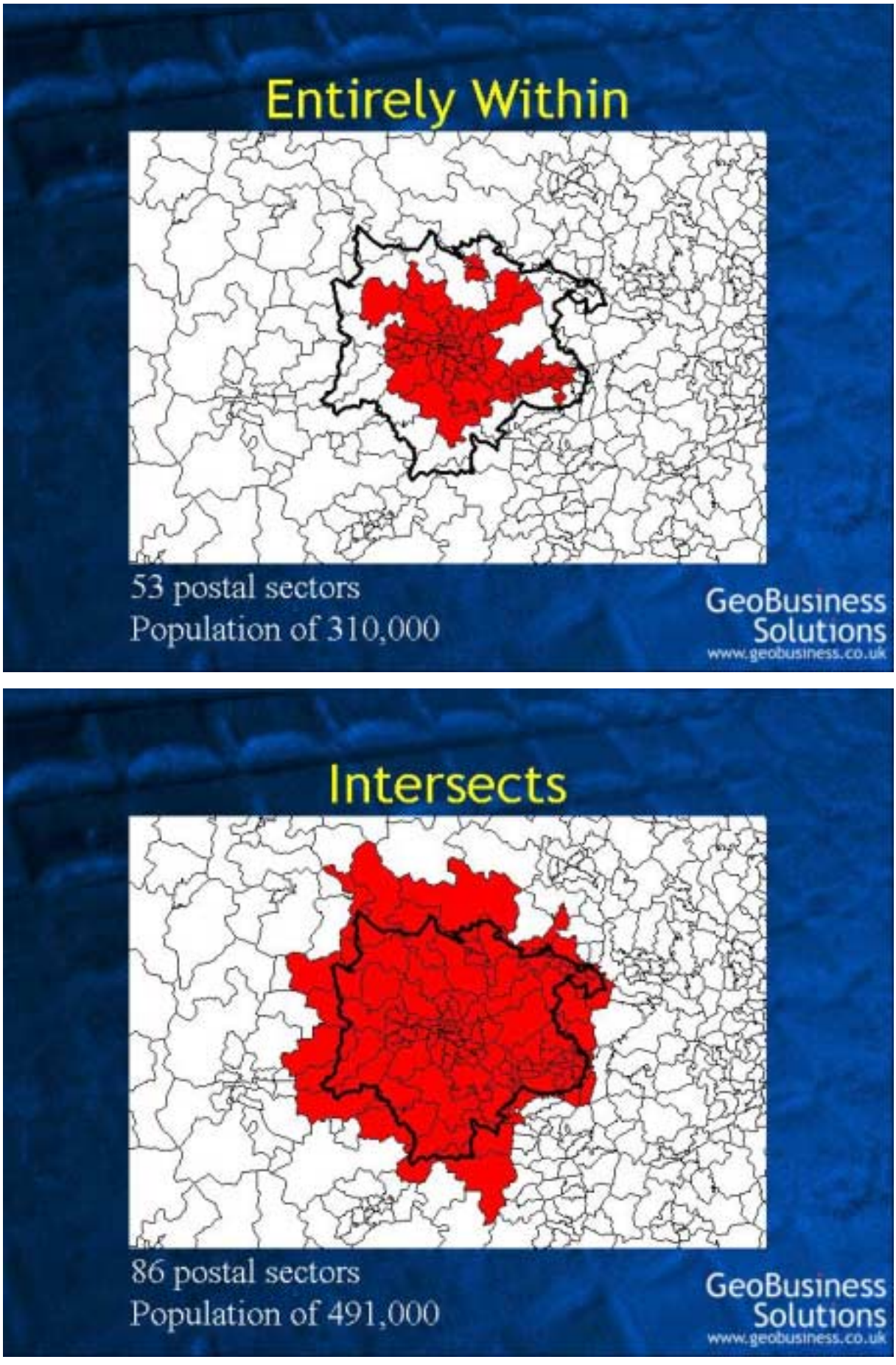


Figure 2 – Variations in the area selection process

This nominal catchment approach is useful when trying to understand basic measurements of demand in pre-defined areas. The concepts behind it are relatively simple to understand and are a cost effective way of going one step beyond educated guesswork. The crux of the problem with this approach is that the use (or misuse) of such outputs can lead to expensive mistakes.

