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USING SPATIAL INTERACTION MODELLING:
THE W H SMITH APPROACH**

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SALES PERFORMANCE AND SALES FORECASTING USING SPATIAL INTERACTION MODELLING: THE WH SMITH APPROACH

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INTRODUCTION

Researchers in the School of Geography at the University of Leeds have a long-established international reputation in the field of mathematical modelling of geographical systems. This reputation owes most to the leadership of Alan Wilson as Professor of Urban and Regional Geography from 1970 to 1991. In the 1980's, geographers at Leeds also became interested in emergent Geographical Information Systems (GIS) technology, in particular as a vehicle for representing and understanding the outcomes of modelling procedures.

The combination of the GIS and mathematical modelling technologies provides a basis for 'Spatial Decision Support Systems' of unique power. As a result, the commercial demand for such systems is now high in a great number of retail and service sectors. To meet this demand, the University of Leeds has established its own limited company, Geographical Modelling and Planning (GMAP) which currently employs around 50 staff.

Some of the broader implications of these developments are considered elsewhere in this volume by the Managing Director of GMAP, Martin Clarke. In this chapter, we will consider a specific application of the approach which has been developed in association with one of Britain's leading high street retailers, WH Smith Ltd.

In the next section, we will introduce the company, and describe its earlier approaches to sales forecasting. We will then show how a National Intelligence System (NIS) has been developed, combining mathematical modelling with advanced computer technology. We will outline the major benefits offered by the system, and then discuss some of the remaining weaknesses and

future development issues. In conclusion, we will comment on some of the general lessons which can be learned from this specific case study.

WH SMITH LIMITED: THE CORPORATE CONTEXT

History and structure

WH Smith Group PLC was founded in 1792 as a seller of newspapers and books on stations with the advent of the railways. The company has expanded continually over the last two hundred years, and now has interests from news and book wholesaling and office stationery supplies through to high street retailing in both Britain and the USA.

The high street chains include over 400 'WH Smith' branches whose major product groups are newspapers, books, magazines, stationery, greeting cards, recorded music and videos. The company also owns Our Price Music and Our Price Video, leading specialist music retailers; Waterstones, the market leader in specialist book selling; and Paperchase, a distinctive retailer of high quality stationery and greeting cards.

The aims of the group include being the leading retailer of books, magazines, stationery, recorded music and video in the UK.

The importance of accurate sales forecasting

Most of the markets in which WH Smith is operating are considered to be fairly mature - in other words there is not much potential for growth in the overall size of the market (the obvious but only exception to this being the rapidly expanding video sector). In order to achieve market leadership, WH Smith therefore needs

to grow through increasing its market share. These objectives are currently being pursued through heavy investment in both information technology and in expansion of the existing store network into new towns and sites.

It is vital that the programme of new store openings be supported by accurate sales forecasts for those new units for at least three reasons. In the first place, without accurate forecasts it is impossible to plan effectively, and produce meaningful budgets or outturns for the stores. A second reason is that with the average cost of fitting out new stores increasing all the time, and the huge rises in rates in the last few years, it is of paramount importance that resources are not misdirected towards unprofitable new openings. Thirdly, mistakes are difficult to rectify as closures are bad for the image of a high profile retailer such as WH Smith.

Previous approaches to sales forecasting

In the early 1980's, sales forecasts for individual towns were based around Local Expenditure Zone (LEZ) population statistics, purchased from CACI. This data provided a residential population in a set area around the town. All existing WH Smith stores were allocated a LEZ population and an analysis of sales by product was undertaken to show the average sales expected for any particular catchment band. In assessing a potential new site, the LEZ population would be looked up, and the average sales found in that catchment band used as a basis for the forecast.

The results from this method were found to be extremely variable. An analysis of branch performance in 1987 showed that roughly half of recent new openings performed substantially above

budget and the other half substantially below. Whilst overall this could be said to make little difference to the company, these results do tend to mitigate against the credibility of, or indeed the need for, a forecasting approach.

