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Geographical information systems (GIS) implementation in the United Kingdom and Malaysian retail organisations

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GEOGRAPHICAL INFORMATION SYSTEMS (GIS) IMPLEMENTATION IN THE UNITED KINGDOM AND MALAYSIAN RETAIL ORGANISATIONS

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Abstract

Over the past 15 years, UK retailers have made increasing use of Geographical Information Systems (GIS). These systems were initially used to help with retail site selection decisions but have developed as Decision Support Systems (DSS) to help in many areas of marketing mix decision making. A GIS cannot just be "installed" in the manner of a 'Plug and Play' software application. Retailers who wish to benefit from the use of a GIS have to consider what is involved in implementing the system in their organisation. A GIS requires careful planning, design and implementation based on a full understanding of what must be done to achieve success and avoid failure. This thesis examines the process of GIS implementation in key UK retailers and considers whether the lessons of successful implementation can be generalised to Malaysian retailers.

Both case study research and a grounded theory approach were devised and employed as a combined methodology to allow the encapsulation of GIS implementation process phenomena. Exploratory interviews with Malaysian retailers were conducted, followed by pilot case studies in the UK local government authorities (where the implementation of Geographical Information Systems is more advanced compared to retailing). Case research was then conducted in four retail organisations (Tesco, Somerfield, Safeway and Boots), reflecting various approaches to GIS implementation. Based on the findings and the derived grounded theory, a process of successful GIS implementation is presented that can be used by the UK and Malaysian retailers. Several future research directions have also been identified.

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Chapter 4 (Review on Decision Support System (DSS) Implementation Process Research)

Chapter 5 (Review on Geographical Information Systems (GIS) Implementation Research)

Chapter 6 (Grounded Theory and Multiple Case Studies)

List of Acronyms

ACORN	A classification of residential neighbourhoods
AGI	Association for geographic information (UK)
AM/FM	Automated mapping/facilities management
ANSI	American National Standard Institute
CD-ROM	Compact disc/Facilities management
DBMS	Database management system
DOS	Disk operating system
DSS	Decision support system
EIS	Executive information system
EPS	Electronic point of sales
GDSS	Group decision support system
Geoplan	Geoplan Postcode Marketing
GIS	Geographical information system
GUI	Graphical user interface
HCI	Human computer interaction
JAD	Joint application development
LIS	Land information system
MIS	Management information system
NCGIS	National Centre for Geographic Information and Analysis
PC	Personal computer
PLC	Product life cycle
SDLC	System development life cycle
SDSS	Spatial decision support system

List of Trade Names

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*To my daughter, **Sharifah Nur Afiqah.***

Chapter One

1.0 Introduction

A poor locational choice has been the cause of many retail failures (Nystrom, 1930; Nelson, 1958; Ghosh and McLafferty, 1982; Mason and Myer, 1984, Zain and Rejab, 1988) and whereas a good site can compensate for bad business practices, even the most skilled retailer is hampered by poor location (Proudfoot, 1938; Guy, 1980; Bermans and Evans, 1995). Given the significance and the long-term nature of most locational decisions, it is not surprising that this subject has attracted considerable academic attention (Porter, 1982; Craig, *et al,* 1984).

In the UK, for the last 15 years Geographical Information Systems (GIS) have developed as a Decision Support System (DSS) employed by retailers. The GIS was initially employed to support their site selection decisions but over the years other marketing mix decisions were able to be supported by the system. Given the comprehensiveness and flexibility of a GIS, more and more retailers of various types are employing the system for their operational and strategic decisions, examples being Tesco, Somerfield, Safeway, Boots, Marks and Spencer, W. H. Smith, Nationwide, Prudential. Independent GIS consultants and vendors (e.g., CCN Marketing) are also increasing at an accelerating rate. Retailers, GIS consultants and vendors are expanding the use of GIS throughout the world (e.g., Eastern Europe, Africa and Far East including Malaysia).

In Malaysia, retail site selection decisions are done in a manner where most of the decisions are based on the intuition of retail managers. They recognise that they need a better approach to support their site selection decisions due to the intensification of competition brought by retailers from abroad (e.g., Marks and Spencer of UK and Carrefour of France). They are also aware of the technological developments that can aid site selection decisions and are prepared to adopt such systems. Unfortunately, the knowledge that they need to successfully implement such systems is not readily available.

A GIS cannot just be "installed" like any other ordinary PC-based "Plug and Play" application (e.g., Windows 95). This is because the GIS fundamentally changes the existing departmental/organisational working approach towards site selection and other marketing mix decisions. The system "re-engineers" the traditional working approach and involves continuous commitment from all the parties (system developers, system users and senior managers) in the organisation. For British and Malaysian retailers, GIS implementation becomes an issue which requires careful planning, based on a full understanding of what must be done to achieve success and avoid failure. Examination of the implementation process in leading UK retailers will hopefully provide these lessons.

As a branch of Decision Support System (DSS)'s studies, GIS may inherit many DSS implementation issues. There are key questions that remain unanswered with regard to GIS implementation, for instance, What activities and stages the retailers go through in implementing the system? What problems do they face? Are these activities and stages identical to any other form of DSS? Nobody can be sure of the answers to these questions, since this area of knowledge is relatively untouched in prior research work. Given the different nature of generic DSS's, results obtained from previous implementation studies of other DSS are likely to provide at best a partial picture of the key issues surrounding GIS implementation. Organisations must understand and manage the implementation process in order to maximise the benefits from their GIS investments.

To cope with these issues, a review of relevant DSS implementation studies was made to understand the current state of theoretical development and the paradigms used to build the knowledge. The outcomes of this review strengthened the contention that it is valuable to view DSS implementation as a process. The significance of considering the entire system development process was therefore relevant to an implementation study.

To further understand the present state of the implementation phenomena, a review of GIS implementation studies was also undertaken in areas that are more developed in GIS implementation, e.g., in local government authorities. Based on this review, it can be concluded that there are enormous amounts of implementation factors available in the literature. As the factors involved seem limitless, a "process" approach towards system implementation was chosen for this research[1].

Both case study research and a grounded theory approach were devised and employed as a combined methodology to allow the encapsulation of GIS implementation process phenomena. Two pilot cases were developed with key GIS specialists from local government authorities (Gloucestershire County Council and North Tyneside Council) prior to the primary data collection stage to clarify and strengthen the knowledge acquired throughout the process of reviewing the literature. Four retail organisations (Tesco, Somerfield, Safeway and Boots) were approached for the purpose of the primary data collection. The data obtained from the in-depth interviews were then compiled and presented in the form of case studies. Besides these individual cases, cross case analyses were also conducted to supplement and strengthen the issues surrounding the GIS implementation process. The results from both analyses allowed the formulation of a grounded

[1] Although a thorough understanding of what are the factors leading to successful implementation can be only employed as a guidance in understanding the whole GIS implementation process.

theory of the GIS implementation process.

The emerging grounded theory of the GIS implementation process that consists of several implementation sub-processes is thus presented. A sequence of activities has been arranged into a series of tasks. Based on the findings and the "derived" grounded theory that forms the analyses, a process of successful implementation is described that can be used by British and Malaysian retailers. Several directions were also identified for future research.

1.1 Background of the Study

A good site is essential for a store's success. Overstated it may be, but it has often been said that the three most worthy qualities of a store success are location, location and location (Wehrly, 1967; Dickinson, 1981; Vigoda, 1981). Given the substantial financial investment, the long-term commitment and the effects on all store operations, site selection decisions must be considered carefully. As Ghosh and McLafferty (1987) noted,

> *"It is through location that good and services are made available to potential customers. Good locations allow ready access, attract large numbers and increase the potential sales of retail outlets. In the extremely competitive environment, even slight differences in location can have a significant impact on profitability and market share. Most importantly, since store location is a long-term fixed investment, the disadvantages of a poor location are difficult to overcome".*

Despite the undeniable significance, site selection decisions appear, until comparatively recently, to have been taken on the basis of obscure rules of thumb or intuition (Guy, 1980; Beaumont, 1987). Indeed, a study of site selection practices of prominent UK multiples, the type of organisation one might reasonably expect to employ the most rigorous methods concluded not only was there a considerable scope for improvement but also that the sophistication of the methods employed was somewhat less than state-of the-art (Simpkin, *et al,* 1985, 1990). It is also not surprising that this subject has attracted considerable academic attention (Craig, *et al,* 1984).

Retail site selection decisions as a subject also attracts great attention from Malaysian retailers, but this has not always been the case. Malaysia has experienced a robust economic growth, recording a consistent eight years of growth (an average of 8.0%) since 1990[2]. The growth has generated a robust development both in the sector of retailing and the construction of retail outlets. As a result, Malaysian retailers have prosperously located their retail outlets without worrying much about future business threats. The need for sophisticated models to assess retail outlets was felt to be unnecessary.

However, Malaysian retailers have recently experienced an intensifying competition, particularly in the large-scale retail outlet format brought by foreign retailers, e.g., from the UK[3], France, USA and Japan. The sudden economic disturbance due to instability of the currency exchange rate in the world market has also intensified the competition and as it becomes more intense (a threat to retail growth) and the likelihood of the country's economic disorder, the need to be prepared to face the increasing difficulties of selecting optimum, suitable sites for their outlets[4] grows. Besides these threats, Malaysian retailers have to prepare themselves to counter the potential threats from foreign retailers who use GIS to aid not just site selection decisions, but also other marketing mix decisions. From a review of site selection decision literature, site selection decision models suitable for the Malaysian retailers can be developed. It appears that most of the site selection decision models became more "objectively" oriented (1980s) compared to earlier models that were "subjectively" oriented (1960s). The interesting part of this literature is the scarcity of published evidence available about retailers claiming that they have successfully used the cultivated models, with the exception of checklists, analogues and regressions. However, a key part of these models since the late 1980s are the development and use of GIS[5]. The increasing amount of GIS literature in retailing site selection decisions research reflects the changing focus of the retailers towards this evolving technology

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[2] The study was conducted prior to the present economic turmoil.

[3] UK retail giants such as Tesco and Boots have started to acquire Far Eastern Region retail chains for their new area of business development.

[4] It has been difficult to sustain the performance as the industry becomes intensely competitive. Given the large array of locational opportunities, it becomes increasingly burdensome to select the right site.

[5] There is no standard definition found on GIS in retailing literature, e.g., NCGIA (1989) defines GIS as, *"An emerging science of spatial information. It deals with how to collect, compile, store, analyse and display spatial data within a digital environment raising explicit questions that have previously always been implicit within spatial analysis, such as the measurement of accuracy of*

(Beaumont and Inglis, 1989; Tonks, 1990; Goodchild, 1991; Sleight, 1992; Robins, 1993; Clarke and Rowley, 1995; O'Malley, *et al,* 1995; Tayman and Pol, 1995).

Tonks (1990) in his study reported that the changing focus of the retailers towards GIS was due to the technology discriminatory power, e.g., the ability to locate customers. He further reported that the system was also able to merge various discrete internal and external databases, e.g., National Readers Survey (NRS) and Target Group Index (TGI). This integration allowed retailer's to make full use of the databases available, inside and outside the organisations (Clarke and Rowley, 1995). Similarly, Sleight (1992) noted that,

> *"The ability of GIS to link to research data is undoubtedly one of the strengths of the technique."*

This point is further supported by Robins (1993) by noting that a GIS is able to produce the most effective way to present information and termed it as *"a desktop tool that can be used to play visual what-if scenarios."* He added by stating that,

> *"A user can click on a competitor's symbol and pick-up a box containing all related information."*

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spatial data" while Sleight (1992) defined GIS as, *"The analysis of people where they live."*

These overlaying features create variety of analytical methods. Clarke and Rowley (1995), added by stating that,

> *"The latest generation of GIS also boasts a number of other features that are likely to make user-friendly and easier to integrate into the total information systems environment within an organisation."*

In addition to the increased complexity in retailing site selection decisions, the availability of geodemographics[6] databases at a national level is also one of the contributing factors towards this change and these databases are becoming more "accessible, at a reasonable cost[7] (Beaumont and Inglis, 1989; Clarke and Rowley, 1995; O'Malley, *et al,* 1995). In short, GIS is able to incorporate both subjective oriented (e.g., intuition) and objective oriented (e.g., regression analysis) site selection decisions approaches of the retailers.

Moving from this review, exploratory fieldwork was conducted to investigate how Malaysian retailers go about selecting their sites. The key aim was to explore whether an optimum site selection decision model could be developed for the Malaysian retailers. 18 retailers from a large array of retail sectors were interviewed. It was found that, in broad terms, Malaysian retailers were intuitive in their site selection decisions. They sought more objective oriented figuring to supplement their present "intuition" approach but did not seem to know how to go

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[6] The term "geodemographics" is derived from the combination of both geographic and demographic information populations (O'Malley, *et al,* 1995).
[7] These data will be more costly if it is self-acquired by the organisation (Robins, 1993).

about it. The complex site selection models may remain theoretical with limited use to Malaysian retailers (as they have to a large extent with retailers in developed countries).

The conclusion of the review from the site selection decisions literature and the exploratory fieldwork that had been conducted in Malaysia has shown that retailers in developed countries (evidently in the UK) are turning their focus to GIS in supporting their site selection decisions. It is also more likely that more and more retailers will be exposed to GIS rather than imitating the hierarchy of complex site selection decision models developed. GIS is a new technology that promises to impact Malaysian retailers. GIS will help the retailers to further understand their customers, determine their needs and meet their needs better. It is seen as a revolutionary tool for the retailers. However, one key question raised was,

> *"If GIS had the potential to be employed by Malaysian retailers, would they be able to implement it successfully?"*

The question was raised after considering the fact that GIS is not just an ordinary "Plug and Play" application (not only the actual GIS but also the implementation that a retailer approaches towards certain marketing mix decisions). In line with this reason, there are also other reasons why studies dealing specifically with GIS implementation are significant and must be undertaken. Many DSS have never accomplished the claimed benefits made when the system was acquired (Alter, 1979; Ginzberg, 1981a; Davis and Olson, 1985; Alavi and Joachimsthaler, 1992; Kivijarvi and Zmud, 1992) which begs the question of what happened in the period from conception to full employment of the system, i.e., implementation.

Despite the widespread use of GIS particularly in the retailing, it appears that the primary focus has been on applications and potential benefits with an inadequate concern for the implementation of the system. It seems that no effort has been made to identify the key themes of GIS implementation process. Practitioners responsible for the implementation of the system cannot assume that the key themes with other DSSs are equally significant for GIS implementation. Even if one believes that to be so, this assumption must be confirmed empirically (given the different nature of DSS implementation process is likely to provide at best a partial picture of the key issues surrounding GIS implementation process in practice).

Chapter Two

Retail Site Selection

2.0 Introduction

Numerous studies in site selection literature attest to this critical nature of site selection decision for retailers (e.g., MacKay, 1972; Parker and Srinivasan, 1976; Olson and Lord, 1979; Zeller, *et al*, 1980; Leonardi, 1981; Recker and Schuler, 1981; Rudd, *et al*, 1983; Dawson, 1983, 1988). Moreover, Craig, *et al*, (1984) has stated,

> *"The choice of a store's location is perhaps the single most important decision a retailer has to make."*

Further, Cox (1968) has also stated, *"Proper siting, is the keystone of profitability."* Given this crucial nature, this study starts with a literature review on site selection decision. The purpose of this chapter can be categorised into three key areas;

- To describe the significance of retail site selection decisions
- To present the outcome of the literature review made on the key store site selection models, as developed and employed in developed countries, particularly in the UK

- To describe the initial research aims which develop based on the review made of store site selection decisions

2.1 The Significance of Retail Site Selection Decisions

The significance of retail site selection cannot be understated. A retailer that selects a poor location will always be at a competitive disadvantage. To overcome poor location, they have to make a substantial adjustment in the product, price and promotional mixes (a struggle that is not always successful). Because adjustments are usually expensive to implement, they can adversely effect profits. On the other hand, a retailer that selects an optimum location enriches the chances of success because it allows greater flexibility in developing the product, price and promotional mixes. As noted by Ghosh and McLafferty, (1987),

> *"It is through location that goods and services are made available to potential customers. Good locations allow ready access, attract large numbers of customers and increase the potential sales of retail outlets. In the extremely competitive environment, even slight differences in location can make a significant difference to profitability and market share. Most importantly, since store location is a long-term fixed investment, the disadvantages of a poor location are difficult to overcome."*

With the premise that site selection can have a major impact on a retailer' s profitability, Simpkin, *et al,* (1985) in his study on prominent UK retail site selection practices, reported that not only was there considerable scope for improvement in the process, but also that the sophistication of the models employed was somewhat less than state-of-the-art. The lesson learned from this study (Simpkin, *et al,* 1985), is that the types of organisations, one might reasonably expect to employ the most rigorous store site selection models, still have room for improvement. Likewise, Brown (1992) in his book, "Retail location; A micro perspective" has advocated the arguments,

> *"Yet despite its undeniable significance, locational decisions appear, until comparatively recently, to have been taken in a decidedly cavalier fashion and on the basis of obscure rules of thumb, rudimentary calculations, past experience, intuition, hunch and/or entrepreneurial flair - call it what you will."*

In considering this crucial aspect, four immediate qualifications to this statement are stated. First, as the industry becomes more competitive (it is difficult to sustain their performance), retailers are conscious of the increasing difficulty of finding the "right" or viable sites for their stores, i.e., store expansion becomes harder to select. Because of competitive forces, the creation of new stores in new geographical areas previously not served by the retailers (the competition for sites has intensified as a greater range of retailers considers similar sites). As a result, decreasing financial resources are chasing a diminishing number of available "right" sites. The situation was easier than it is now, when alternative "right" sites were available. Thus, expansion is likely to involve consideration of sites with risky competition, cost, market and planning characteristics. The days of "easy" sites when retailers couldn't make any mistake are gone.