There are a number of other considerations when using such outputs. Firstly, it does not factor in levels and quality of competitive offer – something that has a significant influence on the shape and size of catchments, and hence profitability of the outlet. Secondly, the choice of drivetime or radial band (in terms of minutes or miles) is usually arbitrary and is not based on previous analysis. For example it is rather naive to assume that the catchment of all new leisure developments will be a 20 minute drivetime?

Research has shown that catchments should not be considered as a definitive boundary where effectively everything inside is in and outside is out. Instead distance decay, essentially a declining propensity to visit with distance from an outlet, needs to be taken into account (more later). Nominal catchment analysis assumes that customers 5 minutes from the outlet have the same propensity to visit as those that are 19 minutes away which is not usually the case (see figure 3).

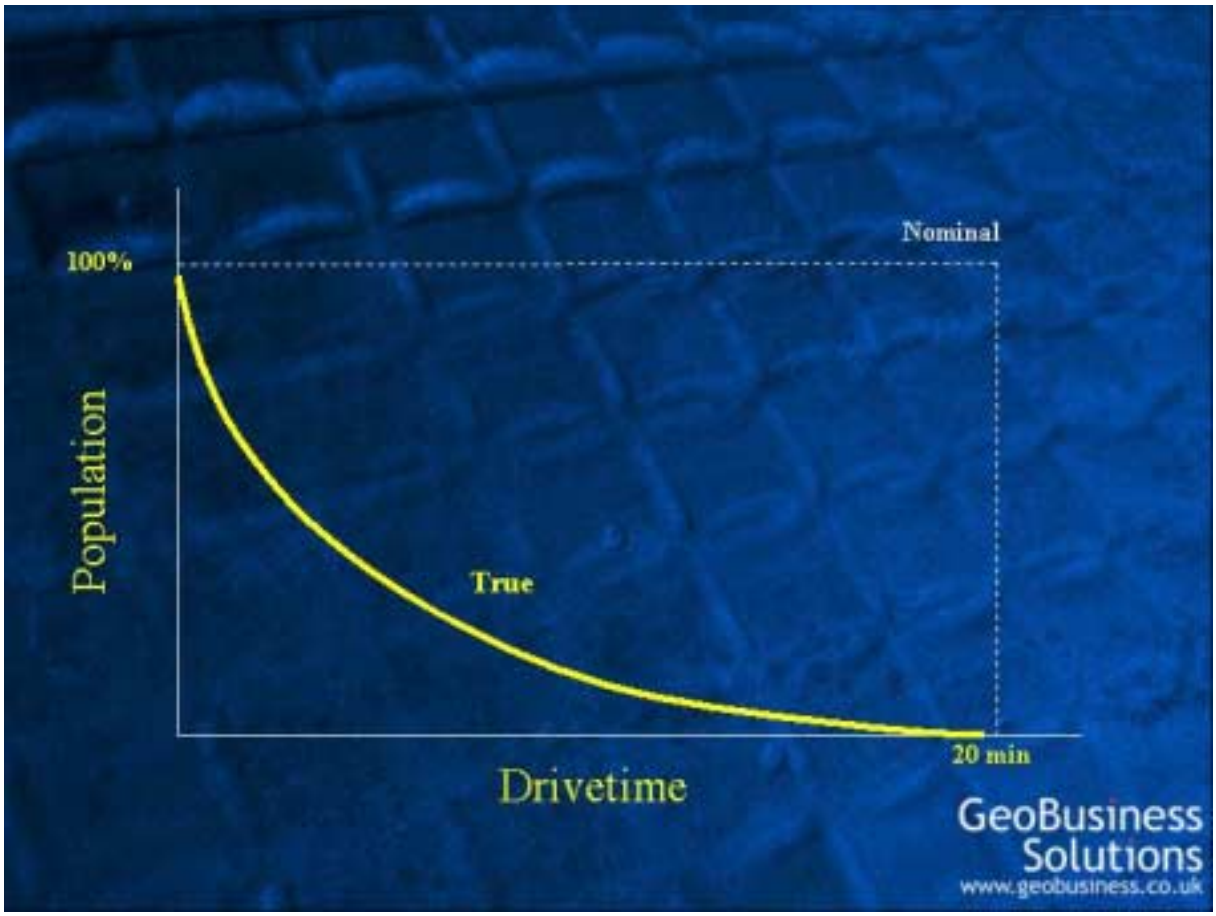


Figure 3 – Nominal versus Real Catchments

Catchments from Customer data

The collection of customer data through a variety of means, such as loyalty card schemes, call centres and customer surveys has improved many retailers' understanding of the real catchments of their outlets. The key to mapping this output in Great Britain is geographical referencing via the postcode. In turn, postcoded information can then be augmented with geodemographic or lifestyle indices which allows retailers to determine what type of customers they are most likely to attract to a particular outlet.

So how do retailers typically use customer information in the definition of catchment areas? Firstly there is the basic sprawl map – a representation of the location of each customer by a position on a map (see figure 4). This approach makes it difficult to visualise concentrations of incidence and there is still no concept of

distance decay. It is often more appropriate to visualise information aggregated to a pre-defined area geography, such as customers by hexagon (see figure 5).