The poor performance of the LEZ-based approach is hardly surprising given that no concrete account was taken of the effect of competition within the town, affluence of the area, local pitch, or of how many people in the residential population actually used their local centre to shop in. Some of these factors were taken into account by members of the Site Development department, and thus provided a basis for manipulating the model estimates according to their own intuition or 'gut feel'.

In the quest for greater accuracy, the company next undertook an in-depth analysis of 15 towns to provide a basis for analogue sales forecasting. This method, introduced by Applebaum (1968) and expanded by Davies (1977) relies on attempt to predict the sales within a given town through a comparison with performance in towns of a similar type. To operationalise the method, 15 towns were selected and between these towns 22,500 interviews were conducted, half of them within the WH Smith store itself, and half in the centre of the town. Questions were aimed at discovering how far people travelled to each centre and to the WH Smith stores, their socio-demographic profile and what products they bought when they were there. The results were analysed in conjunction with population statistics for set radius bands around the centre, with a view to producing estimates of market share for each product.

The major problem behind this method was in the selection of existing or analogous stores to compare with a potential site. There was no discernible pattern to the market shares obtained in each of the test stores. It was not therefore possible to use this analysis to predict likely market share in other towns.

Following this unsuccessful excursion into analogue methods, the company decided to formalise its requirements for sales forecasting. These were:

1. To be able to forecast sales by product group to within 10%
2. To be able to assess the effect of a new branch opening on neighbouring existing branches
3. To be able to identify towns with opportunities for WH Smith.

After further consideration of the available options, the company decided to invest in what is perceived as a 'gravity modelling system', to be developed in Leeds by GMAP. The characteristics of this system are described in the next section.

FEATURES OF THE WHS 'NATIONAL INTELLIGENCE SYSTEM'

A spatial interaction model of consumer behaviour

The basis of the spatial interaction model developed by GMAP on behalf of WH Smith can be expressed in four deceptively simple equations:

$$Y_{ij}^m = A_i^m O_i^m W_j^m \exp(-\beta c_{ij}^m) \quad (1)$$

$$A_i^m = 1 / \sum_j^m W_j^m \exp(-\beta c_{ij}^m) \quad (2)$$

$$Y_{ij}^{km} = Y_{ij}^m t_j^{km} \quad (3)$$

$$t_{kj}^{km} = \frac{a_{kj}^{km} z_{kj}^{km}}{\sum_k a_{kj}^{km} z_{kj}^{km}} \quad (4)$$

where

O_i^m is expenditure of residents in postal sector i on product m ;
 W_j^m is the attractiveness of centre j for product m ;
 Y_{ij}^m is the expenditure from residents at i on products type m at j ;
 c_{ij}^m is the travel time from i to j ;
 β_i^m is the distance deterrence parameter for residents at i , purchase type m ;
 t_{kj}^{km} is the market share of retailer k for product m at j ;
 a_{kj}^{km} is sales per square foot of retailer k for product m at j ;
 z_{kj}^{km} is the floorspace of retailer k devoted to product m at j .

These equations express the notion that individual store turnovers are the outcome of a two stage process. In the first stage of the process consumer expenditure is attracted to centres according to a 'gravity-type' model (a rather loose term which does not accurately reflect the statistical pedigree of the model: hence we generally prefer the term 'spatial interaction model'). Equations (1) and (2) constitute Wilson's (1970) entropy-maximising version of the Huff (1964) model of retail trade. In the second stage, consumer expenditure is split between retailers according to the market share of that retailer within the centre. Market share is in turn derived as a product of store size and branch profitability in equation (4).

It is important to notice a number of features of the model. In the first place, the catchment areas of competing centres overlap, so just because someone lives in a town, it does not necessarily follow that the person will shop there. The degree of overlap is controlled by the parameter β . In practice, β varies between different product types, and tends to take a lower value (with more overlap between catchment areas) for the higher value products like books and records. Secondly, catchment size varies as a complex function of centre size and quality, according to the way that W_j is specified. In the existing version of the model, centre attractiveness is a function of three elements: total centre floorspace (all retailers), total product floorspace (for a particular WHS code e.g. books), and the presence of key retailers such as Mark's and Spencers, and other department stores.