Second, site selection decisions are complex and the cost of mistakes can be very high (Bermans and Evans, 1995). Once, the decision is made, management will find it a depressing financial burden to relocate the store (Archabal, *et al,* 1982), in other words, there is typically little flexibility once a location has been chosen and the attributes of a location have a very strong impact on the overall strategy. The site selection decision requires a long-term commitment and a sizeable investment cost. The "cost" may be counted not only in the direct financial losses involved in acquiring and running the store but also in failure to keep a competitor out of an important geographical area.

Third, retailers are conscious that shareholders expect tangible evidence of expansion and growth. The accelerating pace of change has placed further pressures on retailer's to innovate and expand. Although there are many alternative investment strategies that retailers must do and make, store expansion and the battle for territory continues to be an important ingredient for most retailers. Such pressures to expand can easily lead to financial burden. It may also damage trade in a retailer's older stores and result in the need to develop a strategy for store closure that is linked to the strategy for opening new stores. Thus, failure to response to the locational strategies of rival retailers may spell disaster.

Fourth, in the past, many retailers had based their location decisions on day-to-day practical experience, built up perhaps over many years. Given the quite dramatic changes in conditions brought by today's competitive retailing industry, such experience alone becomes a less reliable guide. The experience gained on the past "easy" sites, need to be supplemented by more rigorous assessment models, as more difficult sites have to be considered. This problem is exaberated by the fact that many of the market characteristics to be faced are and will be changing, i.e., the suburbanisation processes. These changes can alter the current and potential market at a given site in a relatively short space of time. Therefore, when experience is a poor guide, the uncertainty and riskiness of locational decision choices are increased.

In short, site selection decisions are responsible not just for ensuring store performance, but it is the management function responsible for ensuring that every aspect of business is focused on delivering superior value to the customers. The choice of subject of this study has been prompted by an abundance of such sentiments in the literature, "excellent" marketing in other marketing mix variables cannot overcome the problems inherent in an inferior location (Davidson, 1975). Selecting the "right" location is of crucial significance to retailers.

2.2 The Outcomes of the Literature Review of Site Selection Decisions

Given the undeniable significance of retail site selection, many site selection models have been developed in developed countries, notably in the USA to support the retailers' location decision choices since the late 1920s. Leading site selection models include the checklist method, analogue method, regression model, algorithms and Geographical Information System (GIS).

2.2.1 The Checklist Method

According to Applebaum (1965), the checklist method was the first attempt to systematically assess the relative value of a site, compared with other potential sites in the area. The real value of the method involves an assessment of various factors that are likely to impact costs and sales at a site. On the basis of this assessment, the site selection analyst makes a judgement about the desirability of the site (Applebaum, 1965, 1966; Eisenpreis, 1965; Gruen and Smith, 1960; Kane, 1966; Nelson, 1958). Commonly the checklist used will include data about the demographic and socio-economic composition of the selected area.

The checklist method is a relatively simple method to set-up and administers. The task of identifying potential sites and choosing an optimal site from them can be performed in a single step. Its reliance on expert opinion is seen as advantages by some (Goldstucker, *et al,* 1978). As noted by Craig, *et al,* (1984),

> *"While some of the data may be quite subjective, the use of checklists allows standardisation of the data collection procedure and some degree of comparability of information among different sites."*

Unfortunately, in selecting optimal sites, this method neglects the interactive effects of different factors associated with potential sites (Stanley and Sewall, 1976). This problem is particularly important when more than one store is to be located in the same area.

2.2.2 The Analogue Method

The analogue method (Applebaum, 1968) presents a more systematic approach to assess the relative value of a site. An existing store (or stores) similar to the one that is to be sited is identified. The power of an analogue store to draw customers from different zones is observed through surveys. The drawing power of the analogue store is then used to estimate the expected sales at alternative sites. The site with the best-expected performance is then chosen for the new store.

In using such analogues, the retailer must take into consideration all-important variations of the new site under investigation, compared with the nearest analogues known. While easy to implement, the method suffers from two important drawbacks;

- The results are dependent on the stores chosen as analogues and thus rely "heavily" on the decision maker's ability to make judicious selection of analogues stores (Kotler, 1971) and
- The results do not consider the competitive factors in assessing the sites. The competitive factors are brought into consideration only through the selection of the analogue

2.2.3 Regression Models

The checklist and analogue methods provide relatively simple to apply, qualitative approaches to site selection. A more quantitative approach, which associates elements of both (checklists and analogue) is the use of regression models. It induces the site specific variables that affect the costs and revenues of the potential sites, allowing the analyst to identify the variables that are associated with various levels of costs/revenues from store(s) at different sites, i.e., site performance (y) is expressed as a linear function of location (l), store attributes (s), market attributes (m) and competition (k).

$$Y = f\{l, s, m, k\}$$

The coefficients indicate the effects of each factor on site performance and the corresponding beta weights indicate the relative significance of each factor. This model has been used by a variety of retailers such as banks (Clawson, 1974; Lynge and Shin, 1981; Martin, 1967; Olsen and Lord, 1979), grocery stores (Cottrell, 1973; Davies, 1973), liquor stores (Lord and Lynds, 1981), chain stores (Hise, *et al,* 1983), hotels (Hanson, 1983).

Many of the studies display the common pitfalls of multiple regression analysis (see Alpert and Bibbs, 1974; Lord and Lynds, 1981, for greater details). For example, there is *statistical overfitting*, a situation where authors include almost as many variables as there are observations. This inclusion causes unreliable assessment and severe problems of interpretation. In addition, because regression models usually comprise many independent variables, often a number of them are measuring the same phenomena. This important problem is called *multicolinearity*. However, most studies have failed to analyse or discuss the impact of this problem on their findings (Craig, *et al,* 1984). Other pitfalls of the regression models including the definition and measurement of variables within the model (Stanley and Sewall, 1976).

Regression models have been commonly used in site selection to assess the comparative effects of factors affecting site performance. Whilst the simplicity of these models has led to their popularity, the pitfalls discussed here show the need for more carefully conducted studies. Many of the pitfalls can be handled by better use of regression models or if warranted, by more complex multivariate models (Craig, *et al,* 1984). It is impossible to discuss all the findings of the regression models studies but certain general conclusions have emerged from the survey of the literature. In almost all studies, performance is significantly affected by the demographic and socio-economic characteristics of the stores market area. In addition, the findings are consistent with qualitative assessments.

2.2.4 Location-Allocation Modelling

The checklists, analogue and regression models focus on evaluation of site-specific factors in the site selection decision. Location-allocation modelling (algorithms), shifts the focus somewhat to assess locations at the trading area level. It simultaneously selects the location (with an assignment of demand) to those locations in order to optimise some site-specific criteria. Location-allocation modelling has been used by, among others; Archabal, *et al,* 1982; Coehlo and Wilson, 1976; Ghosh and Craig, 1983; Ghosh and McLafferty, 1982; Huff, 1966; Huff and Blue, 1966. The advantage of these models is their ability to systematically assess a large number of possible locational configurations and select the one that maximises the firm's performances. This is particularly critical when multiple stores are to be opened in the same trading area. They can also consider the interaction between location and store design and the optimal site and design is determined simultaneously. Central to this method is the ability to assess how changes in location and store design affect the firm's performance in terms of trading area. Location-allocation modelling have increased their complexity in the last few years. For example, a model has been developed in selecting multiple locations for a retail chain. It is important to consider not only the profitability of different locations but how the performance of individual locations is affected by cannibalisation of sales of other stores belonging to the same chain (Archabal, *et al,* 1982).

Another area in which these models have increased in complexity is in their treatment of possible changes in the future marketing situation. In a dynamic environment, it is important to identify locations that are responsive to such changes and the performance of chosen location may be affected e.g., by changes in the spatial distribution of demand causes by population growth. Since store location is highly permanent and costly to change, it is critical to consider how future changes in the environment may affect the profitability of chosen locations. Ghosh and McLafferty (1982) proposed a scenario-planning approach which uses multiobjective programming (the example of the calculation is shown below, see Exhibit 2.1) to deal with uncertainties in the environment. A set of alternative scenarios is developed by identifying likely events in the planning horizon that will effect marketing environment. An important requirement of the scenario-planning approach is the identification of distinct scenarios of possible future changes and identifying the set of noninferior strategies[8].

[8] A location strategy is said to be noninferior if it is feasible and no other strategy exists which will improve performance in one scenario without lessening the performance in another.

Exhibit 2.1 - The Scenario Planning Approach (Ghosh and McLafferty, 1982).

If Z_k is the performance of a particular strategy in scenario *k* (given *s* is the possible future scenarios which have been identified), the multiobjective problem is as follows;

1)

$$\text{Max Z} = \left\{Z_1(X_1,\ldots,X_n);\ldots;Z_k(X_1,\ldots,X_n);\ldots;Z_s(X_1,\ldots,X_n)\right\}$$

$$X_1,\ldots,X_n \in F$$

Where $X,\ldots,X_n$ are the sets of decision variables

F - defines the set of feasible strategies (in most cases, there is no single strategy that is optimal for all the scenarios)

s - possible future scenarios

Z_k - the performance of a particular strategy in scenario *k*

2)

If the likelihood of each scenario occurring were known, the function can be rewrite into;

$$\text{Max Z} = \sum_{k=1}^{s} w_k \left\{Z_k(X_1,\ldots,X_n)\right\}$$

By rewriting the function this way, the problem has been transformed to a single objective problem that has a unique solution. The weights indicate the level of significance given to each objective, that is, the expected probability of a scenario occurring in the future. Given a particular set of *w's*, we can find the optimal solution to problem 2, using a standard single objective optimisation method (see Ghosh and McLafferty, 1982). The outcomes will be the best compromise strategy for that particular set of weights.

Moreover, Ghosh and Craig (1983) have suggested a game-theoretic approach in considering the effect of future competitive locations on present store locations (competitive reactions), for example, a large number of scenarios, each describing a possible reaction by the competitor, may need to be evaluated. They have argued that a firm should evaluate any strategy in terms of "worst case" scenario (the payoff received if the competitor chooses at best reactive scenario). In facing uncertainty about the competitor's likely reaction, it is best for the firm to choose the strategy that maximises the minimum payoff.

As these models are becoming more complex in their treatment of competition and environmental changes, a number of pitfalls still remain. The efficacy of these models depends largely on the accuracy of the spatial-choice process postulated in the model. It is altered by observing the existing trip pattern in an area and predicting the trading area of new stores based on that result (for greater details on these problems, see Craig, *et al,* 1984; Fotheringham, 1981, Fotheringham and Weber, 1980; Griffith and Jones, 1980).

A key weakness with these models is that they generally assume that consumers have an equal level of knowledge about different stores. Consumer knowledge is independent, however on their level of education and the firm's promotional activities that may vary from store to store and existing location-allocation models have rarely considered the effect of such variations on its predictions.

In general, location-allocation modelling have greatly improved the state-of-the-art in location decision models. It holds promising improvements, i.e., by allowing a variety of objective functions such as market share management and profit maximisation. It is also possible to include other models in location-allocation modelling (for example, see Zeller, *et al,* 1980). Besides these main techniques of site selections, there are many more models of location decisions which have been developed, among others (it is not meant to be exhaustive); Reilly's Law of Retail Gravitation (1929), Huff's Law of Shopper Attraction (1960), Multiple Store Location Model (Achabal, *et, al.,* 1982) and Weighted Location Rating Model (Rudd, *et al,* 1983).

2.2.5 Geographical Information Systems (GIS)

Since the mid-1980s (see Figure 2.1), a key part of the store site selection literature has been devoted to the development of Geographical Information Systems (GIS). In the UK, for example, the increasing amount of GIS literature on site selection reflects the changing focus of the retailers towards this evolving system (Beaumont and Inglis, 1989; Clarke and Rowley, 1992; Johnson, 1989;

Mitchell, 1992; O'Malley, *et al,* 1995; Sleight, 1992; Tonks, 1990). A GIS is defined as,

> *"An emerging science of spatial information, it deals with how to collect, compile, store, analyse, and display spatial data within a digital environment, raising explicit questions that have previously always been implicit within spatial analysis, such as the measurement of accuracy of spatial data"* (NCGIA[9], 1989).

In retailing, GIS is also known as "geodemographics". It is derived from the combination of both geographic and demographic terms (O' Malley, *et al,* 1995).

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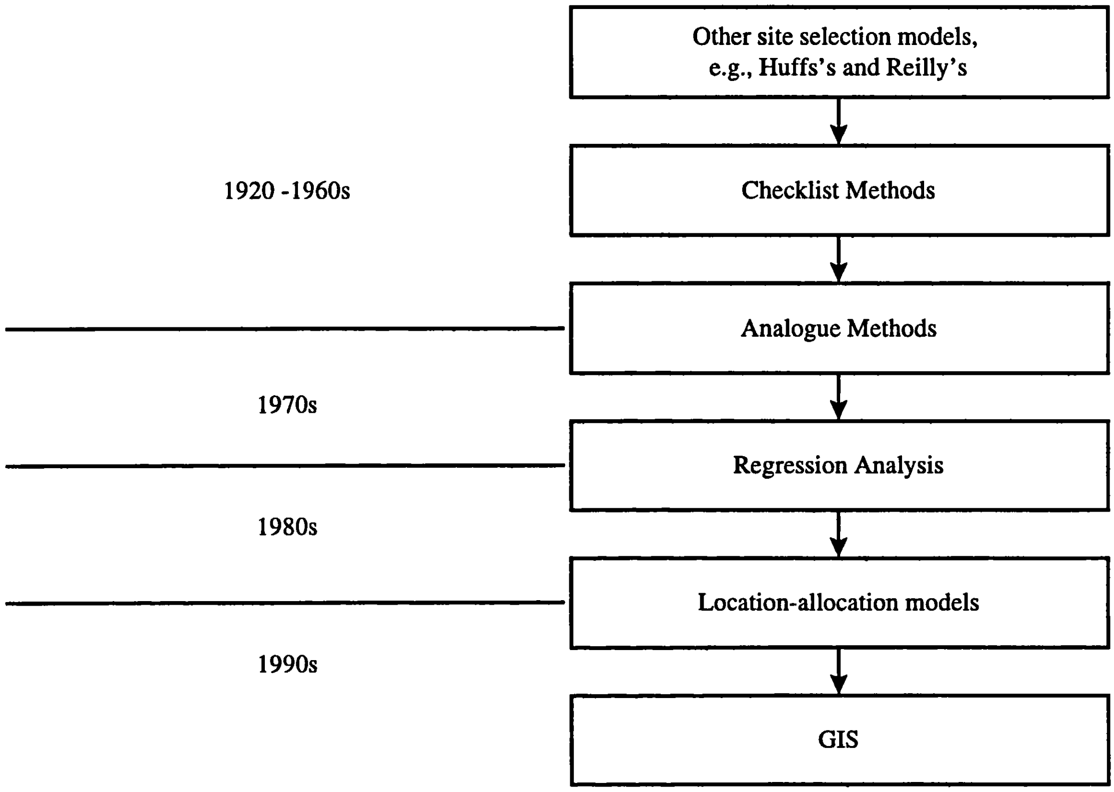
[9] National Center for Geographic Information and Analysis.

Figure 2.1 - Hierarchy of the Key Site Selection Models Developed in Western Economies



Further, the changing focus towards this evolving system is not just due to the fact that location decisions are becoming more complex which has increased the need to a more complex understanding of the customers at a local level but also due to the fundamental strengths that lie in its features.

Tonks (1990) argued that GIS relative advantages lies in its ability to locate the customers through its discriminatory power, i.e., the system is capable of merging various retailer's internal and external databases and this integration has allowed user's to make full use of the existing databases (internal and external datasets). GIS is also able to produce the most effective way to present information (Bryan, 1994; Beaumont and Inglis, 1989; Clarke and Rowley, 1992; Dunn, 1992; Grupe, 1990; Johnson, 1989; Kolli, *et al,* 1993; Michelsen, Jr., 1994; Mitchell, 1992; O'Malley, *et al,* 1995; Rabago and Spiers, 1993; Roger, 1994; Sleight, 1992; Tayman and Pol, 1995; Tonks, 1990; Van Demark, 1992). Moreover, Sleight (1992) has pointed out in his study that,

> *"The ability of geodemographics to link to research data is undoubtedly one of the strengths of the technique."*

He further supported his point by terming GIS as, *"a common thread"* to link to various marketing mix activities together while Robins (1993) in his study has termed GIS as a, *"desktop tool that can be used to play visual what-if scenarios"* and in noting the flexibility of GIS features, he further pointed out that, *"A user can click on a competitor's symbol and pick-up a box containing all related information."*

These overlaying features thus create a variety of analytical models. This point is supported by Clarke and Rowley (1995) by stating that,

"The latest generation of GIS also boasts a number of other features which are likely to make them more user-friendly and easier to integrate into total information systems environment within an organisation."