Figure 4 – Sprawl Map

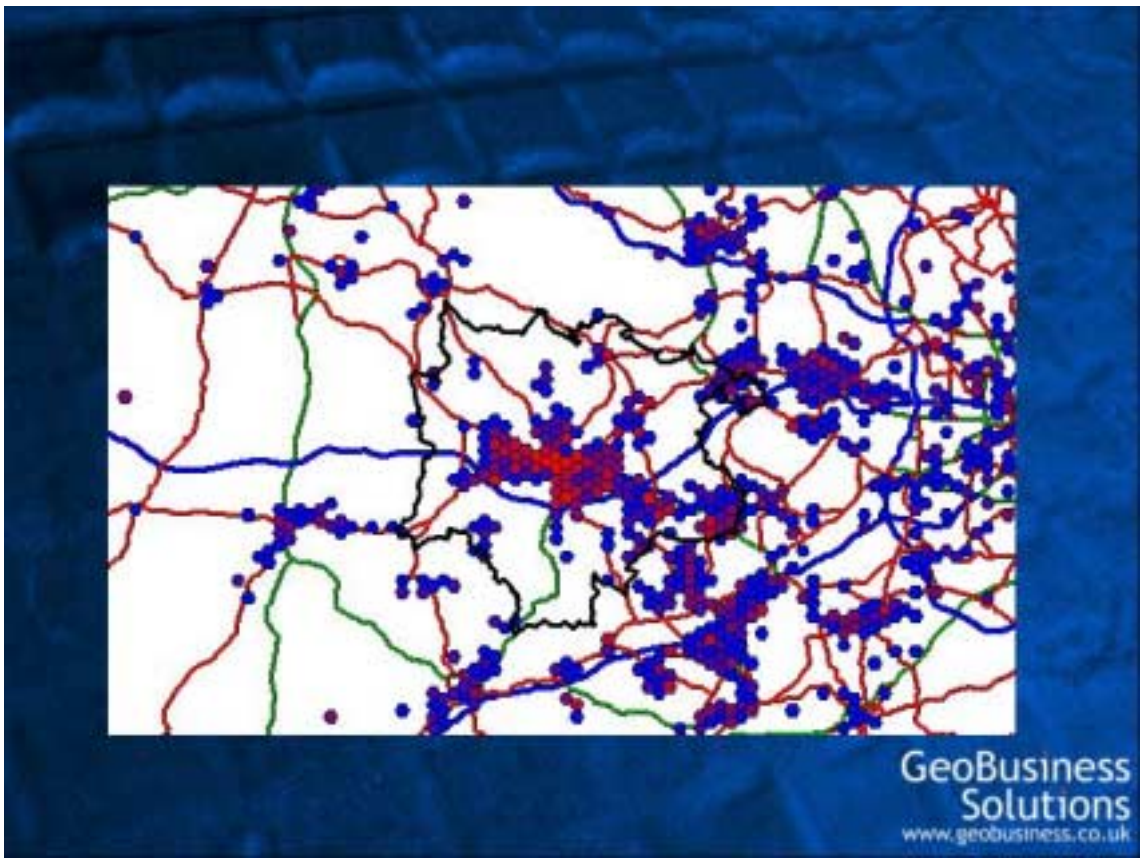