A third feature is that the presence of competitors affects both the total revenue attracted to a centre (through its attractiveness) and also the market share of WH Smith. However the balancing factors defined by equation (2) ensure that an accounting relationship is always maintained, so that opening new shops has no effect on the national market size for a product. It can be argued that the existence of a fixed national market size is less likely for immature markets such as video than the other products. Nevertheless, we would in general argue that the existence of such a binding accounting relationship is a major strength of the present modelling approach, and one which is crucially lacking in many competing methods of the geodemographic type, which typically focus only on the catchment around a single town.

town.

In practice, much complexity is concealed by the simple structure of the equations. This is true because almost all of the model variables must themselves be estimated. Thus residential expenditure (O_i) is modelled as a function of the socio-demographic composition of the population; the attractiveness of centres (W_j) varies non-linearly with centre composition; while beta turns out to be related to population density as well as the socio-economic characteristics of an area, like car ownership.

Inputs to the model

At an early stage, it was recognised that the spatial interaction model described above was too complex for the development of a national model. We decided to break Great Britain down into 30 geographical regions. The analysis focuses on the six major product groups offered by WHS - news, books, stationery, sounds, greeting cards and video. Expenditure for these different products by postal district (O_i^m) is estimated using the Family Expenditure Survey, syndicated market research data (such as Euromonitor 1990) and in-house market research data on expenditure patterns for different socio-demographic groups. All of this information is combined with 1981 census of population data, updated using techniques developed by GMAP.

Shopping centres within each region are defined as any freestanding retail outlet, or cluster of retail outlets, in which one or more of the main WHS products is sold. (An important exception to this is in the news sector, where there are over 46,000 outlets nationwide, according to Verdict 1987.

Many of these are freestanding cornershops which therefore need to be treated in a slightly special way, but the details of this do not concern us here). Over 1500 centres have been identified in this way. The identification of competing retailers, together with estimates of their size and competitiveness, is achieved using a combination of retail directories, computerised Yellow Pages listings, market intelligence reports (such as Corporate Intelligence Group 1990) and WHS in-house data and intelligence, including surveys of local competitors undertaken annually by all WHS store managers.

Model calibration

A rolling programme of implementation was devised, beginning with a pilot study for the West Yorkshire region. Over two years were taken in the model implementation to all 30 regions. The spatial interaction model of equations (1) and (2) was calibrated using a combination of:

- i. PinPoint's LUPIN data - a national telephone survey based on 100,000 respondents, broken down by postal district of residence and primary and secondary shopping centres frequented;
- ii. WHS internal surveys, in which customer flow data can easily be generated by adding simple questions on shopping behaviour to existing market research surveys.

The main criterion by which the model was validated was that it should ultimately be capable of consistently forecasting individual product sales by store within plus or minus ten percent of known revenues, in order to meet the objectives defined above.

defined above.

The whole of the model estimation and calibration process described in this section is subject to annual updating.

Model outputs

For the first dozen or so regions studied by GMAP, individual reports were produced describing the retail geography of the region, variations in the performance of existing centres and outlets, and trying to identify new market opportunities for WH Smith. In addition to the reports, WHS were provided with an in-house modelling facility, which allowed site developers within the company to test the revenue performance of any proposed development, and its impact on existing WHS branches.

There were two obvious drawbacks to this reporting procedure:

- i. with thirty regions, each subject to annual updates, the number of reports rapidly proliferated;
- ii. a tremendous amount of valuable information was being generated within the modelling exercise, not all of which could be adequately represented within the reports.

To overcome these problems, a whole variety of inputs and outputs were taken from the model system and entered separately into a database package (initially Dbase III). Procedures (or 'macros') were written to allow the contents of the database to be explored and analysed easily. In effect, an 'intelligence system' was created.

The functionality of this database has since been enhanced by the incorporation of maps, graphics and statistical procedures; and by embedding the modelling procedure itself within the database application. Hence what we have now is a 'seamless'

modelling, information and mapping system - in effect a model-enhanced Geographical Information System of enormous power.