Further, the availability of geodemographic databases at a national level, for example, in the UK, the Target Group Index (TGI) and National Readership Survey (NRS) is also one of the continuing factors in changing retailers' perspectives of this evolving system. The databases are also becoming more portable (from mainframe to CD-ROM) at a reasonable cost (Beaumont and Inglis, 1989; Clarke and Rowley, 1995; O'Malley, *et al,* 1995). This data will be more costly if it is self-acquired by the retailer (Robins, 1993). Further, in supporting this point Johnson (1989) has stated that,

"The information explosion which has come about over the last few years has fuelled this segmentation as researchers have identified new ways of classifying people to reveal potentially more exciting and actionable groupings."

As the competition faced by the retailers become more intense (for example, the opening-up of new markets, particularly in the European Community), the need for retailers to analyse their market has grown. This situation further justifies why retailers are changing their focus towars GIS technology. Besides location decisions applications, GIS has also been employed by retailers in all sorts of marketing mix decisions, e.g.,

- Credit scoring
- Direct mailing, such as, door to door distribution of leaflets through postcodes clusterings (Beaumont and Inglis, 1989; Sleight, 1992)
- Promotional media, such as, selecting newspaper readers and television audiences (Robins, 1993)
- Sales forecasting
- Target marketing and merchandise management (Johnson, 1989)

GIS is also being used in organising the organisation's databases for supporting these decisions. In short, GIS is relatively new in site selection research. Although developing, the speed of diffusion has been rapid due to its features in solving basic locational decisions. Two key relative advantages are; 1) magnificent discriminatory power and 2) the ability to visually locate the customers geographically. Both advantages have led to the development and the improvement of various marketing mix decisions.

2.3 Conclusions

This chapter presents the outcomes of the literature review conducted on major store site selection models developed, primarily in the USA. It appears that most of the site selection decision models developed are becoming "objective" based compared to the earlier approaches which were subjectively based (see Figure 2.1).

The interesting part of the literature is the scarcity of published evidence available about retailers claiming that they have successfully employed the models cultivated, with the exception of checklists, analogue, regression models and GIS. Evidence to support the view that other models actually work in practice may be lacking due to the highly sensitive nature of a "winning" site selection decision model or the abundance of theoretical assumptions in the models that cannot be sustained in practice. Complex models may therefore remain theoretical and of limited use to retailers.

The key development in site selection decision studies is the use of GIS technology (at present, it has been difficult to work without maps or geographic data). It deals with the theory of spatial relationships. Much of the "gut feelings" about site selection decisions are organised spatially. Various outstanding GIS features, i.e., by tying data to embedded maps, have simplified the difficulties involved in determining the decisions. The forces which have led to the emergence of GIS in the USA and UK may emerge elsewhere globally. This is shown to some extend by the dramatic growth of GIS to support marketing mix strategies in the USA, UK and some Pacific countries (i.e., Australia and Japan).

This review helped to direct the direction of the study especially in the sense of seeing little evidence of the practical use of site selection models but great use and benefits of GIS. At this point, evidence of the use of site selection models and GIS is reported in Western Economies. Given that the findings of this study may be generalised to Malaysian retailers, it seemed appropriate to discover the nature of their site selection practices. With little success in literature sources, it was decided to conduct a small exploratory study with Malaysian retailers.

Chapter Three

Site Selection Decisions in Malaysian Retailing

3.0 Introduction

This exploratory fieldwork set a context to understanding site selection decisions by developing a richer understanding of the present state of retailing in Malaysia. The fieldwork then went on to explore and to understand how Malaysian retailers go about selecting the locations for their retail outlets. This chapter presents the results of the exploratory fieldwork, including the key themes that emerged in site selection decisions such as site selection decision models and the key factors employed.

3.1 The Present State of Malaysian Retailing

The past twenty five years have indeed seen remarkable growth of large and small scale retailing formats in Malaysia, particular since 1990, when the country experienced a robust economic growth (Ministry of Finance, 1994), recording eight years of consistent growth with an average of 8.0% per year (Ministry of Finance, 1994). The growth was due to the country's economic policy that opens its door to foreign investments (e.g., manufacturing, construction and retailing). As a result, local retailers had prosperously located their retail outlets without worrying much about the future threats. The need for sophisticated models to assess outlets was felt to be unnecessary.

However, the industry was experiencing intensifying competition, particularly in the large-scale format brought over by foreign retailers such as from the UK, USA and Japan (witnessing a high profile of foreign capital penetration within the retailing industry)[10]. The competitive situation has further worsened by the present Malaysian currency crisis, which disturbed the stability of the Malaysian economy[11]. As competition becomes more intense (threatening future growth), local retailers face increasing difficulties in selecting good, suitable sites for their outlets. Thus, the need for local retailers to improve their skills in

[10] The Kuala Lumpur and Selangor Chinese Chamber of Commerce and Industry, 1985.
[11] 1998.

selecting optimum sites is paramount to cope with the accelerating pace of competition.

3.2 The Significance of the Exploratory Fieldwork

Malaysian retailers were experiencing an influx of Western and Japanese retailers to challenge their ability to exploit the huge retail demand that had build up over the last eight years. A key part of the challenge was a realisation that they needed to have better methods to support their site selection decisions. Thus, the goal of this exploratory fieldwork has two dimensions;

- To understand how the local retailers go about selecting their retail sites which in return will provide a path for future site selection decision research and
- To see whether "advanced" site selection models, e.g., from the USA and UK would be appropriate for them.

3.3 Research Methodology

18 in-depth exploratory interviews were conducted with informants from various retail sectors in the capital city of Kuala Lumpur. The sampling technique used was that of theoretical sampling, proposed by Glaser and Strauss (1967). The informants had been selected based on two criteria;

- Direct involvement (retailers), where different types of retailers had been chosen based on the number of stores that they have with their perceived level of development and success
- Indirect involvement (non-retailers), where their role was to support the direct involvers in their decisions

Table 3.1 illustrates the number and types of informants involved in the exploratory fieldwork.

Table 3.1 - Informants Involved in the Exploratory Fieldwork

Type of Retail Institutions	No. of Institutions Interviewed
Direct involvers	
Chain departmental stores	2
High street – variety	2
High street – telecommunications	1
Shopping centre	2
Petroleum retail	1
Bank (Branch network planning)	1
Indirect involvers	
Banks (loan department)	2
Estate agency	1
Government authorities	1
Management consultant	1
Project financier	1
Shopping mall developer	1
Academics	2
Total	**18**

Two data collection instruments were used throughout this exploratory fieldwork;

- *In-depth interviews;* The choice of this instrument was based on the exploratory nature of this fieldwork where pattern building was of prime significance. In-depth interviews were used in conjunction with a set of semi-structured questions.
- *Field observations;* Besides the used of in-depth interviews, field observations had also been employed to supplement the fieldwork results. Field observations also allow deeper dimension of the observed phenomena to

emerge. It had also contributed to greater confidence in the generalisability of the results.

3.4 The Findings

Local retailers generally based their site selection decisions on day-to day accumulated practical experience. It appeared that a few of the retailers engaged in a formal feasibility study in selecting retail sites. Only a few of them did some research on consumer demographics. As one of the informants[12] noted,

> *"In Malaysia, the retailing industry has a major problem. Very few of them do anything that is a real feasibility study. The attitude is, we get a piece of land, we assume that we can build a shopping centre that is better than what the neighbour is doing. Very few of them do any real research on demographics. The problem that you have as well is that any information that is available is really outdated. The data, the amount of residential units being constructed and being released over year by year just made any statistics impossible to follow. You can get a general idea from the statistics but you cannot do the demographics study such as in Australia or Great Britain because the information is just not there. You have to do your own sampling every year by year to be able to come to those conclusions. It's very much gut feeling. It is an educated guess."*

[12] Charles DeBono, Business Development Manager, Parkson Grand Malaysia Berhad, Malaysia.

Local retailers seemed to still rely on highly emotional evaluations of site potentials (gut feelings). This was due to the fact that the required public data was not available or might be outdated. Most of them tended to be suspicious of the quality of the "public data".

Some retail organisations however, were striving to develop sound strategic site selection decision models, especially in undertaking expansion into market areas that were new to them (while these retail organisations did not expect complete scientific accuracy, they did optimistically anticipate that, with the aid of site selection decision models, serious mistakes would be avoided and the probability of success should be correspondingly improved). Table 3.2 illustrates the site selection decision models used by the local retailers.

Within the retailers' approach, checklists and analogues described in the literature were evident and with rare exception, there were also such local retailers, such as, shopping mall developers which used financial models, i.e., internal rate of return (IRR), net present value (NPV), and payback period (PP). Small-scale local retailers had conducted the least thorough site selection decision feasibility study, due to their low initial capital compared to large scale retailers. Site selection decision feasibility study by habitués of the High Street were less likely to be formally conducted. Their decisions were based on an evaluation of a limited set of criteria (see Table 3.3). Most local retailers were expanding through new outlets in geographical areas not previously served by them due to;

- The intense competition for sites which had escalated, especially from innovative retailers abroad, such as from the UK, USA and Japan
- The increasing pressure to expand
- The non-availability of land
- The changing pattern of consumer demographic structure and demand as a result of the fast economic growth
- The high cost of mistakes, i.e., large scale local retailers, such as shopping centres, required a sizeable financial investment
- Diminishing financial resources
- The growing expectation of high returns from share holders

Table 3.2 - The Site Selection Decision Models Used

Type of Retail institutions	Site Selection Methods Employed
Direct involvers	
Chain departmental stores	Gut feeling + analogues
High street – variety	Gut feeling
High street – telecommunications	Gut feeling
Shopping centre	Gut feeling + analogues
Petroleum retail	Checklist + analogues
Bank (Branch network planning)	Gut feeling + analogues
Indirect involvers	
Banks (loan department)	Not applicable
Estate agency	PP
Government authorities	Gut feeling
Management consultant	IRR +NPV + PP
Project financier	IRR +NPV + PP
Shopping mall developer	IRR +NPV + PP
Academics	Not applicable

On the whole, local retailers considered similar variables but the significance of these variables differed from sector to sector and almost all local retailers would estimate the sales potential before making a commitment to another retail outlet. The two most important variables considered in selecting retail sites were;

- Competition and
- Accessibility

Some local retailers used outside consultants, i.e., market research agencies, mostly in conjunction with the firm's personnel to help them collect relevant data. The majority of retailers would prefer assistance from a specialist if competent support were available at a reasonable cost.

Table 3.3 - Major Factors Considered by the Local Retailers in Assessing Retail Sites

Factors Considered	Types of Retail Institutions										
	1	2	3	4	5	6	7	8	9	10	11
Demographic variables	/	/	/						/		/
Consumer convenient		/									
Location of competition	/	/	/	/	/	/	/	/	/	/	
Location of key traders					/	/		/			
Land physical attributes				/	/		/				
Availability of space				/							
Closeness to supply				/							
Planning authorities permission				/							
Traffic flow		/		/	/	/	/	/			
Accessibility	/		/	/						/	/
Financial analysis outcomes		/							/	/	/

Legend;

1- Shopping centres
2 - Shopping mall developers
3 - Chain departmental stores
4 - Petroleum retail
5 - Bank (Branch network planning)
6 - Government authorities
7- High street - variety
8 - High street - telecommunications
9 - Management consultants
10 - Project financiers
11- Estate agencies

3.5 Conclusions

In Malaysia, site selection decisions were generally done in a cavalier fashion, where most of the decisions employed were based on gut feeling. Local retailers recognised that they required a better approach to support their location decisions due to the intense competition and unpredictable economic circumstances. They were also aware of technical development that could assist their site selection decisions and were prepared to adopt such systems i.e., GIS. Unfortunately, the knowledge that they require to successfully implement and use such systems was not apparent. There was a clear line of development of site selection models in Malaysia. The sophisticated site selection decision models will remain theoretical and of limited use to Malaysian retailers.

The key development in site selection decision studies in Western economies is the use of GIS. GIS has the ability to cope with masses of internally generated and external data, producing more 'objective' pictures of consumer and competitive behaviour. GIS also allows an amount of "gut feeling" (subjective) judgement, which cannot be dismissed. It is significant to be able to incorporate both objective and subjective judgements of the local retailers. The use of GIS has grown fast in the support of marketing mix strategies in the UK, USA and some Pacific countries (e.g., Australia and Japan). Malaysian retailers could expect to experience the impact of GIS (being use by foreign competitors) in the very near future. GIS is a new technology that promises to impact Malaysian retail organisations more than other site selection decisions models due to its user-friendly nature in performing an array of market analysis and marketing mix decisions beyond site selection studies. The technology could help Malaysian retailers understand their customers, determine their needs and meet those needs better, e.g., assisting their marketing tasks in developing the product, pricing and promotions for their organisations.

The conclusion of the review and the exploratory fieldwork that had been conducted in Malaysia indicates that retailers in developed countries (evidently in the UK) are turning their focus to GIS in supporting their site selection decisions. It is also more likely that more and more retailers, particularly the developing countries, like Malaysia, will be exposed to GIS rather than imitating the sophisticated site selection decisions models developed in the Western economies. It is believed to be the most practical way for the retailers to move forward to face the intensifying competition from the foreign and domestic counterparts, since the sophisticated site selection decision models will remain theoretical, and of limited use to the retailers. For this reason, local Malaysian retailers are expected to be learning some of the lessons experienced (site selection decisions) by Western retailers (in this case, UK retailers).

However, implementing a GIS into an organisation is more than just "installing" the software and let it run by itself ("Plug and Play" application like Microsoft Word 6.0 or Windows 95). GIS implementation requires extensive commitment and preparation not just from potential users but also from senior managers and system developers, in planning the entire system, i.e., in its database design and training. The existing data sets have to be converted, standardised and maintained for the system to make it work. To give some idea of the problem faced in developing and implementing a GIS in Malaysia a checklist is presented in Appendix 2. This checklist is produced by the GIS vendor CCN Marketing. As they enter new countries to develop a GIS specifically for that country, certain types of data are needed to make it work. Again, Appendix 2 illustrates what that data is. Appendix 2 summarises an example of the various data sets that need to be gathered in order to implement the technology.

A "change" to a GIS approach cannot be accomplished on an overnight basis. If GIS were to be employed by Malaysian retailers, would they be able to implement it successfully? Thus, the emphasis of this study had been redirected to implementing GIS in retail organisations. In the next chapter, we will explore the DSS implementation literature to enrich our understanding in designing the entire research framework. Not being "Plug and Play" software indicates something of the complexity of developing, installing and using a GIS. The whole process can be defined as "implementation". Having established that the technology has potential use for Malaysian retailers, and that a GIS needs implementing in a retail organisation, the emphasis now turns to what "implementation" means.

Chapter Four

Review on Decision Support System (DSS) Implementation Process Research

4.0 Introduction

Examining literature on GIS implementation leads to a context of literature on DSS implementation. The lessons of other types of DSS implementation are an essential starting point to understand the process of GIS implementation. Within this context, this chapter is divided into five key parts. The first part of this chapter discusses the present state and significance of Decision Support System (DSS) implementation research. It is helpful to distinguish between the installation of a system and its implementation (see Appendix 1 for greater details). "Installation" refers to the physical placement of a system into an organisation (Meredith, 1981) while implementation is defined as a series of activities throughout the development of a DSS. The second part outlines the classification of DSS implementation research paradigms available for DSS implementation researchers to consider. Its rationale is to illustrate the strengths and weaknesses that exist in each paradigm. The third part presents the review of previous DSS implementation research studies with a concentration upon the process view of DSS implementation studies. The intention of this section is to help develop appropriate questions for this study. Critical issues found in reviewing these studies and their impact upon the design of the attempted research form the fourth part of the chapter. The aim is to discuss some of the "inherited problems" faced in conducting research on DSS implementation process. The final part concludes this chapter by establishing the structure of the intended fieldwork in this thesis.