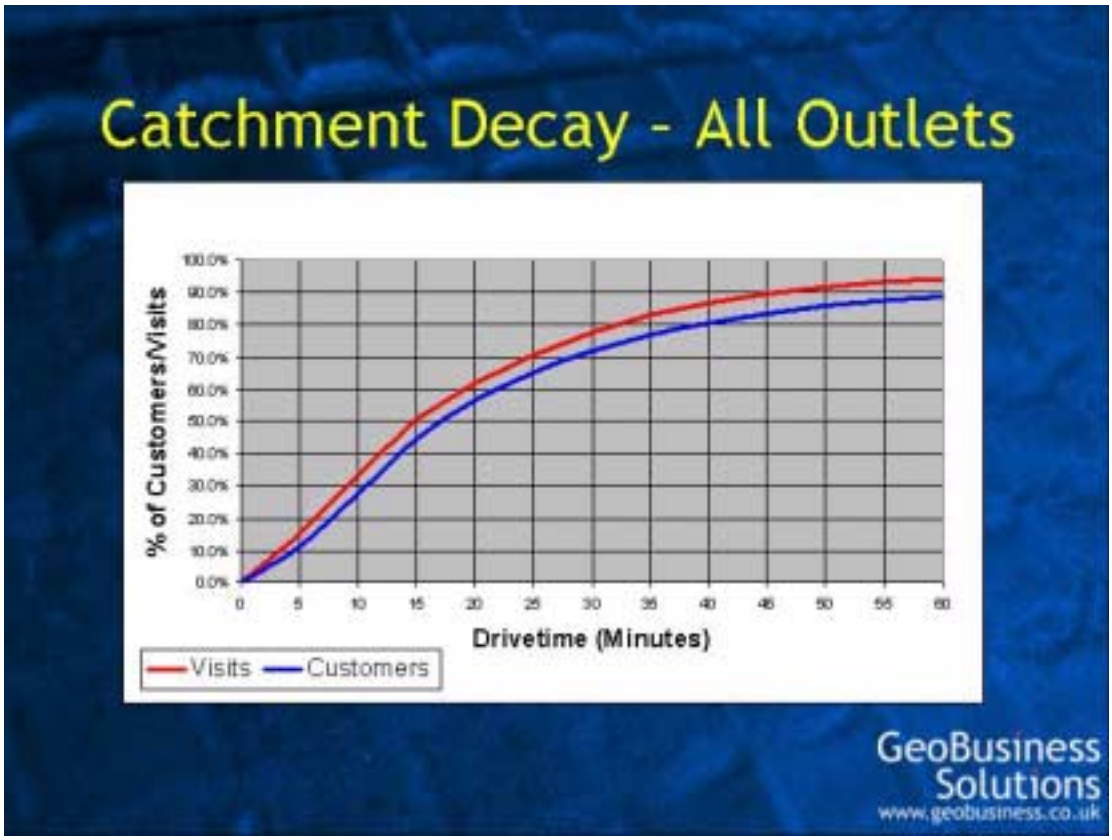
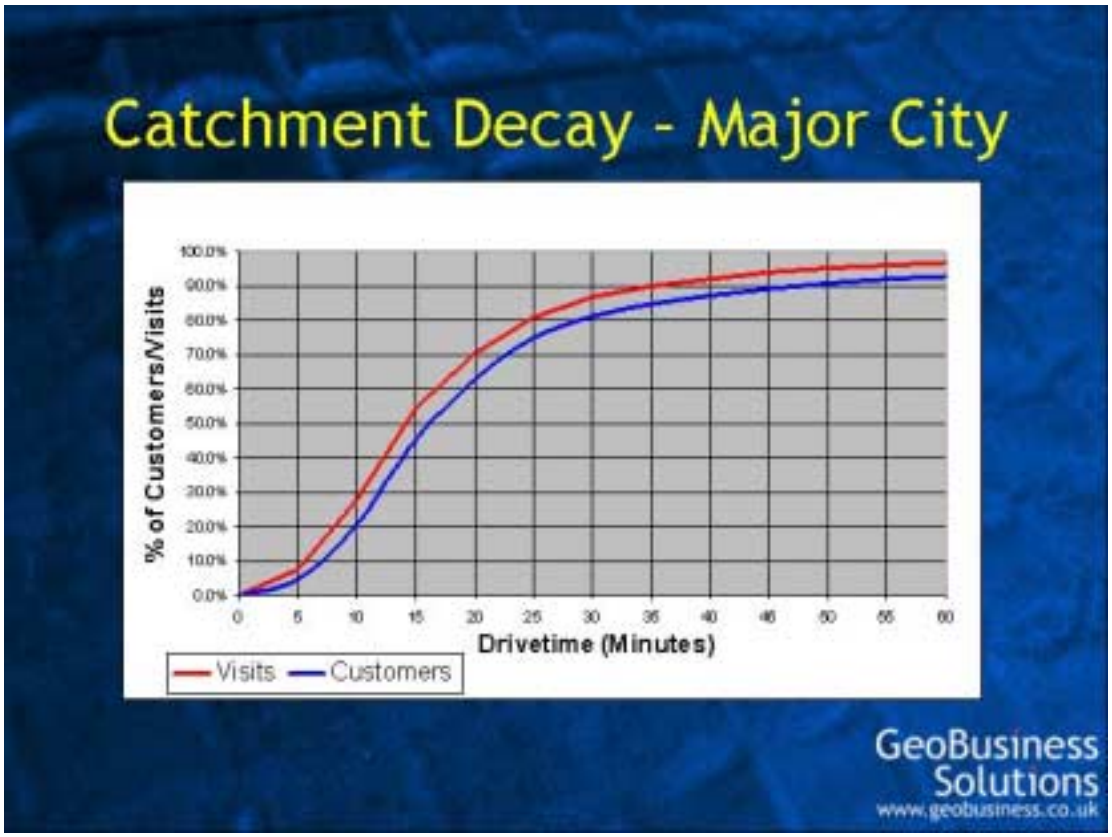