Clearly much of the information contained within this 'National Intelligence System' (or NIS) is commercially confidential. For this reason, a demonstration system has been developed in which the data have been disguised. In the next section, we will illustrate some of the contents and applications of the NIS, using this demonstration system.

BENEFITS OF THE SYSTEM

The principal benefit: a 'what-if?' sales forecasting facility

The model enables WH Smith to assess the effect of a new WH Smith Group store anywhere in the country within minutes. The user only has to enter the size of the proposed new store in the chosen town (floorspace is then assigned to product codes according to a standard store layout). The output shows the expected sales for the new store, the effect on stores in surrounding centres (sales deflections), changes in catchment populations, market size and market share for each product group. The effect of changing the amount of space given to each product within existing branches can also be assessed, as can the effect of new competitor openings.

Other benefits

The baseline model generates a market size and catchment population for each of the 1500 centres identified. For towns where there is a WH Smith Group store, a predicted sales level

and market share are generated. All these variables are provided for each of the six major product groups.

These model outputs, together with inputs including competitor presence and floorspace, population profiles, actual WH Smith sales, and many others, are all integrated within the NIS. A standard menu of performance indicators is shown as Figure 1. The NIS allows the user to interrogate particular towns, or to combine indicators flexibly across a region or for the whole country. It is also possible to perform specialist searches, for example to identify all the locations of a particular competitor across the country. There is an enormous range of application for this quantity and quality of information. Some of the main ones are discussed next.

Market intelligence

The NIS enables stores to be ranked in order of size, potential catchment, extent of competition, performance (observed versus existing revenue) and so on. Indeed, as we observed above, any of the indicators shown in Figure 1 can be combined, filtered, ranked, and analysed statistically. A typical application is shown in Table 1. Here centres in the Avon region have been extracted, with the centre catchment population and floorspace, a social class index, WHS floorspace, sales per foot, and market share. Note that all floorspace is measured here as 'EFT' (effective floorspace total) which is a measure of the shelf space allocated to products. Also note that the social class index is simply the percentage of the catchment population who are in social class A or B.

The table is ranked by centre size, showing a Smith's presence

in the nine largest centres, and also Wells, Clevedon, and Wellington. In general, WHS sales per foot is higher in the larger centres, but the market share is lower. The centre which has the highest catchment population but lacks a WHS store is Bedminster.

The effect of opening a new store in Bedminster is shown in Figure 2. Figure 2a shows a revenue forecast for a unit of 3000 square feet of 800,000 pounds per annum. Figure 2b shows that 146,000 pounds of this revenue is deflected from existing WHS stores (mainly Bristol and Clifton). Figure 2c shows market penetrations in the Avon region before and after the new store opening is simulated. The left-hand map shows the existing penetrations across the whole region. The right-hand map shows an expanded window around Bristol, with a new store in Bedminster. The figure illustrates that the new store helps to raise market penetrations in the Bristol area to the levels found already around Bath, Yeovil and Taunton.

There are many other types of application. For example, in many large towns, WH Smith already has more than one store. The system can identify the top 10 towns where there is potential for a second WH Smith store - towns where the level of competition per head of catchment population is lower than average, where WH Smith sales per unit of floorspace is relatively high and WH Smith's share of the market for each product is relatively low. Stores vulnerable to competitive entry can also be identified (perhaps where the WH Smith market share is abnormally high in certain product areas). From this kind of analysis, a 'what-if' scenario can be run to test the effect on the WHS business of a competitor opening, and this may spark a search for a site for

one of Smith's own competitive chains.

Current store performance

The NIS can be used to look at the difference between the model prediction of WHS sales in an existing store and the actual sales. Modelling error has been established to be less than 10%, hence branches where the predicted sales are more than 10% away from the real figures can be examined to isolate the reasons for the under- or over- performance. Such analysis may lead to a recommendation that the branch be resited or extended, or in rare cases, closed.