4.1 Present State and Significance of DSS Implementation Research

There has been a great amount of research assessing DSS implementation. Implementation phenomena have been among the earliest and most actively researched themes in the field of DSS (Ginzberg, 1979, 1981a; Zmud, 1979; Alavi and Henderson, 1981; Markus, 1981; Nichols, 1981; Multinovich and Vlahovich, 1984; Leonard-Bartons and Deschamps, 1988; Tait and Vessey, 1988; Barki and Huff, 1989; Galliers, 1991; Joshi, 1991; Kivijarvi and Zmud, 1993, Saarinen and Vepsalainen, 1993; Yoon, *et al,* 1995; Chaudry, *et al,* 1996, Nandhakumar, 1996). To implement a DSS successfully is perhaps the major obstacle to the increased take up of DSS's. Given the impact of implementation failure, a considerable amount of studies have investigated the difficulty of implementation with a view of providing guidelines for implementation success, e.g., to define implementation and inherent problems[13] (Schein, 1961; Rubenstein, *et al*, 1967; Harvey, 1970;

[13] Practical experience and research have indicated that the more serious obstacles to implementation success lie outside the technical boundary (Garrity, 1963; Churchman and Schainblatt, 1965; Maranka, 1972; Carter, *et al,* 1975; Schultz and Slevin, 1975; Alter, 1976; Lucas, 1976; Edstrom, 1977). When the source of DSS complexity lies not with technical issues but with organisational issues, the process of implementation, i.e., roles adopted by the participants

Huysmans, 1970; Doktor and Hamilton, 1973; Bean, *et al,* 1975; Ginzberg, 1975; McFarlan, 1981; Kwon and Zmud, 1987; Tait and Vessey, 1988) to characterise factors that influence implementation success or failure (Bean, *et al,* 1975; Harvey, 1970; Schultz and Slevin, 1975; DePree, 1988; Keyes, 1989; Smith, 1989; Byrd, 1991; Palvia and Chervany, 1995; Stone, 1995; Yoon, *et al,* 1995) and to suggest alternative strategies for implementation (Ginzberg, 1975; Cooper and Zmud, 1990). Many of the approaches described above have dealt with various factors associated with different measures of implementation success.

Yoon, *et al,* (1995) further noted that much more research is needed to synthesise previous findings, formulate and empirically test hypotheses regarding the likely determinants of DSS implementation and build a theoretical foundation in this significant area. The ability to develop a technically elegant and sophisticated DSS far surpasses the ability to provide useful and workable solutions. As a result of this body of research, a wealth of knowledge exists regarding those phenomena most likely to influence a DSS's successful implementation. On the other hand, reviews of DSS implementation studies (Vasarhelyi, 1973; Dickson, 1981; DeSanctis, 1984; Ives and Olson, 1984; Alavi and Joachimstaler, 1992) have revealed that collectively, DSS studies have yielded somewhat conflicting findings. These reviews have highlighted faulty research designs and inconsistency of findings. Thus, the extent to which the existing body

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and the interactions among participants becomes a greater concern than the particular technical techniques employed during DSS implementation.

of knowledge reflects substantial and cumulative development is not entirely clear[14]. As Keen and Scott-Morton (1978) described,

> *"The most obvious point is that we do not understand the dynamics of implementation. This is really an extraordinarily fact; implementation is the avowed purpose of a large number of highly skilled and experienced professionals in the computer field, but while many of them are certainly successful implementers, they seem unable to pin down any general principles underlying their success. Hordes of researchers have analysed millions of questionnaire responses and the best they can conclude is that top management support is essential. If we assume that the practitioners are competent and the researchers are intelligent, then we must suggest either that implementation is impossibly difficult or that there are some key barriers to implementation that arise from the nature of the technology itself or the personality, training, and behaviour of the implementers and/or client (p. 196-97)."*

20 years on from the above quote, the current understanding of DSS implementation process has not progressed very far in moving from quite general prescriptions to situation-specific prescriptions, i.e., guidelines for facilitating the implementation process of particular types of DSS within particular organisational contexts.

[14] To some extent, these factors were linked to successful implementation and suggested a set of necessary conditions for implementation, noted by Ginzberg (1975), the results of empirical studies were often in conflict. Hence this body of research as a whole provides a limited basis with which to predict behaviour, i.e., managerial usage of particular model. Nonetheless, these research efforts

on a DSS) often in the form of case studies. Unlike factor studies, attempt is made to probe the way in which a DSS is developed. Lucas (1981) argued that this type of research might appear unfocused at times and less rigorous than factor research. However, it contributes a great deal to the understanding of the DSS implementation. Taking a process view is a significant step towards advancing the understanding of DSS implementation due to;

- DSS implementation is itself a process that unfolds over a period of time. Any view that fails to cope with the "unfolding" overtime cannot do justice to the inherent complexity of the situation.
- Factor research approaches have tended to focus on a single aspect of the implementation process (e.g., user involvement) and have failed to show how these pieces of DSS implementation process fit together. The process view enables consideration to be made on the multiplicity of interacting factors that affect the implementation process.

4.2 Paradigms of DSS Implementation Research

There are two major paradigms of DSS implementation research (Ginzberg, 1975; Lucas, 1981); 1) factor and 2) process research. Factor research describes individual DSS implementation factors. It determines those factors that are significant in implementing a DSS. A large amount of factors have been identified through this type of DSS implementation research. Ginzberg (1975) argued that there are three key shortcomings of the factor approach as a research paradigm, it;

- Focuses only small portions of the endless territory of factors
- Takes a static view of an inherently dynamic phenomenon
- Is oriented towards measuring factors rather than towards developing the tools in which management could control and guide the DSS implementation process

Nevertheless, although factor research does not allow researchers to indicate how these factors fit together, it does allow researchers to concentrate more effort and resources on the particular factor under consideration (impressive in scope). In contrast, process research aims to encapsulate the process of DSS implementation (e.g., a description of the relationship among individuals working

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identified some major variables and demonstrated the need for contingency approaches to implementation.

4.3 Review of the Previous DSS Implementation Process Studies

4.3.1 A Process View of Implementation

The implementation literature provides consistent evidence of the significance of only two generic issues for success in DSS implementation process. These issues are;

- Management support (Rubenstein, *et al,* 1967; Bodenstab, 1970; Harvey, 1970; Radnor, *et al,* 1970; Schultz and Slevin, 1973; Bean, *et al,* 1975; Hoyt, 1977; Alter and Ginzberg, 1978; Anderson and Schroeder, 1978; Bodin and Kursh, 1978; Byrd and Moore, 1978; Ein-Dor and Segev, 1978; Ginzberg, 1978; Hay, 1978; Robey and Zeller, 1978; Vollman and Hall, 1978; Chynoweth, 1979; Mohan and Bean, 1979; Anderson and Narasimhan, 1979; Akamatsu, 1980; Leonard-Barton and Deschamps, 1988) and
- User related variables (e.g., Evan and Black, 1967; McKinsey and Co, 1968; Alter, 1978; Dubin, 1978; Zmud, 1979; Olson and Ives, 1981; Ives, *et al,* 1983; Smith, 1988; Tait and Vessey, 1988; Barki and Huff, 1990; Sviokla, 1990; Sloane, 1991; Byrd, 1992)

A large body of DSS implementation process studies has investigated the relationship between user related variables and implementation success (Alavi and Joachimsthaler, 1992). The relationships between these factors and DSS implementation process are believed to be influenced by a number of contextual variables consisting of external, organisational and user variables (Bailey and Pearson, 1983; DeSanctis and Courtney, 1983; Ives and Baroudi, 1983; Rockart and Flannery, 1983; DeBrabander and Thiers, 1984; Baroudi, *et al,* 1986; Baroudi and Orlikowski, 1988; Doll and Torkzadeh, 1988; Swanson, 1988; Lane, *et al,* 1994).

User related variables include user experience, involvement, and training[15]. User experience refers to prior exposure to DSS and to the user's work history (e.g., number of years). User involvement, according to Swanson (1974) refers to the "entanglement" of the user in DSS related activities. Thus, a user and a DSS, two purposeful systems are "involved" to the extent that activities of each facilitate the attainment of the ends of the other. In this context, involvement refers to user participation in DSS implementation process. Training, in the context of DSS implementation process, refers to the provision of hardware and software skills sufficient to enable effective interaction with a DSS under consideration. Many of these concepts can be utilised in implementing a DSS.

Several authors conclude that introducing a DSS into an organisation results in profound changes to the organisation (Hedberg, 1975; Vertinsky, *et al,* 1975; Bostrom and Heinen, 1977; Edstrom, 1977; Boland, 1978; Ginzberg, 1978; Narasimhan and Shroeder, 1979). They argued that it is the interaction of many

[15] The aim of such formal education is to provide common ground by which participants will be able to learn from one another through suggestions, inquiries and criticisms. Many valuable design

DSS project to change the role behaviours of organisational members. In support of this belief, Edstrom (1977) found a high congruence between perceived DSS success and the amount of organisational change. The change approach to DSS implementation process strives to create a situation in which change will be accepted through the involvement of affected organisational members, an intensive education programme and most significantly, the assigning of project responsibility to the DSS user.

They also argued that the DSS implementation process can be seen as a social change process (Zand and Sorensen, 1975; Lawless, 1976; Boland, 1978; Keen and Scott-Morton, 1978; Ginzberg, 1979, 1981a). Keen and Scott-Morton (1978) suggest many of the conflicting results in early implementation research might be explained by the overwhelming impact of the interpersonal and organisational dynamics of the change process on other particular situational factors. Urban and Karash (1971), focused on process issues by addressing two approaches to implementation based on the nature of user/system developer interaction. One approach, termed "traditional", involves a minimum of user input, relying primarily on the developer's expertise to assure appropriate problem conceptualisation, model definition, and solution generation.

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insights arise only after participant's get beneath the surface relationships among a DSS and the organisational activities being served.

The alternative strategy, termed "evolutionary", attempts to maximise user input by beginning with simplistic models and iteratively updating these models based on feedback from actual usage by the client. Schultz and Slevin (1975) enlarged the scope of the evolutionary strategy by formalising the nature of the user/system developer interaction and attempting to ensure that proposed solutions fit organisational constraints. Similarly, research on the design of information systems provides insight into process-oriented strategies. Boland (1978) pointed out that the traditional strategies for system design place the analyst in a problem-solving mode. The designer's task is to obtain information about the manager and the problem setting. Analysis focuses on building a model of the decision process and using this model to design the information systems. The user plays the role of an information resource, with limited opportunities for input and learning. The alternative system analysis strategy suggested by Boland (1978) shifts the emphasis towards a structured, hopefully more effective, interactive process with the user. This evolutionary strategy attempts to create a mutual exchange of information about; (1) the user and analyst's potential skills and knowledge base that might be appropriate for solving the problem, (2) potential solutions, and (3) personal critiques of these solutions. The approach hopes to utilise an iterative user/system developer learning process as a means to generate a more appropriate definition of system requirements.

Ginzberg (1975, 1978) and Keen and Scott-Morton (1978) contend the Lewin (1947) and Schein (1961) change process model offers a basis for design strategies. This model involves three stages; unfreezing, change and refreezing. Unfreezing involves establishing the necessary conditions for change. Many of the situational factors, such as top management support or user-felt need, are evaluated and manipulated, if necessary, during the unfreezing process. The change stage involves those tasks normally associated with the traditional strategy (e.g., model formulation). Finally this change model explicitly confronts the problems of institutionalising (refreezing) a system or a model. Keen and Scott-Morton (1978) propose a DSS design strategy that includes a predesigned phase that directly considers the unfreezing stage. While the specific nature of the user/analyst interaction is not defined, the process is iterative, focusing both on situational factors and on the decision process. The iterative emphasis results in a design strategy similar to the evolutionary strategies proposed by Boland (1978) and Schultz and Slevin (1975). The conclusion of each study was that implementation is more likely to succeed if they closely follow the dictates of a normative model of change e.g., Lewin/Schein model, Kolb/Frohman model and diffusion of innovation model (Wolek, 1975). Each of these models is organised as a sequence of stages. Analyses of DSS implementation using these models have examined the relative significance to overall project success of good performance at each stage. Rather, each stage is composed of a number of issues requiring resolution and good resolution of one of the issues does not necessarily imply good resolution of the others. Thus, it is difficult to say whether "good" performance at a particular stage requires good resolution of all issues or only of some issues and if the latter is the case, which issues are most important?

Empirical analyses to date have not focused on this level of specific issues or types of activities occurring within and perhaps across, stages, i.e., issues which arise recurrently throughout the implementation process and to assess the relative significance of these issues for determining implementation success and failure.

Moreover, Ginzberg (1979, 1981a) argued that previous analysis of the DSS implementation process has focused on the conduct of individual process stages as explanations of successful and unsuccessful implementation. However, process stages involve multiple issues and it is unlikely that all issues are significant at a stage. As a result, he identified generic implementation issues (those issues which arise at many process stages). Zmud and Cox (1979) proposed explicit specifications of process requirements believed to be necessary when organisational complexity becomes a major concern when implementing a DSS. He presents an approach to DSS implementation process in situations where a substantial amount of organisational change is expected. A focus is given on implementation process, i.e., the activities and the responsibilities of and the interactions among participants. DSS activity is referred to as an implementation stage, involving a series of different tasks. Specific techniques have evolved for accomplishing these tasks (Zmud and Cox, 1979). They have argued that refined techniques have developed for accomplishing implementation activities (that are predominantly concerned with facilitating the technical difficulties that arise).

Lucas (1978) summarised the empirical evidence for a descriptive model of implementation process. The studies support the existence of a relationship between system quality and users attitudes. There is evidence of an association between management support and users attitudes. There is also an evidence of an influence of system quality and implementation success. In short, the studies provide evidence for the supportive relationships between management support, user attitudes and perceptions. One of the findings is the relationship between attitudes, perceptions and implementation success. The results suggest that forced use of a poor quality system may lead to the development of unfavourable attitudes. There is also the contention supporting the relationship between decision style and implementation success. It suggests that more quantitative oriented decision-makers be expected to use a system model more than non-quantitative decision-makers. The results also show that the non-reference users are more likely to use the system if their reference group leader has favourable attitudes toward the system. It appears that the actions of the subordinate group in the case are fully consistent with the attitudes of reference of group leaders. The clearest finding that emerges from these studies confirms the existing predictions that the older and less educated member of the organisation is most likely to resist a DSS.

It is also significant to examine contingencies to further understand the DSS implementation process. Bean *et al,* (1975) provide evidence showing that the organisation stage in the DSS life-cycle affects the relative significance of different factors to project results. There are quite likely other significant contingencies that have not yet been explored. The understanding of DSS implementation process will thus enrich by further studies, which attempt to map out these contingencies.

4.4. Some Critical Issues in Reviewing DSS Implementation Research

Two paradigms of DSS implementation research paradigms has been outlined earlier in this chapter, factor and process research. Furthermore, it is significant to address some of the critical underlying issues, which have evolved while conducting the review. This is due to the fact that the model a researcher uses to structure his investigation of a phenomena has a critical impact on the results of their study. Four issues have been raised about the pattern underlying (explicitly and implicitly) previous research efforts, which are;

- The choice of dependent variables
- The interaction of the various variables in DSS implementation process
- The perspectives of different participants in DSS implementation project
- The portion of project life-cycle considered in the study

The first issue, which needs to be considered in reviewing DSS implementation research, is the dependent variable. The question that arises, however, is how implementation success (and conversely, failure) should be defined and measured. There are plenty of DSS implementation success definitions and measurements available in the literature, e.g., Schultz and Slevin (1975) and Tait and Vessey (1988) have written a review of approaches to measure the results of DSS implementation efforts. These definitions make the implicit assumption that DSS implementation effort is an attempt to satisfy the DSS managers. Accepting this assumption can result in a confusion of means with ends (the aim is to help the manager to understand his environment better and to enable him to deal with it effectively). Given the major impact which the definition of the dependent variable can have on the research results, further effort to explore just what the researcher means by implementation success seems justified.

The second issue, is the interaction of the various variables, which affect the DSS implementation process. Previous studies have implicitly viewed the independent variable as absolute. A situation which was assumed to be always good or always bad. A realistic view is one, which recognises that the effect of any variable may be contingent on the other variables, which characterise the particular situation.

The third issue is the diverse perspective of DSS implementation project participants. Each individual involved in a DSS implementation project brings their own set of needs and goals to that project. There is little reason to believe that DSS manager' needs and goals will be the same as the researchers goals. Each of them comes from a different subculture (Starr, 1971) and each is evaluated and rewarded on a different basis (Hammond, 1974). Much of the empirical research on DSS implementation research has focused only on a single view (managers or users), assuming that their views provide an adequate representation of what took place. Clearly, the problem with this approach is the fact that managers and users do not share the same perceptions. If the approach is proceeded, an incomplete and one-sided view of DSS implementation project will be obtained.

The fourth issue is in which part(s) of the DSS development process is the researcher referring to when they talk about implementation. Traditionally, system designers have viewed implementation as part of the system development life cycle, which begins after the system has been designed and ends once outputs are produced. This view eliminates the majority of the effort expended in system development from consideration in studying the DSS implementation process. Users for example, do not share this view. They see implementation once the system is set-up. Events critical to the results of a project occur at all stages of the system development life cycle.

A true understanding of the determinants of DSS implementation process success or failure requires a consideration of all events involved. Indeed, implementation should be defined as beginning with the first thought of developing a system and not ending until the user is satisfied that they are in control of the system (Ginzberg, 1979). Clearly, not every research project is affected by this array of problems but the occurrence of these problems is sufficiently common to merit the researcher's concern.

4.5 Conclusions

Much has been written about implementation in various established DSS areas, e.g., Expert Systems (ES) and Executive Information Systems (EIS). This is because the answers to these questions help to avoid the array of problems that occur upon implementation. Given the dramatically different nature of DSS implementation, results obtained from previous studies are likely to provide at best a partial picture of the key issues surrounding GIS implementation in practice. There are many factors contributing to DSS implementation success but unfortunately, the results of these prior studies are mixed and inconclusive (Srinivasan, 1983; Swanson, 1988). The studies have been conducted in fields other than GIS or retailing such as production management.