Figure 5 – Visit by Hexagon

Catchment decay curves can assist understanding of retail outlets, and show how incidence of customers, visits or expenditure decline with distance from the outlet. Different outlets will have different decay curves (see Figure 6), and this information should at least be applied back to assist decisions about defining core catchments for outlets. However, it is very rare for the distance decay effect to be equal in all directions and graphical visualisation will not identify non-uniform decay.





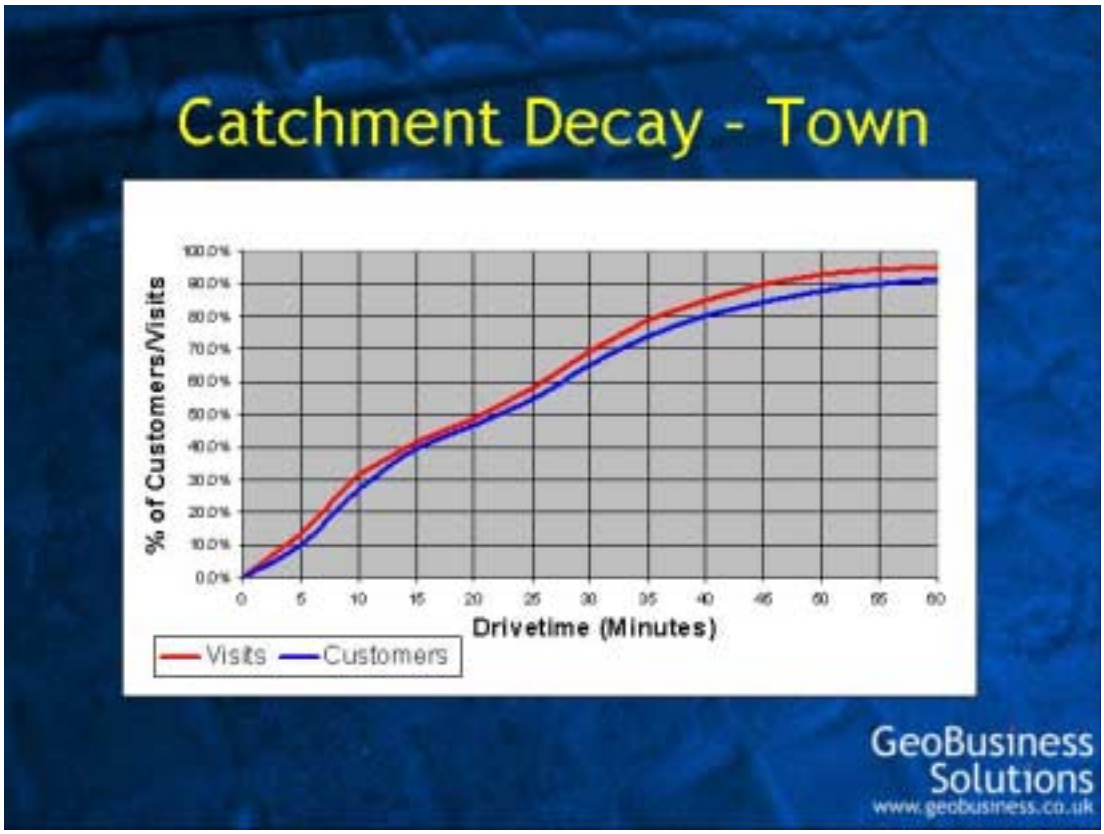
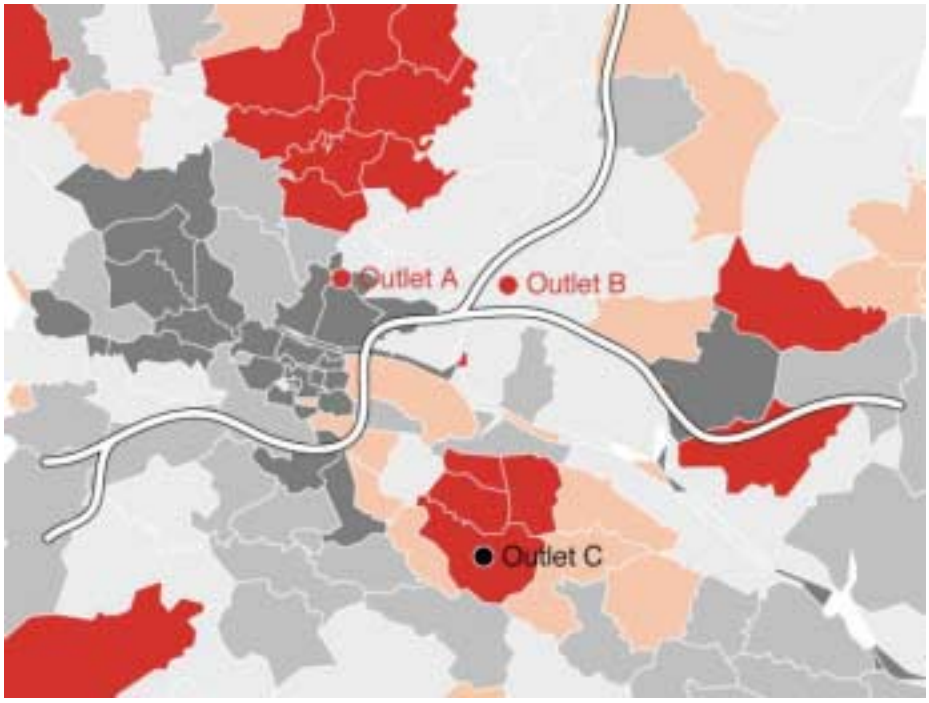


Figure 6 – Distance Decay by Outlet location

A way of creating geographical core catchments is to rank geographical zones based on their penetration rate or percentage of total customers, and cumulatively add the zones with the highest penetration until n% of customers are accounted for. It is usual for n to between 70 and 80%. Retailers often use percentages to define a primary, secondary and tertiary catchment.

The choice of geographical zones for the analysis plays an important part in the visualisation/interpretation of results. Figure 7 demonstrates the problems of mapped visualisation – how the same data can be displayed differently according to the size and the shape of the geographic boundaries used. As a general rule the smaller the geographic "brick" the reduced level of error.