Demographic analysis

The intelligence database shows the number and percentage of people in any postal district who are in any age, sex or social class band, together with the average expenditure per head on WHS products of those residents. This information has great potential as a local promotions tool when certain sectors of the population need to be targetted. In the latest version of the system it is now possible to overlay demographic data relating to postal districts with data for centres or outlets. An example of this is shown in Figure 3, where centre sales of books per foot is overlaid on the proportion of the population in social class AB. Were the data not altered for the protection of confidentiality (see previous section) one might expect to see a fairly strong relationship here.

Evaluation

GMAP's National Intelligence System provides WH Smith with a

proven and reliable mechanism for sales forecasting. In addition, the system provides the company with the most comprehensive set of market intelligence data it has ever had. Although the investment made by the company has been costly in terms of both time and money, it is recognised that this investment can be fully recouped by siting just two stores profitably where they might previously have been disasters.

Nevertheless, the system is the product of an emergent technology of geographical modelling and information management. It is perhaps to be expected, therefore, that there remain a number of weaknesses in the system, and an agenda for ongoing refinements. These will be discussed in the next section.

IMPERFECTIONS OF THE SYSTEM

New shopping centres

It is difficult to assess the effect of new out-of-town centres, which cannot reasonably be expected to attract consumer expenditure in the same way as existing town centres. However these out-of-town centres, such as Thurrock and Meadowhall, are likely to provide some of the most exciting development opportunities over the next decade. In 1991, an extensive research programme has been undertaken into the Thurrock Lakeside development which will help us to improve our ability to forecast the profitability and impact of these new centres.

Micro-location factors

Forecasts of sales assume that the company will choose sites in

prime pitch and no account is taken of variations in the shape and layout of units, number of sales floors, and quality of staff. Of these, pitch is the most important. This implies that 'gut feel' within the site development department is still crucial in selecting the optimal location for a WHS store within a centre.

Region dynamics

Although our regions overlap with one another, we have found quite consistently that results from the model are less reliable for towns which fall close to the region boundaries. This is because however carefully regions are constructed, there will always be significant flows of expenditure across the boundaries. We are currently exploring the possibility of 'boundary-free modelling', in which each town becomes the centre of its own region. Ongoing developments in computational technology make this possible, but the necessary overhaul and recalibration of the models would make this procedure rather costly.

CONCLUSIONS

General lessons

In order to undertake a project of this kind, a company needs to be willing to invest large amounts of time and money for both hardware, and for software development. It also needs to collect comprehensive information on:

1. Its customers: where they live, where they shop, what they spend;

well they do;

3. Its markets: how big they are, whether they are growing or declining;

4. Its own outlets: how large they are, how well they do, and factors which affect sales.

The beauty of the system, however, is that it can turn data of this kind into meaningful, actionable management information, and thus confer a potentially precious advantage in the marketplace.

The future

The existing NIS is the outcome of more than four years of collaborative development between WHS and GMAP. Nevertheless there remain many potential areas for further development of the system. One possible direction that has been discussed above is towards boundary-free modelling. Another would be the incorporation of a time-series element to the system. At the moment, the system is regularly updated, at which time the earlier version of the system is archived, but effectively discarded. An extension of the system in which store performance and behaviour of the various product markets could be monitored over time is of tremendous potential value. A third possibility for further development is the incorporation of the existing investment appraisal process by which new store openings are evaluated, into the model. At the moment this handled as an 'offline' process in which model-based revenue estimates are entered separately into an investment appraisal model.

Finally, and more speculatively, the future development of Electronic Point of Sale systems within the company offers the

exciting possibility of further huge volumes of data being generated. This data would be of tremendous value if incorporated into the kind of geographical management information system which has been described in this paper.