The results of this review have strengthened the contention that it is valuable to view DSS implementation as a process (the significance of considering the entire life cycle as relevant to implementation process is presented). It also raises some questions about appropriate methodology for implementation research. Previous implementation research has used managers or users as the source for data and such a methodology reveals how managers view implementation.

Key issues on DSS implementation process research have been postulated and reasons for the problems in conducting such research have been presented and a broader perspective of what properly constitutes the DSS implementation process is thus needed. Whilst no individual factor was sufficient to completely distinguish successes from failures, perhaps some combination of factors could do so (there is not a well-articulated list of generic implementation issues to serve as a research starting point). Within the context of the state of DSS implementation research, the next chapter looks at GIS implementation research.

Chapter Five

Review on Geographical Information Systems Implementation Research

5. 0 Introduction

This chapter is divided into three key parts. The first part describes the significance of GIS implementation research in retailing. The second part describes the state of implementation research in other developed areas of GIS. Its purpose is to understand what has been done in areas that are relevant to retailing. The third part brings together key themes into a framework that can be used to develop an understanding of GIS implementation (the framework is believed to be useful as a guidance for the next research stage, e.g., setting-up the questions for the pilot studies). The overall purpose of this chapter is to identify future research directions in GIS implementation and to develop a research methodology that tackles these issues.

5.1 The Significance of GIS Implementation Research in Retailing

Geographical Information System (GIS)[16] in retailing is a rapidly growing discipline at the frontier of GIS (GIS World, 1993). Marketing professionals seem to believe that the systems are able to help in the vital tasks of accurate market and consumer analyses (Hughes, 1991; Holtz, 1992; Baker and Baker, 1993; Curry, 1993; Buttery and Volk, 1994).

The increasing amount of GIS applications studies (e.g., Frank, 1988; Beaumont and Inglis, 1989; Johnson, 1989; Tonks, 1990; Goodchild, 1991; Dunn, 1992; Sleight, 1992; Kolli, *et al,* 1993; Robins, 1993; Bryan, 1994; Michelsen, Jr., 1994; Clarke and Rowley, 1995; O'Malley, *et al,* 1995, Tayman and Pol, 1995) show a great array of applications and increasing complexity in the systems. However, there is little research available on GIS implementation in UK retailing (with a great array of applications and benefits detailed).

[16] It is worth to note that there are several competing definitions of GIS, but essentially it is a combination of computerised cartography, Database Management Systems (DBMS) and spatial analysis tools. These three components of GIS facilitate the following three functions; 1) the representation of the object world as proportionate symbols on a scale-transformed co-ordinate geography, 2) the accumulation of relevant information about these objects in a spatial database and 3) the elaboration of a set of procedures for the accumulation, manipulation and representation of this information.

The reasons why studies dealing specifically with GIS implementation are significant may be summarised as;

First, despite the widespread and increasing significance of GIS technology in retail organisations, only a little effort has been made to identify the successful GIS implementation process or to identify its factors. Most research efforts are not found in retailing but in other more developed areas, e.g., local government authorities. It appears that the primary focus has been on the system applications with a lesser concern about the implementation of the system. Some of the "common wisdom" about issues leading to successful GIS implementation process needs to be evaluated. Managers responsible for GIS implementation process cannot assume that the set of determinants for success (and failures) with other DSS or any other developed areas of GIS are equally significant for GIS implementation process in retailing. Even if one believes that to be so, this assumption must be confirmed empirically.

Second, there is also little research on GIS implementation process in retailing in the United Kingdom. The insights from other geographical settings may be generalisable but an in-depth research into "a UK" geographical context is needed to enrich the UK retail managers' understanding towards successful GIS implementation process. The outcomes of this research will describe the characteristics of successful (and failures) GIS implementation process experienced by UK retailers in which other retailers can share its lessons, e.g., who are still developing the system.

5.2 The Present State of GIS Implementation Research

GIS implementation research is still within its early days. It is only within the past 15 years that GIS issues have been researched with very little emphasis on implementation. Most of the studies have focused on the system's applications, such as;

- Site selection decisions (Goodchild, 1991; Kolli, *et al,* 1993; Bryan, 1994; Buttery and Volk, 1994; Clarke and Rowley, 1995; O'Malley, *et al,* 1995; Tayman and Pol, 1995)
- Spatial analysis (Beaumont and Inglis, 1989; Johnson, 1989; Tonks, 1990; Mitchell, 1991, 1992; Dunn, 1992; Sleight, 1992; Robins, 1993; Michelsen, Jr., 1994; O'Malley, *et al,* 1995), e.g., trade area definition and traffic volumes analysis (Botts, *et al,* 1994; Chandler, 1994; Sobolak, 1994)
- Product development (Johnson, 1989; Kalinski, 1994) and
- Determining appropriate promotional media (Johnson, 1989), e.g., in selecting newspaper readers and television audiences (Robins, 1993), in direct mailing (Beaumont and Inglis, 1989; Cooke and Pescosolido, 1994), and door to door distribution of leaflets through postcodes clusterings (Sleight, 1992)

Another area of development in GIS research focuses on the benefits[17] of the system, (e.g., doing things better) that is difficult to quantify in cash terms but in areas where efficiency is likely to be improved (Beaumont and Inglis, 1989; Grupe, 1992; Spiers and Rabago, 1993; Michelsen, Jr., 1994; England, 1996), as a tool for strategic planning (King, 1994; Less and Gericke, 1994; Tucker, 1994) and analysing the competitive threats (Clark, 1994).

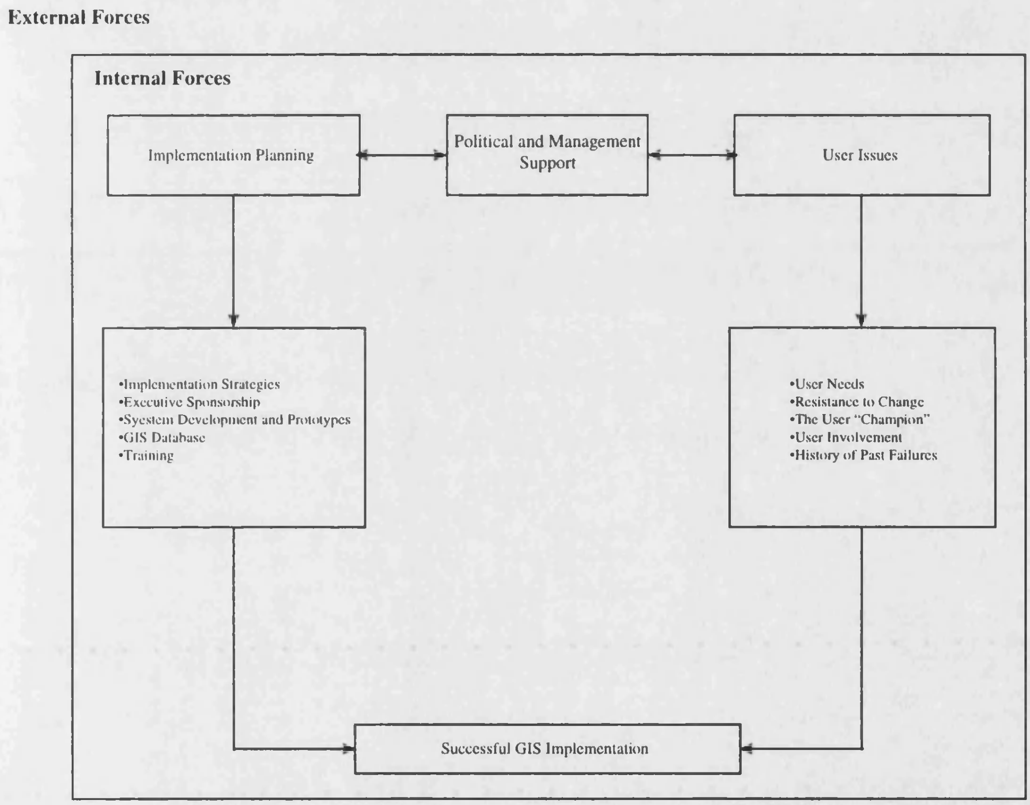
The relative youth of this field limits the amount of GIS implementation studies that can be found (although it has been applied in various industries within retailing, e.g., banking, food, insurance, real estate, transport). The following section therefore, present a broad framework that could be the "starting point" to develop a theory of GIS implementation in retail organisations.

[17] Benefits in terms of more explicit decisions and the reduction of decision-making time are both related to the GIS applications (Campbell and Maseer, 1991).

5.3 System Development Life Cycle (SDLC)

The SDLC (McLeod, 1990) was used in the attempt to identify the activities that occur in the development and implementation process[18] (see Figure 5-1).

Figure 5.1 - The Emerging GIS Implementation Research Framework



[18] It is significant to note that parts of the process may be repeated. However, the general sequence of activities can be arranged into a series of tasks that approximately follow the process.

The traditional SDLC arose out of a need in the 1960s to provide structure to the development and implementation of large software systems. The life cycle for development and implementation described presents the process design in a somewhat static "pipeline" manner. In reality, even for batch processing systems, the actual design process is iterative (work in one design activity affects work in other design activity in the cycle). Campbell (1992)[19] argued that a successful[20] GIS project proceeds through three distinct stages of implementation;

- Adoption of the vision that GIS can improve the organisation
- Implementation of the system in accordance with users needs and
- Use of GIS once it has been implemented

The findings of Campbell's research indicate that issues change during the GIS implementation process, initially centring on technical problems such as data compatibility and then progressing to other data-related issues. As progress continues, the issues became more organisational in nature, revolving around difficulties concerning the ownership and control of the system. Further, Campbell describes the distinction of SDLC in GIS implementation as follows;

[19] Campbell investigated nine local government authorities in Massachusetts and Vermont in 1990 that had adopted GIS that involved interviews with system developers (e.g., project managers) and users in a range of local councils who had successfully implemented GIS.
[20] Campbell also argued that a true measure of success of a GIS project is the successful use of the system, i.e., GIS project cannot reach that stage unless the concept is accepted and funded by decision makers and until the necessary hardware, software, data and people and procedures have been implemented.

"The decision to introduce new technology into an organisation may be protracted but there is a finite point at which a decision is taken to commit at least initial funding. In contrast, implementation is an on-going process involving repeated cycles of development, learning and routine utilisation as new elements are integrated into the existing system. Each of these cycles entails the complex process of managing change in environments which are themselves dynamic and characterised by the interplay of individual personalities in a context of distinctive procedures and long standing practices." (p. 86).

The core of the theoretical framework is guided by the system development life cycle (McLeod, 1990; Lucas, 1992). System Development Life Cycle (SDLC) was chosen as it provided a broad framework that could set boundaries for topics to tackle, out of the vast array of topics that impinge upon the implementation process. There are two key environments characterised by the life cycle; 1) external and 2) internal environments. The external environment refers to the forces outside an organisation that may shape a GIS (e.g., competitive forces, pace of GIS development, the availability of independent data sets). The internal environment consists of organisational issues that may shape implementation of the system. All these strategies can be, and are, used to implement GIS.

As no single approach to define a successful GIS implementation currently exists in the literature (Medyckyj-Scott and Cornelius, 1993), Figure 5-1 was constructed based on the common themes found in the scope of local government GIS. The rationale of selecting local government GIS in constructing a framework for implementation research is due to the fact that implementation studies in this area are much more developed and stable. However, those studies are not done in the field of retailing. Nonetheless, the outcomes of these studies provide useful insights into further GIS implementation research, including retailing (this reviews serves as a guideline in probing the issues related to successful GIS implementation process in the next data collection stage). The preceding studies relate to GIS that developed in the late 80s and early 90s involving a complex set of integrated factors. These early experiences with GIS do not adequately predict similar results when GIS is applied to organisational computing. A look at some of the present studies into successful GIS implementation may help to draw parallels and to recognise that will assist in understanding the significant issues in GIS implementation. As Budic (1994) has stated in the final part of his study,

> *"Further insights into the factor that help to achieve benefits from GIS use in the planning process could be valuable in guiding the allocation of financial resources for GIS development, designing more focused implementation strategies and building successful geographical information systems"* (p. 258).

This notion is further supported by Innes and Simpson (1993) by noting,

> *"Practitioners on the job have created most of these implementation methods. To make more effective progress in the future, academic researchers must also give serious attention to the strategic tasks. Researchers can help by first codifying existing practices and documenting and explaining successes and failures. Ultimately, they can build a framework for practitioners to apply in the overall innovation effort"* (p. 234).

Three key organisational issues have emerged based on how GIS implementation has been described by factor research, in which can be summarised as;

1) Implementation planning that includes;

- Implementation strategies
- Executive sponsorship
- System development and prototypes
- GIS database and
- Training

2) Political and management support

3) User Issues that includes;

- User needs
- Resistance to change
- The user "champion"
- User involvement
- History of past failures

5.3.1 Implementation Planning

Steffenson (1995), Westfall and Seifert (1995) and McIntosh (1996) argue that it is vital to thoroughly plan an implementation process. Implementation planning refers to the process of translating the strategy into a series of specific project tasks and when they are completed, the organisation will have a functioning GIS (Huxhold and Levinsohn, 1995). As Innes and Simpson (1993) contended,

> *"Technology is not just an artifact like a computer or a piece of software. It also includes knowledge and practices necessary to transform the capabilities of artifacts into useful output"* (p. 231).

Most planning tasks are non-routine and multifunctional, often integrating various types and sources of data. Effective implementation planning requires the ability to forecast different growth scenarios that would result from alternative regulatory policies. System developers have to ensure that GIS implementation goals are clear to all team members, e.g., senior managers and users (Westfall and Seifert, 1995). Further, in terms of implementation planning framework, England (1996) in his study in his own organisation reported that implementation planning framework is a crucial factor which held the department together in achieving the project on time and within budget.

a) Implementation Strategies

Organisations can adopt a variety of strategies by which key changes can be implemented in an existing situation. The strategies can be loosely arranged on a dimension from the revolutionary to the most evolutionary. Five strategies, derived from Eason (1988) are;

- *The "Big Bang";* One of the most difficult kinds of implementation is when an existing system is being discontinued in its entirety as the end of one day and a new system replaces it on the following day. A highly publicised example in recent years was the overnight switch of the London Stock Market to electronic trading in 1986. The aim is to identify the main principles of each strategy and the circumstances in which it might be used.
- *Parallel Computing;* One popular way of minimising the risks to the on-going work is to introduce the new system alongside the old one and to run them in parallel until everybody is confident that the new system will be effective. When the maintenance of the quantity and quality of existing work is one of the highest priorities, this is the most popular strategy[21].
- *Phased Introduction;* The problems of making massive changes can be eased by phasing in the changes over a period of time. There are two ways in which large-scale changes can be subdivided to facilitate phased introduction. First,

[21] If parallel running is used as a strategy, it needs an agreed programme of tests so that everybody can see the progress that is being made towards the switch to the new system and can participate in

the functionality of the technical system can be introduced in phases so that the basic task processes can be supported in the early stages and subsequently facilities can be added which support, for example, decision-making tasks. Second, it may be possible to introduce the system in different parts of the organisation at different times. A combination of these two approaches can also be used.

- *Trial and Dissemination;* This strategy explicitly recognises that there will be "teething troubles" when a new system is introduced. By holding a key trial or pilot project (usually undertaken with the technical system it is planned to implement) before embarking upon full-scale implementation. This strategy provides a valuable opportunity to prepare thoroughly for implementation before it is in the throes of full-scale change. However, many organisations fail to make good use of the opportunities that the trial presents. Tapscott (1982) calls this approach as the Second Law of Office Systems,

> *"The ease of a pilot implementation is inversely related to the complexity of its operational extension"* (p. 199).

- *Incremental Implementation;* The alternative to a revolutionary change is gradual evolution. The growing sophistication and flexibility of technology is making the incremental implementation of systems and increasingly practical proposition. When users are discretionary and powerful and their needs are

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the decision-making.

varied, not to say idiosyncratic, the service has to be tailored to individuals and incremental implementation may be the only option that is acceptable to users.

The implementation team needs to select the route that the organisation and the users can best accommodate. The more evolutionary the approach, the more time the users have to adjust but the more likely the momentum of the project is to be lost (Eason, 1993).

b) Executive Sponsorship

A recurring theme in the literature is the significance of the executive sponsorship or champion. Glover, *et al,* (1992), found a lack of sponsorship to be the most common cause of a DSS failure. The sponsor has to be organisationally powerful so that key decisions about the development can be taken and they can become an active promoter of the system amongst their peers. They also have a crucial part to play in helping to derive needs analyses.

c) System Development and Prototypes

In terms of system development, most studies are concerned about development procedures and database management systems (DBMS) activities.

For example, Westfall and Seifert (1995) further outlined the procedures of GIS group-based project on Local Area and Wide Area Network (LAN and WAN), e.g., central system design, site system design, requirement specifications, initial project goals, request for proposal (RFP), network framework, installation and testing of the equipment[22]. While Riggs and Krumm (1996) had also outlined an extensive review on technical database preparation issues for a GIS project including a detail quality assurance and quality control procedures[23].