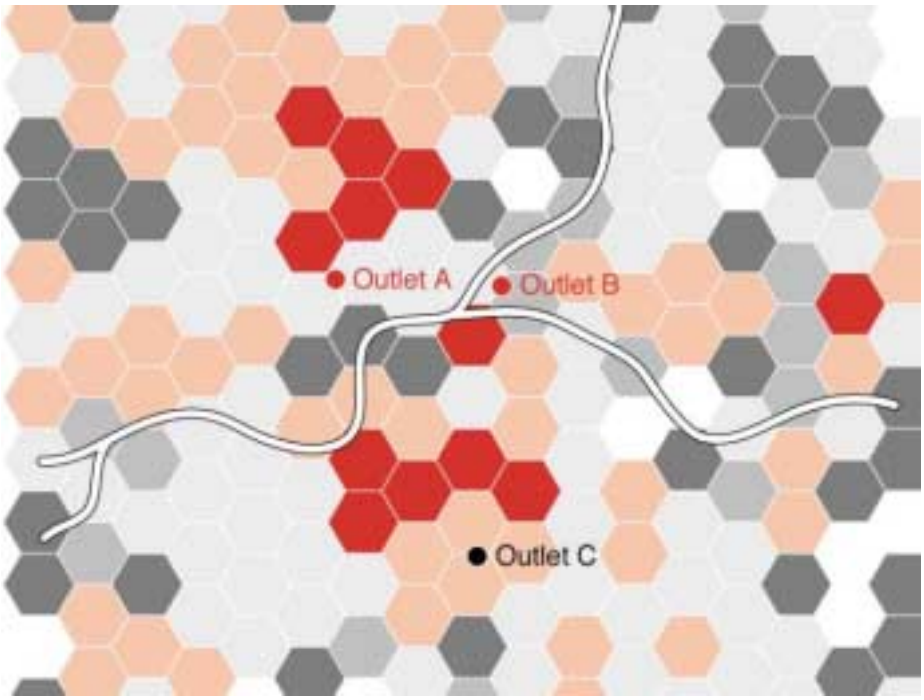


Figure 7 – Visualisation of data by different geographies

The use of such internal customer data adds intelligence to the catchment definition of existing outlets, and to some degree can help in predicting likely catchments of new outlets (analogues). However, analysts need to be aware of biases in the customer dataset – sample size and recency, and what about the customers who visit your competitor, do not have a loyalty card, or have a loyalty card but forget to use it?

The National Survey of Local Shopping Patterns

Using externally available survey data can be a good way of replacing or filling some of the gaps and bias in internal customer data. The benefits of these datasets are that they are usually based on a regular programme of updates and the costs of collection are spread across a number of clients.

The earliest commercial source of shopping survey information was LUPiN (1984/85), which provided information about both local press readership and retail catchments. This was followed by SHOPPiN in 1989, a survey of convenience and comparison flows.

The National Survey of Local Shopping Patterns (The National Survey), first carried out in 1996, is a more recent source, being the largest continuous household survey of shopping destination preferences that has been undertaken. It is the definitive source of information on UK catchments and catchment penetration rates for both non-food (comparison) and food (convenience) goods. The latest release has over 1.2 million responses, accounting for 2,500 comparison goods and 4,600 grocery stores locations (See Figure 8), providing:

- The geographic extent of catchment areas by postal sector
- catchment population sizes
- catchment penetration rates
- shopping population sizes
- competing trading locations
- catchment and shopping population profiles
- market size relativities

Figure 8 – Survey locations: food and non food

The National Survey is not clustered at the store level (unlike loyalty card data) and provides a unique insight into what is happening in the total market. The survey identifies all significant trading locations in any particular area. Uniquely, the convenience dataset identifies flows from residential zones to individual food fascias. Providing an important insight into the market penetrations of competing food stores.

Example applications

The final section of this paper looks at a number of case studies where The National Survey has played an important role in aiding site location and marketing research.

One of the main uses of such origin and destination dataset is as a calibration set for gravity modelling. Gravity modelling is a technique that uses a mathematical model to predict the level of customer trips between residential zones and outlets or centres. The National Survey provides an essential means to ensure that the model as close as possible matches observed trip flow data.