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Figure 1. Performance indicators available in the National Intelligence System

Region: Avon									
RESIDENTIAL DISTRICTS INDICATORS SELECTION SCREEN									
<div style="border: 1px solid black; padding: 5px;"> PRODUCT: All Main A - Expenditure B - Expenditure/Head C - WHS Market Pen. D - OPM Market Pen. E - Wat Market Pen. F - PpC Market Pen. G - OPV Market Pen. H - Corp Market Pen. </div>						<div style="border: 1px solid black; padding: 5px;"> I - Pop change 81-88 J - % Social Class K - Act Social Class L - % Population M - Act. Population N - Geography </div>			
						TABULATING ---INDICATORS CHOSEN---			
Esc Menu	F1 News	F2 Books	F3 Stat	F4 Sounds	F5 Cards	F6 Video	F7 All Mn	Space Help	F10 Map

REGION: Avon															
CENTRE INDICATORS SELECTION SCREEN															
<div style="border: 1px solid black; padding: 5px;"> PRODUCT: All Main <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> WH Smith A - EFT B - Observed Revenue C - Predictd Revenue D - Obs. Sales/EFT E - Pre. Sales/EFT F - Obs. Market Shr. G - Pre. Market Shr. H - Performance I - Square Footage J - Number of Stores </div> </div>						<div style="border: 1px solid black; padding: 5px;"> CENTRE K - Total EFT L - EFT / Capita M - Weighted EFT N - Centre Revenue O - Revenue / Capita P - Centre Sales/EFT Q - Av. Dist. Travld R - Social Class Ind S - Catch. Populatn. T - Competitor EFT U - Competitor No's V - Town Focus Plus W - Geography </div>									
						--- INDICATORS CHOSEN ---									
Esc Menu	F1 News	F2 Book	F3 Stat	F4 Snds	F5 Card	F6 Vid	F7 AllM	1 WHS	2 OPM	3 Wat	4 PpC	5 OPV	6 Cor	F10 Map	Space Help

Table 1. Key centre performance indicators for the Avon region

Name	All Main Catchmnt Populatn	All Main Total EFT	Social Class	WH Smith		WH Smith		WH Smith	
				All	Main EFT	All	Main Sal/EFT (Obs)	All	Main Mrkt Shr (Obs)
BATH	279477	12050	36.6		590		4610.7		8.0
BRISTOL	372619	9498	33.2		790		6356.8		12.5
TAUNTON	118231	5805	35.0		849		3966.8		24.0
CLIFTON	84273	5745	36.5		588		2410.5		13.6
YEOVIL	98416	4389	33.7		535		4327.3		21.8
WESTON SUPER MAR	78152	3800	34.6		455		4477.6		19.2
BRIDGWATER	57351	3196	32.2		329		3510.9		16.1
KINGSWOOD	60415	2823	32.5		381		3291.1		21.5
TROWBRIDGE	50942	2204	34.1		369		3184.3		17.0
KEYNSHAM	19305	2168	33.4		0		0.0		0.0
FROME	9045	1915	32.8		0		0.0		0.0
BEDMINSTER	29911	1814	31.5		0		0.0		0.0
BRISLINGTON	11826	1779	30.5		0		0.0		0.0
WELLS	27131	1635	38.7		259		2071.0		18.1
BRIDPORT	14823	1614	39.6		0		0.0		0.0
FISHPONDS	22757	1495	33.3		0		0.0		0.0
BISHOPSTON	19139	1350	36.2		0		0.0		0.0
THORNBURY	3694	1324	37.0		0		0.0		0.0
BURNHAM-ON-SEA	12064	1222	36.1		0		0.0		0.0
MELKSHAM	10346	1181	33.6		0		0.0		0.0
YATE	9774	1175	36.1		0		0.0		0.0
CLEVEDON	15897	1161	44.5		149		2161.7		12.0
SHIREHAMPTON	6147	1109	32.9		0		0.0		0.0
NAILSEA	6677	1105	43.7		0		0.0		0.0
WESTBURY PARK	10884	1039	37.8		0		0.0		0.0
SHERBORNE	9603	1035	38.6		0		0.0		0.0
HENLEAZE	9628	983	36.4		0		0.0		0.0
GLASTONBURY	8330	975	34.8		0		0.0		0.0
CREWKERNE	12742	939	34.5		0		0.0		0.0
WELLINGTON	10511	937	36.4		181		1534.8		16.9
CHARD	11046	923	34.9		0		0.0		0.0
EASTVILLE	7336	921	32.7		0		0.0		0.0
LYME REGIS	7521	868	41.5		0		0.0		0.0
MIDSOMER NRTN	2929	830	36.7		0		0.0		0.0
HENBURY	3746	696	35.4		0		0.0		0.0
STAPLE HILL	5106	663	33.3		0		0.0		0.0
WORLE	3752	661	35.8		0		0.0		0.0
BISHOPWORTH	3608	547	29.1		0		0.0		0.0
WINCANTON	3027	547	33.6		0		0.0		0.0
PORTISHEAD	2700	512	43.0		0		0.0		0.0
STREET	11298	508	33.7		0		0.0		0.0
ILLMINSTER	660	465	36.2		0		0.0		0.0
BRADFORD-O-AVON	836	405	36.0		0		0.0		0.0
WILLITON	36	398	38.0		0		0.0		0.0
CHEDDAR	476	395	43.6		0		0.0		0.0
REDFIELD	3866	389	31.0		0		0.0		0.0
HORFIELD	2680	384	35.0		0		0.0		0.0
CHIPPING SODB.	1019	357	36.3		0		0.0		0.0
WESTBURY	1747	346	31.7		0		0.0		0.0
SOMERTON	1572	335	37.4		0		0.0		0.0
SHEPTON MALLET	3123	331	36.2		0		0.0		0.0
STAPLETON	1051	305	33.2		0		0.0		0.0
	1563138	89935	2016		5475		41904		201