Innes and Simpson (1993) in their study argue that a GIS should be used incrementally with benefits occurring at the early stages and changes should be reversible in the first place, in which prototypes should be developed by system developers prior to completing the project. They also argue that large-scale failures have political repercussions, hurting chances for continued funding[24]. As Westfall and Seifert (1995) noted on the significance of the prototypes,

> *"Even if with adequate planning, it always takes longer than expected. By prototyping the solutions, we actually were able to get some of the solutions in earlier. The hardware purchase decision could also be postponed until we were really comfortable with the technology chosen."*

In addition to prototype issues, Westfall and Seifert (1995) also commented on the significance of documenting all relevant issues during the

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[22] Although this study is conducted on a single setting environment, the input towards DBMS proved valuable for further research in regard to the activities undertaken throughout the GIS implementation process.

[23] These procedures were developed to ensure that appropriate and consistent steps have been followed to maintain high standards for compiling GIS databases.

[24] A GIS that requires a large-scale change at the outset is unlikely to be implemented.

implementation process[25]. It is very expensive to have to go back and visit the site for documentation and audit purposes. In another study, Pistorese (1996) argue that DBMS design is the most significant activity during the GIS implementation process. DBMS includes such activities like determining the data requirements and its relationships, data conversion, data maintenance, back-ups and prototypes. The presence of these guidelines is an indicator that senior management is paying attention to GIS implementation (something that would tend to encourage others to support GIS implementation as well).

d) GIS Database

GIS database refers to the system's layers of data. An extensive database encompasses more distinctive elements of data relevant to planning issues and thus makes it easier to analyse those issues (Dueker, 1980). Multipurpose database (integrated or shared) usually contains a variety of features, because their objective is to satisfy the information needs of several departments. The development of the database is one of the most labour-intensive and time-consuming tasks in the GIS implementation process. Most local government starts with a partially developed GIS database.

[25] This really came in handy when there is a need to review why something was left certain way at a site. System developers need to document as they go along by insisting on it with the team.

e) Training

Training, in the context of GIS implementation, refers to the provision of hardware and software skills sufficient to enable effective interaction with GIS under consideration (Ventura, 1995). Moreover, McIntosh (1996) argue the significant role of training in GIS implementation success and Steffenson (1997) elaborated on the training scope by suggesting that senior managers can allocate an on site technical specialist in entertaining users queries during the implementation process. The outcome of the approach is that users will become independent and successful through the transfer of expertise.

5.3.2 Political and Management Support

Securing political and management support is crucial for GIS implementation. Organisational politics play a significant role in GIS implementation and can substantially influence its outcomes (Markus, 1983; Somers, 1987; Juhl, 1988; Crosswell, 1991; Budic 1993; Pinto, 1993). Winning the support of the decision-makers and senior management is often mentioned as one of the critical prerequisites for initiating GIS implementation[26] (Aronoff, 1989; Wiggins and French, 1991).

Budic (1993) finds continuity is a significant aspect of political and management support, i.e., demonstrations of systems' benefits. On the other hand, prolonged implementation and changes in political climate can adversely affect the implementation of a GIS. Political and management support appears to allow development of a database, perhaps by indirectly inspiring financial and moral commitment to GIS project as well as by increasing the likelihood of adequate user support (Budic, 1994). The decision-makers are also the source of political and management support for a GIS[27]. Strong political and management support or weak thereof could affect the decision-making effectiveness.

On the other hand, Armstrong (1994) in his study has outlined a valuable group-based approach to GIS implementation. He believes that social interaction bureaucracy does influence GIS implementation success. In addition, Seifert and Westfall (1995) in their study on the consolidated effort in implementing a centralised GIS data library had stated that system developers have to ensure that any support personnel should be involved in the project as early as possible because system developers and users' schedules were not always their priority. Further, Newkirk (1996) argued that GIS implementation success relied on a high

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[26] One of the key purposes of GIS need analysis is to convince senior managers that GIS is a worthwhile investment.
[27] Senior management roles will not disappear but will reduce in significance as the system

level of trust between senior managers, users and system developers which allowed full system implementation.

5.3.3 User Issues

User issues are divided into user needs, resistance to change, the user champion, user involvement and history of past failures

a) User Needs

Deciding on the need analysis of the users is on of the most difficult, and yet crucial part of the implementation of a GIS (Allison, 1996). Identifying the correct needs can prove to be elusive. The creation of a set of universal requirements based on organisational and departmental goals is especially difficult.

A key stumbling block is that even when user time is given to assist in the analysis process, it is difficult for them to identify their needs. Of course a user will try to identify items of significance, but the tendency is to focus on items which have been significant in recent days or weeks. The process inevitably leaves

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becomes operational.

out the vital information. According to Millet and Mawhinney (1990) the full value of GIS will only be realised when the system helps users focus on strategic issues. A few studies conclude that GIS implementation success is attributed to users needs identification (Pinto and Onsrud, 1991; Budic, 1994). They also argued that users of successful GIS employed similar processes to acquire the system. Users of successful GIS implementation perceive that their systems are valuable to their organisation because it is easy to assimilate and use. A GIS is most likely to be viewed as successful when users perceive that the system provides more advantages than their old methods and the organisations have fallback options in the event that the system does not perform to their satisfaction and the costs of the system are not excessive.

Further, Armstrong (1994) argued that system developers should develop the application based on consensus-building mechanisms and should determine particular tasks required to support inter-group communication. As he put it,

> *"An effective group DSS must provide mechanisms for consensus-building and conflict resolution, since differences of opinion will almost certainly arise during any group decision-making process"* (p. 674).

Innes and Simpson (1993) further support this notion by stating that participants' consensus decisions should be reached in completing a GIS project[28]. In considering users needs, Innes and Simpson (1993) suggest three key areas;

[28] GIS implementation requires co-operation between local government which do not normally work together. A strategy to increase compatibility between GIS and organisational culture is needed through the automation of the existing tasks. Most system developers are unskilled in GIS

- *Simplicity;* System developers and users do not have to understand the details of how the system works but they do need a simple idea that communicates the system essential ability. However, within the context of GIS, a simplification strategy of defining what GIS is should be used as a tool, e.g., system developers should not start the system with difficult but simple applications and as users become accustomed to the system, they will automatically find more uses for it.
- *Observable benefits;* The benefits of adopting the system must be visible[29]. However, within the context of GIS, the benefits of adopting the system are difficult to observe in the short run.
- *Relative advantage*; The benefits of adopting the system must exceed the costs. A strategy to visibly link the benefits and the costs for system developers and users should be developed, e.g., personal satisfaction that comes with doing better work should be used as an incentive for system developers to adopt GIS.

b) Resistance to Change

The most common reaction to technological innovation and implementation in organisations is resistance to change. To people at work new

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(Innes and Simpson, 1993).

[29] The outcomes of the system must be made visible by tying them to favourite applications.

technology can spell all kinds of trouble (Eason, 1993). It can mean loss of jobs, disruption to know procedures, the need to learn new skills or the further dehumanisation of the work itself. New technology means change and change can be disadvantageous and difficult. A particular change may, of course, be none of these things. It may bring a better quality of working life, opportunities to become more proficient etc., but the most common reaction is to expect the worst. Resistance to new technological change is widely documented (e.g., Keen 1981) and failure rates are high even amongst GIS (Eason, 1993).

In order to avoid these problems of resistance to technological change, Eason (1988)[30] suggested that the overall system development process have to be user-centred. Only by involving users at all stages of system development can users feel they own the change and want it to occur. There is also a considerable literature on the planning of change, for example, Bennis, *et al,* (1976). The general principles are; 1) to find a strategy in which users can participate. As Coch and French (1948) discovered, an implementation strategy in which there is the participation by all those affected leads to much more positive response than a process in which only a few representatives are consulted, 2) participation must be more than symbolic (it must be possible to influence issues that matter to them and to "own" the future system so that it is not perceived as a development imposed from outside) and 3) it must enable an understanding of the implications,

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[30] A user-centred approach in which the significant groups of users who will be affected by the system participate in the decisions to select or develop and play their part in designing the processes (Mumford, *et al,* 1978; Eason, 1988).

appreciate positive opportunities, come to terms with negative aspects and plan their own coping strategies (if it is to be effective, the planning details must be done by the people who will be affected).

c) The User "Champion"

It is significant to involve a senior user in the implementation process, if possible vesting responsibility for implementation. The "champion" should have authority for the range of potential users (Eason, 1993; Huxhold and Levinsohn, 1995). In addition, England (1996) has noted the significant role of the catalyst (steering group) in managing GIS project. There were significant players for agreeing proposals and financing in the project.

d) User Involvement

If resistance to change is to be avoided it is necessary to involve all potential users in the process, not merely a selected few. In a large implementation it is difficult to involve everybody in the strategic decisions but there are many "local" decisions in which everybody can participate. It is significant to note that involvement of this kind gives people considerable influence over the decisions that affect them personally and it is this kind of example which most successfully encounter feelings of external threat. Wall and Lischeron (1977) demonstrated that whilst people liked to feel their interests were represented in the strategic decision making, they wanted to be personally involved in the decisions that affected their daily work.

e) History of Past Failures

History of information systems failures suggests that organisations' concern with information systems failure helps to ensure GIS project success (Pinto and Onsrud, 1991). Perhaps those who have had their "fingers burned" in the past require more scrutiny in the GIS project than those who are not aware of the adverse impacts of information systems project failures.

Experience, in a broad sense, refers to prior exposure to GIS as well as to the individual work history (e.g., number of years in job position). It takes time to implement a GIS. Database development, for example, has been acknowledged as the most challenging and time-consuming tasks (Chorley, 1988; Aronoff; 1989; Lang, 1990; Budic, 1993). In addition, mastering the technology itself requires extensive time and intensive work.

5.4 The Rationales of Reviewing the Organisational Issues

This environment around the technical elements influences the use of GIS in many ways. People vary not only in technical skill but also in their attitudes and beliefs about computing and use of information (Ventura, 1995). Recent definitions of GIS attempt to include the context for system use, including organisations that provide people and purpose for systems (e.g., Dueker and Kjerne, 1989; Maguire, 1991). Few studies have indicated that GIS implementation success is more towards the organisational issues rather than its technical aspects of implementation. Kraemer and King (1979) demonstrated the difficulty of encouraging organisation-wide GIS solely through providing funding and state-of-the-art technology (a complete data model, top-down design, from conceptualisation, analysis, design, implementation with prototypes implemented incrementally). As they put it, *"A specific package of information management technology is not likely to be in universal demand"* (p. 347).

The top-down approach proved too cumbersome and costly precluding the opportunity to implement some applications early in order to demonstrate benefits. The approach also was abandoned when the mass of detail became overwhelming. System developers began to develop only those applications that they intuitively felt were needed when deadlines approached. Further, Campbell (1992) also found that the most significant stage of their projects was the process of implementation;

"Effective utilisation was not found to be simply dependent upon the technical operation of GIS. Organisational issues, including the ownership and control of information, securing general commitment and ensuring the need users are met through a realistic understanding of the role [of] information in decision making, were found to have marked influenced on the implementation process" (p. 86).

Innes and Simpson (1993) further argued that system developers should understand GIS as a organisationally constructed technology by noting,

"The task ahead for GIS proponents is to develop strategies that will encourage transformations of planning practice in response to the opportunities that GIS offer."

Moreover, Onsrud and Pinto (1992) reviewed GIS from an organisational theory perspective. They listed over 30 factors that might influence the adoption of GIS within organisations. Incentives and barriers to changes in organisational practices included personal factors, perceived and real costs and benefits, intra and inter-organisational communications, decision-making structure, approach towards technology introduction and training. Their reviews provide several insights into factors that appear to influence GIS adoption. In short, if technical limitations in the use of GIS for decision-making really are only technical limitation, then solutions are usually straightforward.

5.5 Conclusions

GIS implementation has been a topic of interest to researchers over the past 15 years and remains a high priority research topic for the following two reasons;

First, both organisational investments in and reliance on GIS have significantly grown over the past 15 years. Such systems have been used for competitive advantage, establishing direct electronic links with customers, enhancing organisational planning and decision-making and reducing the cost of operations. Thus, the knowledge of which GIS implementation process is most significant for the success of a particular initiative can be determined within the constraints faced in the organisation.

Second, reviews of DSS/GIS implementation research (DeSanctis, 1984; Pistorese, 1990; Alavi and Joachimsthaler, 1992; Armstrong, 1994; Budic, 1994;

Ventura, 1995; Riggs and Krumm, 1996) have revealed that collectively, implementation studies have yielded conflicting and somewhat confusing findings. Thus, the extent to which the existing body of research reflects substantially and cumulative development is not entirely clear.

Based on the review, it can be concluded that there are enormous amounts of successful implementation factors available in the literature[31]. These factors are subject to where and how GIS has been implemented and it varies according to what organisation (e.g., size of the project and size or the organisation, number of personnel involved, nature of applications or sector it belongs to). Therefore, a broad framework of GIS implementation was presented based on the SDLC (see Figure 5.1) to set boundaries to events of enquiry.

As indicated in the previous chapter, a thorough understanding of what are the factors leading to successful implementation can only be used as guidance into understanding the whole implementation process[32]. Most of the research efforts were not found in retailing but in other developed areas such as in local government. As with to GIS studies, most efforts were concentrated towards understanding the successful (and indeed failed) factors of system implementation. Although this approach is nevertheless valuable in providing direction for implementation practitioners on what are the factors to concentrate upon, this

[31] The relative significance of each successful GIS implementation factors cannot be generalised.
[32] Process if referred as the linking of action/interactional sequences (Strauss and Corbin, 1990).

approach is unable to provide the entire "picture" of implementation process needed by them. This review also suggests that there are interaction effects among key factors and other variables, e.g., senior management support and user involvement. It strengthens the contention that it is valuable to view GIS implementation as a process (it seems evident if one wishes to be more successful in implementing the systems, one will have to expand the factor view of system implementation).

This review also provides insights into methodological issues that are useful for directing and building future enquiry in the field. Little theoretical guides were found on how to construct a research framework and to measure or understand the system implementation process phenomena. At this point, it is still not clear *"What is there to measure?"* and this has led to the selection of the grounded theory approach as a prime methodology (to allow the encapsulation of the entire "picture" of the relevant components of the implementation process). This methodology is discussed in detail in the next chapter.

Chapter Six

Grounded Theory and Multiple Case Studies

6.0 Introduction

The first part of this chapter justifies why grounded theory and case study research was selected as the fundamental design for this research. There are descriptions of its rationale and strengths as well as its philosophical basis. The second part of this chapter describes the sampling decisions, the process of gaining access employing a theoretical sampling approach. The third part of this chapter consists of the strategies for data collection including the use of interviews, direct observations and archives. In the fourth part, the strategies are described for data analysis followed by a description of the procedures used in "evaluating the quality" of this research.

6.1 Justification for Combining Grounded Theory and Case Study Research as a Research Design

The chosen design was lead by several ongoing outcomes throughout this research. Firstly, it was due to the exploratory nature of this study (no prior studies were found on GIS implementation process in retailing). With no prior studies, there was little clarity of the variables to actually measure.

Secondly, the literature (see Chapter 4) examining the paradigms and weaknesses of the current approaches of GIS research showed a concentration on the factors and not on describing the issues faced throughout the implementation process. Conducting case studies enables the capturing of the required GIS implementation process "map" needed by implementation practitioners and researchers. Case study research allows a structuring and contrast in the data collected.

Grounded theory allows an "understanding" rather than "measurement" of the informants, the organisations, the unanticipated influences and phenomena (what influence their actions and the processes which had taken place), thus leading to the generation of the grounded theories.

The rationale of combining grounded theory and case study research is that there are good reasons for using both methods in the same study (Easterby-Smith, 1993). This approach prevents the research becoming method bound; in other words using a variety of approaches allows a flexibility to match the phenomena under investigation. The strength of almost every form of measurement is flawed in some way or other and therefore research designs can be offset by counterbalancing strengths from one to another[33]. Counterbalancing strengths can be done through triangulation that can be traced back to Campbell and Fisk (1959) who developed the idea of "multiple operationism". The design (methodological triangulation) provides several opportunities by allowing us to understand the particular "context" within which the informants act and the influence that this context has on their actions. As a result, an unanticipated phenomena and influences can be identified, thus generating new grounded theories[34]. This is the overall strength of the combined designs. In this case, the design is not an end in itself (the approach is to use different methods from the same paradigm whenever possible).

[33] The phenomenologist view of reality which is flexible, fluid and continually renegotiated.
[34] The process by which actions and events take place.

6.1.1 Philosophical Basis

One of the most significant issues in designing a qualitative study is how much attempt should be made to "prestructure" the methods. The pre-structuring of the initial protocol used in the in-depth interviews allowed a focus on the phenomena being studied to become apparent to informants and allowed for an "evolutionary" approach to understanding the GIS implementation process. The phenomenologist view of the world (see Table 6.1) is followed where "reality" is socially constructed by people. Hence the task of the social scientist should not be to gather facts and measure patterns but to appreciate the different constructions people place upon their experience.