Professor Stan Openshaw, with a commentary on "insoluble problems in shopping model calibration" in Regional Studies (December 1973), stated that "it is possible to calibrate the model using constrained optimisation techniques or by making assumptions about mean trip lengths and solving maximum likelihood functions, but there can be little empirical justification for either of these approaches when the trip pattern is not known. If trip data is not available, these problems will remain insoluble, and lesser problems relating to the selection of data zones, the measurement of trip times and the estimation of spatial variation in retail expenditures, are somewhat irrelevant. The solution is of course to collect shopping trip data."

The National Survey has been used as a calibration set in a number of major commercial modelling exercises. For example, a major property developer was in dispute with a grocery retailer about the value of a parcel of land, the value to be determined by arbitration. Land value is largely based on the expected future revenues of the proposed use, in this case a grocery superstore. The grocer proposed a value based on hypothetical stores. A model was commissioned to identify the likely future revenues of various types and sizes of grocery outlet at different sites. This model was calibrated using The National Survey. The research demonstrated that the grocer's assessment of the site value was invalid. The award to the developer was 60% greater than the value suggested by the grocer.

As well as local market studies, the coverage and sample size of The National Survey has warranted its inclusion in the largest ever optimisation and targeting project undertaken for a retail organisation within the UK. One of the National Lottery bidders commissioned a Network Optimisation model that modelled trip making behaviour, and The National Survey was used to calibrate the shopping based trips. The objective was to determine an idealised network of terminals that minimised average travel time and maximised convenience to the customer.

A major player in shopping and leisure centre development, used The National Survey to measure the effect of new shopping schemes, and reduced the reliance on outputs from the traditional nominal catchment approach. An in-house gravity model allows the simulation of changes in the retail supply network, and predicts the effects new schemes may have on the existing network. The survey also allows them to define the true catchments of existing centres, and through the use of centre rankings, identify the rising opportunities for development.

Comparison goods centres are often ranked according to their supply attributes (especially number, type and quality of units), and this can be supplemented with information derived from The National Survey about real shopper populations. Allocating people to centres based on the penetration rates at postal sector level provides a demand side ranking that lists the top 2,500 centres and their shopper populations. A number of retailers are using this in the creation of target town lists, particularly when expansion plans move away from the traditional large cities of London, Glasgow, Manchester, Birmingham and Leeds.

A more marketing focused application using The National Survey was for a major Leisure operator in the UK. Local promotions have been traditionally held at the venue, and there was a requirement to promote the venues at other locations. This operator used The National Survey to identify the key shopping destinations to carry out promotional activity. Using observed customer flows from The National Survey they allocated

their active members at postal sector to shopping destinations, to create a shopping destination ranking. This enabled a more focused marketing campaign geared towards the highest ranked centres, where existing and new customers were more likely to visit.

Conclusion

This paper has discussed a number of ways that retail, leisure, and development organisations define catchments for centres or outlets. It has outlined the pitfalls associated with different approaches, the benefits of using in house customer data and offered suggestions as to how externally available shopper flow data, such as The National Survey of Local Shopping Patterns, can greatly assist in helping solve a variety of site location and marketing problems.

Other Relevant Material and Links

This paper is adapted from a training course entitled "*Achieving Accurate forecasts of Retail Catchments"*, GeoBusiness Solutions, April 2000 and June 2001.

Halsall, S.R., Thompson A., Walker J. (1999) *Profiting from Geographical Analysis – Using geographical analysis to ensure profitable business decisions.*

Paxton C., GI News, March 2001 "*Using Postal Geography data for Business Analysis*".

Teale M., paper presented at GeoBusiness Conference October 2000 entitled *"The Impact of Major Regional Shopping Schemes in the UK".*

Teale M., paper presented at the 1999 GeoBusiness Conference entitled *"The Real Catchments of UK Shopping Locations".*

Walker, J.W., paper presented at GeoBusiness Conference October 1999 entitled *"Using Models to Optimise Network Planning".*

Walker, J.W., paper presented at Henry Stewart's September 2000 Art of Assessing the trading Potential of Store Locations Conference entitled "*Optimising Retail Networks to Maximise Sales Performance".*

Some of the papers listed above are available for download from the GeoBusiness Web site: http://www.geobusiness.co.uk

A dedicated web resource for the National Survey of Local Shopping Patterns can be found at: http://www.geobusiness.co.uk/cbhp.htm