Figure 2. The effect of a new store opening in Bedminster

Figure 2a. Revenue forecast

PRODUCT SUMMARY			Region: Avon				Dec 16 1991		
Product: All Main			Current centre: BEDMINSTER						
		WHS	OPM	WAT	PPC	OPV	CORP	CENTRE	
Number of stores		1	0	0	0	0	1		
EFT	(Bsl)	0	0	0	0	0	0	1814	
EFT	(Mod)	345	0	0	0	0	345	2159	
Sales £,000	(Bsl)	0.0	0.0	0.0	0.0	0.0	0.0	2682	
Sales £,000	(Mod)	800.3	0.0	0.0	0.0	0.0	800.3	3196	
Sales/EFT £	(Bsl)	0.0	0.0	0.0	0.0	0.0	0.0	1478.5	
Sales/EFT £	(Mod)	2319.7	0.0	0.0	0.0	0.0	2319.7	1480.3	
Market Sh	(Bsl)	0.0	0.0	0.0	0.0	0.0	0.0		
Market Sh	(Mod)	25.0	0.0	0.0	0.0	0.0	25.0		
Catchment		(Bsl)	29911	Av. Dist. Km.(Bsl)		9.27			
Catchment		(Mod)	38298	Av. Dist. Km.(Mod)		9.32			
Press <Return> for next modelled centre									
Esc	F1	F2	F3	F4	F5	F6	F7	F9	F10
Menu	News	Books	Stat	Sounds	Cards	Video	All Mn	Comps	Deflec

Figure 2b. Deflections

			News	Books	Stat	Sounds	Cards	Video	All
WH Smith	Total	(£,000)	-5.8	-4.4	-6.8	-32.3	-1.5	-12.6	-63.4
WH Smith	%		-0.1	-0.2	-0.5	-1.3	0.0	-0.3	-0.3
Our Price M	Total	(£,000)	0.0	0.0	0.0	-5.4	0.0	-10.5	-15.9
Our Price M	%		0.0	0.0	0.0	-1.4	0.0	-0.2	-0.3
Waterstones	Total	(£,000)	0.0	-63.3	0.0	0.0	0.0	0.0	-63.3
Waterstones	%		0.0	-0.4	0.0	0.0	0.0	0.0	-0.4
Paperchase	Total	(£,000)	0.0	0.0	-3.3	0.0	-0.1	0.0	-3.4
Paperchase	%		0.0	0.0	-1.1	0.0	0.0	0.0	-0.6
Our Price V	Total	(£,000)	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Our Price V	%		0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Total	Difference	(£,000)	-5.8	-67.7	-10.1	-37.7	-1.6	-23.2	-146.1
Total	%		-0.1	-0.4	-0.6	-1.3	0.0	-0.3	-0.3