Table 6.1 - Key Features of Phenomenological and Positivist Views (Easterby-Smith, *et al,* 1995)

	Phenomenologist	Positivist
Basic beliefs	• The world is socially constructed and subjective	• The world is external and objective
Researcher roles	• Focus on meanings • Try to understand what is happening • Look at the totality of the phenomena • Develop ideas through induction from information	• Focus on frequencies • Try to understand the causality • Reduce the phenomena to simplest elements • Formulate hypotheses and test them
Preferred methods	• Using triangulation of methods • Small samples	• Measuring concepts • Representativeness

6.1.2 Unit of Analysis

The unit of analysis becomes the key analytical element for the "case" being studied. A key challenge in constructing an acceptable case study research design is to ensure that the key questions of study are pertinent to the selected unit of analysis and if the questions do not coincide with the unit of analysis, the data collected may not answer them either. The unit of analysis for this study is a series of organisational and technical activities taking place over time, that is the entire GIS implementation process. When the system being implemented is complicated, the processes were divided into sub-processes or modules and these modules could be one candidate for an embedded unit of analysis. The conceptual framework for the case study follows the system "life cycle" in which project managers sequentially go through the following phases in developing and implementing GIS.

6.2 Sampling Decisions

> *"Designs vary of course, depending on the needs of multi-focus or single-focus case and process inquiries. Different sampling issues arise in each situation. These needs and issues also vary according to the paradigm being employed."*
>
> \- Denzin and Lincoln (1994, p. 201)

In this study, the basis employed in selecting the informants was based on Glaser and Strauss's concept of theoretical sampling (Glaser and Strauss, 1967) instead of using a quantitative sampling approach[35] (see Figure 6.1). The primary aim of this study is to produce the "GIS implementation process map" (representativeness of the study is a secondary aim).

The sample is not chosen on the basis of "a priori" basis (i.e., random) but inductively in line with the developing conceptual requirements of this study[36] while increasing the in-depth of focus rather than be simplified or ignored (Martin and Turner, 1986; Pettigrew, 1990; Orlikowski, 1993). This is a strategy in which 4 organisations were deliberately selected in order to provide the required data. As Strauss and Corbin (1990) noted,

> *"In the initial sampling, a researcher is interested in generating as many categories as possible, hence he or she gathers data on a wide range of pertinent areas. Later, the concentration is on development, density, and saturation of categories, here the data gathering is more focused on specific areas"* (p. 178).

The selection of grounded theory as an approach is also due to the fact that the phenomena studied, the GIS implementation process, is actually a new experience to the retailers (since this is a new technology, it is in its growth stage in retailing). Experiences gained in GIS implementation process i.e., what they have done with the data from the loyalty card, can be used "competitively" to win and to lead the market. Thus, this knowledge of GIS implementation process is "well kept" in the organisation which evidently a reason for difficulties in gaining access.

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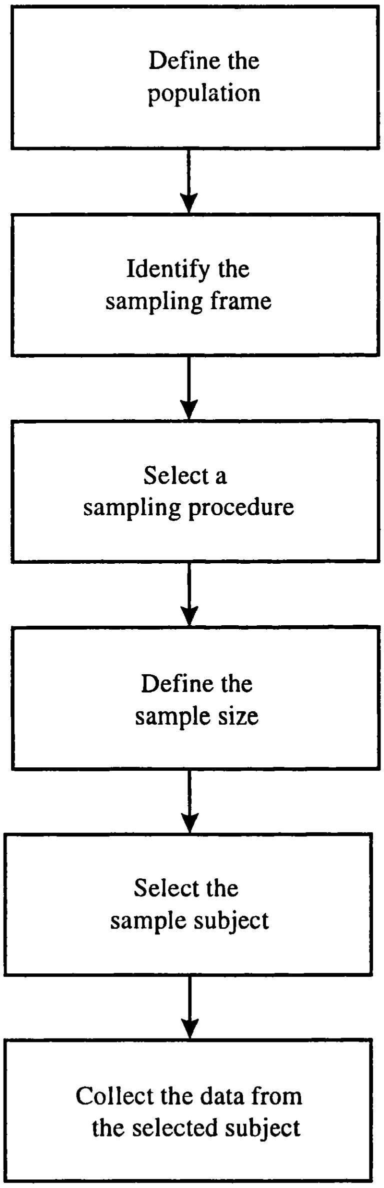
[35] Quantitative sampling approach is referred as the process of selecting a sufficient number of subjects from the population (Sekaran, 1992).

[36] Rigidity in sampling hinders theory generation which after all is not the main goal of grounded theory.

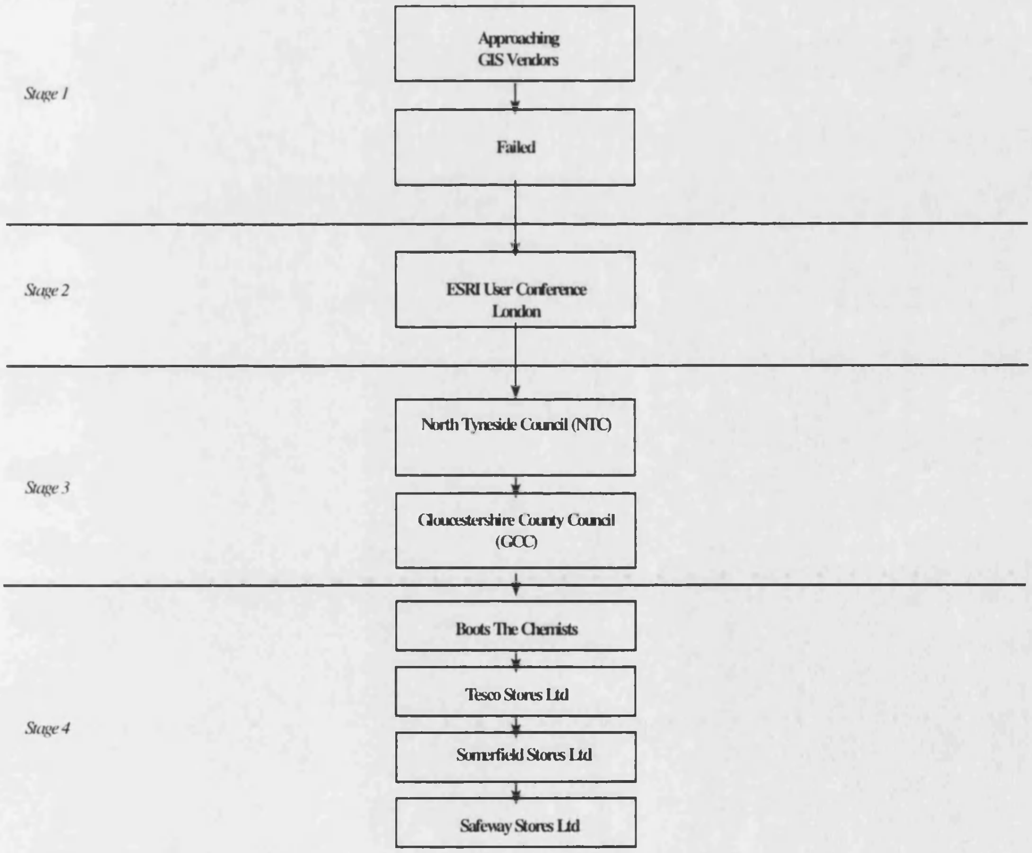
Figure 6.1 – A Quantitative Sampling Process (Churchill, 1995)



6.2.1 The Process of Gaining Access

As a result of the difficulties faced in defining the population, the samples are not wholly pre-specified but evolved once the fieldwork began. Figure 6.2 illustrates the sampling process.

Figure 6.2 - The Theoretical Sampling Process



Stage 1

The sampling process started through a promising meeting with two representatives from one of the leading GIS vendors in the market, who have many contacts with leading retailers. A series of follow-up calls were made through letters and telephones but unfortunately no feedback was received (this went on for around three months). It was decided not to continue waiting any longer and to develop other means of approaching the informants.

Stage 2

Fortunately, there was a GIS user conference organised by the Environmental Systems Research Institute (ESRI) which was held in London. This conference gave the opportunity of "lobbying" the attendees on the nature of this study. After approaching a few people with a short briefing (who were identified from the conference list), a follow-up on-site meeting was agreed with a GIS expert in North Tyneside Council (NTC), Newcastle.

Stage 3

Following the agreement, issues and topics required for the interview were developed, focusing on GIS implementation process in UK local councils. A set of topics was sent to Newcastle in advance, giving the GIS officer time to prepare for the interview. Thus, the first pilot in-depth interviews could commence. This opportunity allowed a test of knowledge and methods of eliciting data which had been pre-specified to some extent (although this organisation is considered an "infant" in GIS implementation, based on the years of involvement in GIS), nevertheless, the data supplied was more than sufficient in terms of developing a means to access organisations and understanding the issues involved in GIS implementation process.

At the end of the session in North Tyneside, reference was made to another GIS expert in Gloucester County Council (GCC). GCC was approached through the same process used to approach NTC. A speedy response was received from the IS manager (he asked for an appointment!). This was quickly followed-up and a set of topics was sent to Gloucester in advance to let the IS manager prepare for the interview. A lot of insights were shared with the IS manager throughout the interview (he was involved with GIS implementation in GCC for around five years). Although, the pilot study placed no great weight on internal or external validity. It was more on testing the topics, developing questions and building up interviewing skills.

Stage 4

By stage four, it was still proving difficult to gain the access into any retail organisations that had coped with GIS implementation. It was very difficult to approach the right GIS implementation candidate for interview. Fortunately, after a prolonged search using the world wide web, a membership list of individuals belonging to Intergraph, one of the leading GIS vendors in the market was uncovered. The names of individuals who were members were sent a brief introductory letter on the research topic, trying to persuade them to agree to meeting. As a result, three major retailers come forward, expressing their willingness to co-operate further into the research. The companies were, Boots The Chemist, Tesco Stores Limited and Safeway Stores Limited. The first in-depth interview started with Boots, followed by Tesco and Safeway. Prior to the interviews, a set of topics was sent to the managers in advance, letting them to prepare for the interview. Realising the difficulties faced in gaining access, the School of Management helped out by contacting Somerfield Stores Limited. The School of Management has an established long relationship with Somerfield.

Most of the interviews were on a one to one basis except with Safeway Stores Limited where a group interview was performed. The interviews were useful in testing out the procedures and my skills (restructuring and rephrasing questions). The questions were open-ended and each unexpected answer was incorporated into a new question for the next interview. Thus it became an evolutionary, on-going process. The advantages of unexpected insights provided by them were capitalised upon through this approach.

Choices of informants and interactions were also driven by the intention to expose any of the similarities and dissimilarities, providing the opportunity for comparing and understanding key relationships in the setting in which Miles and Huberman (1994) termed this approach as, “conceptual-driven sequential sampling”. The rationale of meeting those GIS experts is explained in Chapter Seven.

6.3 Strategies for Data Collection

Triangulation of methods in data collection was to maximise the quality of data collected. Three prime data collection instruments were used concurrently. As each method "unfolded" insights were used, allowing additional focus and points to be explored. In other words, the three methods were mutually supportive.

6.3.1 In-depth Interviews

In-depth interviews were the most significant source of data in this study. Face to face interviews were used because of the three prime advantages; 1) They allowed "control" over the questions, 2) They allowed informants time to reflect and thus furnish the historical data needed and 3) The time allocated allowed the informants to describe their experience and share their insights in their own language. The logic and the flow of idea that lay behind their actions could be understood. As a result, rapport could be built with the informants (a considerable level of empathy was developed). A guide proposed by Michael Q. Patton (1980) was used as guidance for conducting the exercise. The informants were asked about distinct facts and their opinions on a number of topics. They were also asked to propose their insights into certain events or occurrences. Such propositions were used as the basis for further inquiry. All interviews were tape-recorded and the relevant portion of the tape was transcribed in full[37].

6.3.2 Direct Observations

Direct observations were used to supplement the in-depth interviews (helping to shape the questions), not only to examine the same phenomena but also to enrich understanding. It allowed the "underlying" dimensions of the research to emerge. It also contributed to greater confidence in the data analysis, thus the generalisability of results. Direct observations were made without any participation. The intent was to "illustrate" issues that may be uncomfortable for the informants to discuss, e.g., the sophistication and thoroughness of the applications developed.

[37] Note-taking is found to be necessary in serving as a back-up in the case of tape-recording failure. It will also act as preliminary index to the tape-recording itself (Brown, 1990).

6.3.3 Archives and Documents

For case studies, the most significant use of archives and documents was to corroborate and augment evidence from other sources. Archives and documents are also helpful in providing other specific details to corroborate data from other sources, i.e., if the documentary evidence was contradictory rather than corroboratory, the researcher had specific reason to inquire further into the topic. Moreover, archives and documents were helpful in verifying the correct spellings that might have been mentioned in the interview. Because of its overall value, archives and documents played an explicit role in the data collection of qualitative case studies.

6.4 Strategies for Data Analysis

How would one interpret a text? In grounded theory approach to data analysis, where the nature of the study is exploratory, the structure for data analysis is derived from the data. As Jones (1987, p. 25) noted,

> *"Grounded theory works because rather than forcing data within logico-deductively derived assumptions and categories, research should be used to generate grounded theory which "fits" and "works" because it is derived from the concepts and categories used by social actors themselves to interpret and organise their worlds."*

The strategy was to develop a descriptive framework for organising the theory. Clearly, the framework helped to focus attention on certain data and to ignore other data. As Easterby-Smith (1993) noted,

> *"Grounded theory provides a more open approach to data analysis which is particularly good for dealing with transcripts. It recognises that the large amounts of non-standard data produced by qualitative studies makes data analysis problematic."*

The data was most visible in tape recordings of the in-depth interviews. These tape recordings were transcribed and the process of transcribing allowed the data to be rearranged, easing the data analysis process. Working carefully with interview transcripts and continuous readings of the source materials allowed informants' insights to be captured. The findings will be presented in Chapter Eight according to the case study research proposed by Yin (1994). For the data analysis, two modes used were;

- Within-case analysis (is a descriptive analysis of the particularised experience of the case itself) and
- Cross-case analysis (is a comparative analysis of all cases in the "sample")

6.5 Measuring the Quality of the Research

> *"Because a research design is supposed to represent a logical set of statements, you can also judge the quality of any given design according to certain logical tests"*
>
> \- Yin (1994, p. 33)

Four common tests are used (Yin, 1994), to examine the quality of research data. Table 6.2 lists the four recommended tests of case study tactics (cross-referenced to the phase of research when the tactic is to be used).

Table 6.2 - Case Study Tactics

Tests	Case study tactics	Phase of research in which tactic occurs
Reliability	• use case study protocol	• data collection
Construct validity	• use multiple sources of evidence • establish chain of evidence • have key informants to review draft case study report	• data collection • data collection • composition
Internal validity	• do pattern-matching • do explanation-building	• data analysis • data analysis
External validity	• use replication logic in multiple case studies • feeding back the findings to informants	• research design • composition

6.5.1 Reliability

Reliability is a matter of stability (Easterby-Smith, *et al,* 1995). The test deals with the problem of ensuring whether if a later researcher followed exactly the same procedures as described by an earlier researcher and conducted the same all over again, the later researcher should arrive at the same findings and conclusions. One prerequisite for allowing another researcher to repeat an earlier case study is the need to document the procedures followed in the earlier case through the use of a case study protocol. The general way of approaching the reliability problem is to make as many steps as operational as possible and to conduct research as if someone were always looking over your shoulder. As Yin (1994) noted,

> *"For case studies, a significant revelation is that the several tactics to be used in dealing with these tests should be applied throughout the subsequent conduct of the case study, and not just at the beginning. In this sense, "design work" actually continues beyond the initial design plans"*

6.5.2 Construct Validity

As Table 6.2 shows, three tactics for doing case studies, are available to increase construct validity. The first is the use of multiple sources of data, in a manner encouraging convergent lines of inquiry and this tactic is relevant during data collection. The second is the use of a chain of evidence and this tactic was also relevant during data collection. While the third is to have the draft case study report reviewed by the informants. Yin (1994) noted,

> *"People who have been critical of case studies often point to the fact that a case study researcher fails to develop a sufficiently operational set of measures and that "subjective" judgements are used to collect the data"*

6.5.3 Internal Validity

Internal validity had been given the greatest attention in experimental and quasi-experimental research (Campbell and Stanley, 1966; Cook and Campbell, 1979). "Internal generalisability" (Maxwell, 1994) is clearly a key issue for qualitative case studies. The descriptive, interpretative and theoretical validity of the conclusions are all depend on their internal generalisability to the case as a whole. For case study research, the concern over internal validity may be extended to the broader problem of making inferences. To regard the research as valid, feedback was used.

a) Feedback

Feeding back findings to informants is considered as, "phenomenological validity" (Bronfenbrenner, 1976)[38]. It requires the informant to comment on the findings or on the case as a whole. However, the delicate issue is that of introducing bias (researcher's bias). Feeding back findings in the course of a research may change informants' behaviour (they are no longer comfortable discussing the issues in the next visit or react oppositely). As a result, it was decided to lessen the hazard by conducting the feeding back by talking to other informants.