Figure 2c. Market penetrations before and after

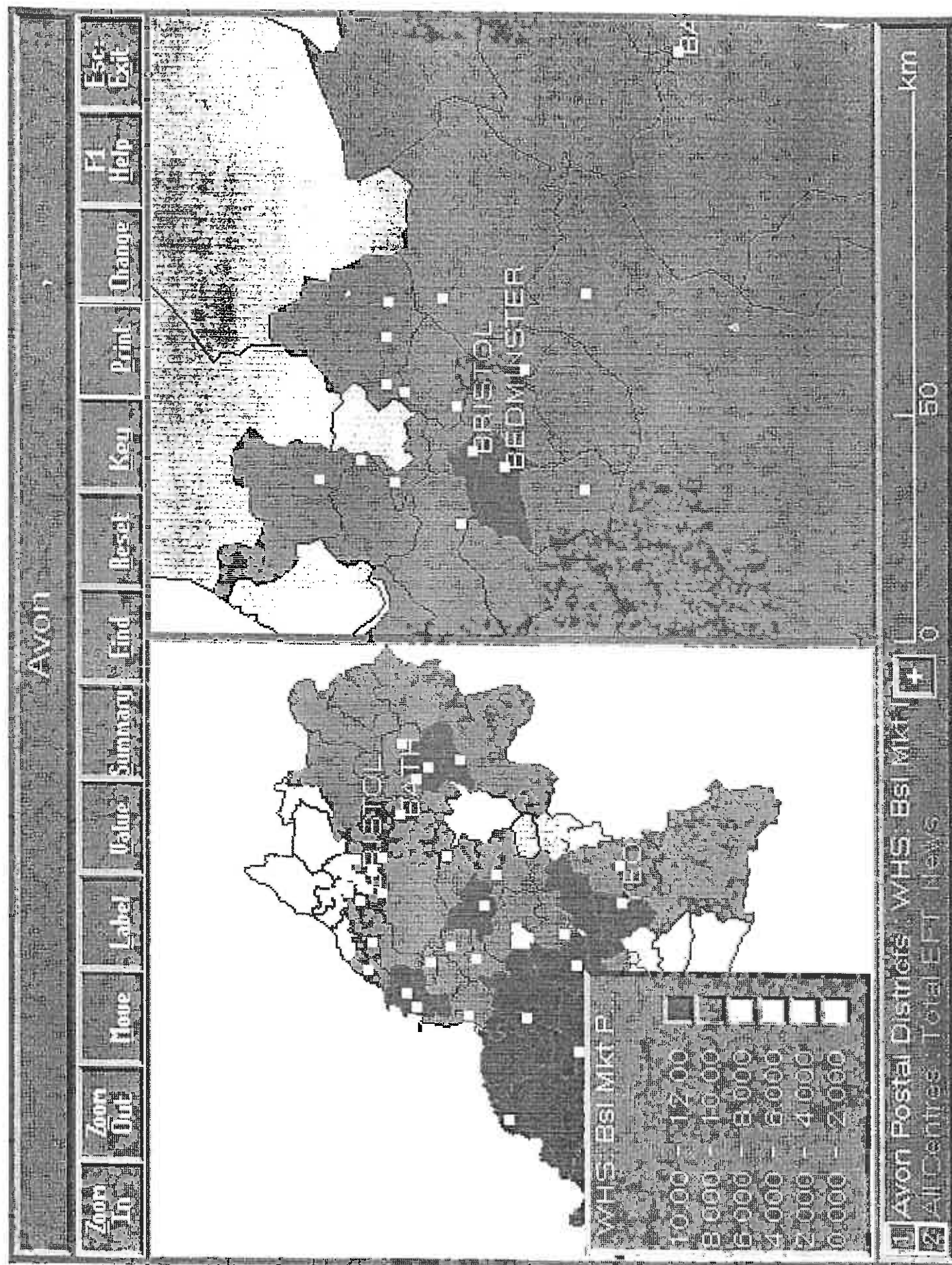


Figure 3. Store performance overlaid on social class in Avon