6.5.4 External Validity

"External generalisability" (Maxwell, 1994) is not a crucial issue for qualitative case studies. As Maxwell (1994) noted,

> *"Indeed, the value of a qualitative study may depend on its lack of external generalisability, in the sense of being representative of a larger population..."* (p. 97).

The test deals with the problem of knowing whether a study's findings are generalisable beyond the immediate case study. For some researchers, this problem has been a major barrier in doing case studies. Critics typically state that single case offers a poor basis for generalising. However, such critics are implicitly contrasting the situation to survey research, in which a "sample" (if selected correctly) readily generalises to a larger universe. This analogy to samples is incorrect when dealing with case studies. This is because survey research relies on statistical generalisation, whereas case studies rely on analytical generalisation.

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[38] The quality of the data could be assessed through this tactic.

In analytical generalisation, the researcher is striving to generalise a particular set of results to some broader theory.

This study utilises theoretical rather than probability sampling. This does not mean that qualitative case studies are never generalisable beyond the setting or individuals studied. Literatures on local authorities or other developed areas of GIS implementation (most of them are originated from a single case study) and the pilot studies which had been conducted are two precise evidences towards this issue. As Yin (1994) have noted, external generalisability is based not on explicit sampling of a defined population to which the results can be extended but on the development of theory to which the results can be extended to other cases. Below is a list of features that lend plausibility to generalisation from qualitative case studies (Hammersley and Atkinson, 1983);

- Informants own assessments of generalisability
- Similarity of dynamics and constraints to other settings
- The presumed depth or universality of the phenomena studied
- Corroboration from other studies

These features provide credibility to generalisation from qualitative case studies but none permit the precise extrapolation of results to a defined population that probability sampling allows. One approach used in validating this study externally was to test the ideas of GIS implementation process gained from the

UK retailers (such as, the applicability of the technology) to the Malaysian retailers. As a result, two Malaysian retailers were selected for this purpose.

6.5.5 Dealing with the Validity Threats

a) Bias

Two significant threats to the validity of qualitative conclusions are the selection of data that fit researcher's existing theory and preconceptions and the selection of data that "stand out" to the researcher (Miles and Huberman, 1994). However, it is clearly impossible to deal with these problems by eliminating the researcher's theories, and preconceptions. It is the researcher's responsibility to explain how he deals with possible biases in this thesis. Validity in qualitative research is not the result of indifference but of integrity.

b) Reactivity

The influence of the researcher on the organisations or individual studies, known as reactivity, is a second threat that is often raised on qualitative research. In most quantitative studies, the approach is trying to control the effect of the researcher (is appropriate to a variance theory perspective, in which the goal is to prevent researcher variability from being an unwanted cause of variability in the outcome variables). However, it is clearly impossible to deal with these problems by eliminating the actual influence of the researcher. The aim in qualitative research is not to eliminate this but to understand it and to use it productively. This is because reactivity in interviews is a powerful and inescapable influence, what the informant says is always a function of the interviewer (more undesirable consequences could be prevented by avoiding leading questions).

What is significant is to understand how the researcher influences what the informant says and how this affects the validity of the inferences that can be drawn from the interview. Although methods do not guarantee validity, they are nonetheless essential to the process of ruling out validity threats and increasing the credibility of conclusions. The strategies that were utilised for this purpose are listed in Table 6.3. The overall point to make about these strategies is that they primarily operate not by verifying conclusions but by testing the validity of conclusions and the existence of potential threats to those conclusions. The fundamental process in all of these tests is trying to find evidence that challenges conclusions or that makes the potential threat implausible. There are two modes of strategies that had been used in this study. It is used to ensure that biases are kept at minimum (see Table 6.3).

Table 6.3 - Strategies Used to Reduce Bias

Description	Strategy
The data had been collected from a diverse range of organisations, from the high performers of the market to the marginal performers of the market and individuals, from business director to business analyst through interviews, direct observations and archives. The aim was to reduce the risk of chance associations due to a specific method and allows a better assessment of the generality of explanations.	**Triangulation**
Soliciting feedback from both the organisations and the individuals was the strategy used to identify the threats of researcher's biases, assumptions, and flaws in logic or methods. This is consistent with the philosophy underlying triangulation.	**Feedback**

6.6 Conclusions

Although there are many choices of research design available, a combination of methods, grounded theory and case study research was seen to be the most appropriate design in achieving the research aims. In this chapter, we have discussed the reasons underlying the approach to this study including its implications (advantages and limitations). Many attempts had been made to approach the potential informants, prior to the selection of this approach to maximise the amount and quality of the data collected, such as by following a quantitative sampling process like randomisation, defining the population and identifying the sampling frame but unfortunately, due to the crucial nature of the inquiries, quantitative approaches seem to be unrealistic and were proven impossible. An overview of the strategies to capture the data, the strategies to analyse the data and the strategies to verify the data have also been presented and as stressed earlier in this chapter, grounded theory suits the nature of this research due to its flexibility in its design, allowing the generation of the theories and sampling decisions on an on-going basis. The politics of research are complex. As Easterby-Smith, *et al,* (1995) noted,

> *"Along the road of qualitative research there are also many dilemmas. There is the problem of public access to private experiences, and the difficulty of deciding how and when to impose any interpretive frameworks on this. There is the question of how accurate one's information is, and how "accurate" it needs to be, or can be. And there is the continual*

tension underneath the research process between creating meanings and counting frequencies" (p. 115).

I guess I felt the same. I found it so hard to find the "willing" site that is, one in which I can conduct interviews and make observations (the key hurdle was in gaining the managers' permissions to access their organisations). How to create good research designs remains an "art" that most researchers improve on throughout their entire careers. In developing this "art", the results of the pilot studies conducted in North Tyneside Council and Gloucestershire County Council are presented in the next chapter.

Chapter Seven

The Pilot Studies

7.0 Introduction

The difficulties faced in gaining access into retailers who are employing GIS were one of the key reasons for pilot studies. There were so few retailers with whom case studies could be developed. It was also vital that when access was gained, it was not wasted by having an approach that did not work. The prime purpose of the pilot studies was to improve the quality of research experience in those researchers with whom access was afforded. Two pilot interviews were conducted with key GIS specialists from two local government authorities; 1) North Tyneside Council (NTC) and 2) Gloucestershire County Council (GCC). These contacts resulted from, as a result of a prior agreement with Mrs. Anderson from NTC during a conference held in London.

This chapter is divided into three key parts. The first part of this chapter presents the roles and significance of these two interviews. In broad terms, pilot interviews explored the issues discussed in the literature and the informants' personal experience associated with GIS implementation process in their organisations. The second part of this chapter presents the outcomes (key themes) from these interviews which emerged from the differences that exist within both councils in which comparisons of approaches used in GIS implementation process had been made. Finally, rationales for selecting a key theme (GIS implementation process), in which a research conceptual framework is constructed and bringing it forward as a key primary data collection issue is presented in the third part of this chapter.

7.1 The Significance of the Pilot Studies

Whilst helping to improve the research experience in retailing, pilot studies helped the research process in other ways. Pilot studies support the "pre-mature" knowledge established during the literature review. In other words, it allows an exploration of the sometimes-conflicting ideas in the literature. It also develops and strengthens the interview "skills" on the part of the researcher. The key criterion of selecting the samples was made by prior personal contact. Pilot interviews with two key informants and a brief period of observation assisted the research process in several ways;

First, it helped in refining the data collection plans with respect to the overall structure of the research design and the content of the questions as well as the procedures to be followed.

Second, it helped in clarifying the theoretical framework of the study by allowing a focus on several key issues that may have been unclear previously, e.g., to uncover several key issues which previously was not apparent. By viewing the pilot process as being exploratory, these pilot cases provided valuable insights into the fundamental issues being studied. This data was used in parallel with the ongoing review of DSS/GIS implementation literature, so that the final research design was informed both by prevailing theories and by a fresh set of empirical observations. The dual sources of data helped to ensure that the intended study reflected theoretical issues as well as questions relevant to contemporary cases (it was a testing experience).

Third, the pilot studies act as "laboratory", allowing observations of different phenomena from different angles (testing of knowledge) and to try different approaches on a trial basis, covering both methodological and substantive issues through the employment of an open ended approach or through "less structured" interviews (the issues discussed in the interviews were kept broader and less focussed and each unexpected answer was incorporated into a new question at the next interview)[39].

[39] Various methodological procedures of social interactions were tried and the variations and trade-offs of these trial procedures were acknowledge. As a result, a satisfactory procedures were developed for the primary data collection stage.

Fourth, the interviews allowed a development of rapport with the informants that helped to build confidence, to identify new leads and established effective communication patterns.

7.2 Pilot Study Informants

As described in the previous chapter, "samples" examined were pre-specified but evolved once the data collection activities began (see Figure 6.2 for greater descriptions).

The first pilot in-depth interview was with a GIS officer in North Tyneside Council (NTC), Newcastle. NTC was still in its introductory stage of the system implementation. GIS implementation was introduced three years ago (1995) by a team of senior officials drawn largely from the Information Technology Department (ITD). Most of the issues evolved were rather technical than organisationally oriented, e.g., system development tasks such as database design, data collection and conversion, applications designs and networking design and development. Some of the users were "still" suspicious of the system. The resistance to change was clear. It was due to the non-existence of any immediate tangible benefits offered by the system. They were in the process of tailoring their jobs according towards the system. The second pilot in-depth interview was with

IS manager of Gloucestershire County Council (GCC), Gloucester (in which reference was made by the informant in NTC). Unlike NTC, GCC was in its maturity stage of the system implementation (the system was still growing but at a decreasing rate). Most of the issues evolved were no longer technical but was oriented towards organisational aspects of the implementation (although the technical issues are continuous, e.g., data maintenance and application standardisation). Most of the users were more involved and used to the system. GIS was perceived as part of the "nerves" of their daily jobs (it was impossible to perform any job without GIS). GCC has successfully established the "interest" in the heart of its users after five years of enduring efforts.

7.3 Issues Discussed in the Interviews

As described earlier in this chapter, the key aim in conducting these studies was to further understand the GIS implementation process. As a start, a broad set of key implementation issues (data, organisational and users issues) were sent in advance to both NTC and GCC, as a guideline, letting the informants prepare for the interview. Table 7.1 further summarises the issues discussed with both the informants.

Table 7.1 - A Summary of the Issues Discussed with Both Informants

Issues Discussed	North Tyneside Council (NTC)	Gloucestershire County Council (GCC)
Database Management Systems (DBMS) related		
Data collection process	**	X
Data entry process	**	X
Data conversion process	**	*
Standardisation process (Quality control, e.g., minimising errors)	**	*
• Data	*	X
• Applications	*	X
• User-interface	*	*
Documentation process	**	X
Maintaining and updating process	**	*
• Data	**	*
• System	**	*
External data issues	*	*
• OS Maps	*	*
• Neighbouring data	*	*
Organisational related		
System development life-cycle	*	**
Project management	*	**
• Implementation planning and objective	*	**
• Implementation strategy	*	**
• Requirement analysis	**	**
Training Management	*	*
• Plans	*	*
• Types of training	*	*
Management Support	**	**
• Types of support	**	**
• Level of support	**	**
• Resistance to change	**	**
User related		
User involvement	**	**
• Level of involvement	**	**
• Applications development	**	**
• User-developer relationship	**	*
• User feedback (e.g., in system benefit)	**	**
Others		
Hardware and software	*	**
• Evaluation process	X	**
• Procurement process	*	**
Networking management		
• LAN and WAN design and development	X	*
• Performance	*	**
Vendor management	*	**
• Vendor-client relationships	*	**

Legend; * - Mentioned by informant, ** - Mentioned in detail by informant, X - Nothing mentioned by informant

7.4 Emerging Themes from the Interviews

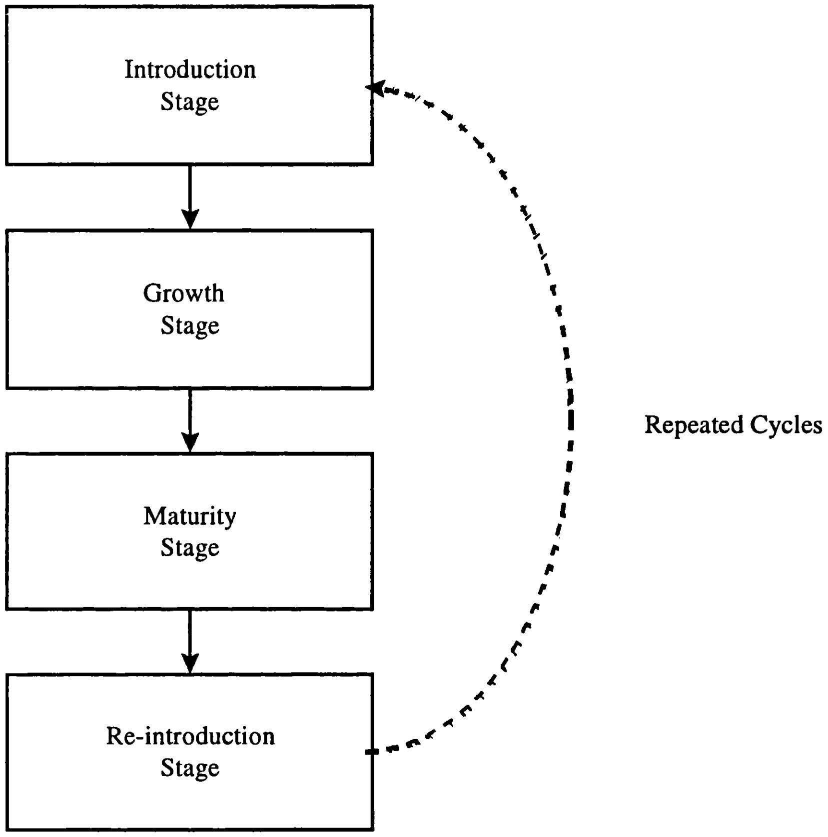
Many interesting issues of GIS implementation process were discussed in both interviews. In broad terms, these issues can be categorised into four key categories;

- Database Management Systems (DBMS) issues
- Organisational related issues
- User related issues
- Other issues

These four key categories were guided by[40] the GIS Development Life Cycle (GDLC). There are many different approaches in bringing about the implementation of new technology (Schein, 1969). A GIS development life cycle (GDLC) is an evolutionary process. A general agreement was found among the informants that the system life cycle was an accurate description of the implementation tasks that must be accomplished. Regardless of the magnitude of each issue (factors and processes), they are significant towards successful GIS implementation. Both interviews revealed that a GIS development life cycle is similar to that of a product life cycle (see Figure 7.1).

[40] The significance of understanding these issues (DBMS, organisational related and user related issues) lies in which GIS implementation stage an organisation is in.

Figure 7.1 - GIS Development Life Cycle (GDLC)



In every stage lies their implementation sub-stage (the underlying factor or process is it's building blocks). For example, in the introduction stage of the development, NTC was concentrated more on the development issues (e.g., database design, data collection) whereas GCC, which was in its maturity stage, concentrates more towards the maintenance issues (e.g., database maintenance).

7.4.1 Organisational and Technical Orientation

The issues in these interviews could be categorised into two key categories; 1) Organisational (e.g., management support and user involvement) and 2) Technical (e.g., database design). The ability to develop a technically elegant and sophisticated system far surpasses the ability to provide managers with useful, workable solutions to the organisational problems. Organisational issues appeared to be more influential in constructing GIS implementation than any other issues. The GIS implementation process is perhaps the key obstacle to installing a GIS in an organisation. This is inline with Campbell's (1992) findings which reported that issues will change during GIS implementation process, initially centring around technical issues, e.g., database design and as progress continues, the issues will become more organisational in nature.

7.5 Choice Among the Emerging Themes and Its Rationale

The findings raised a series of technical and organisational issues. They revealed that more attention should be given to the organisational aspects of the implementation. In the final part of the first interview, the GIS officer noted,

> *"... definitely the social problems, the technical problems are difficult but someone has done it somewhere else exactly the same way, someone who can get you base knowledge. You can bring up a different copy and see how you do this, how did you do that but social problems... they are more individual."*

These findings are in parallel with Onsrud, *et al,* (1991) and Campbell (1992) studies on successful GIS implementation projects in the USA and Kraemer, *et al,* (1989) study on GIS in general. However, if a decision is made to select one or more of these issues for further investigation, a major disadvantage lies in being able to capture the entire "map" of the process of implementation.

The GIS implementation process consists of a set of concepts (technical and organisational) for organising data. The "map" of GIS implementation process can only be captured by not leaving out any of these driving forces. Key to the implementation process framework is a set of guideline or principles that provide a basis for setting aims and monitoring progress. The aim of this study is to understand the logical sequence of the implementation process. It is only going to be achieved by not discarding any of the activities and issues (mentioned by the informants).

7.6 Conclusions

Many issues discussed in the pilot cases led to the emergence of themes underlying the phenomena studied and proved to be fruitful. They also provided a significant source to test emerging ideas from the literature and interviewing and observation skills. The "knowledge" offered by these informants was more than sufficient to prepare for the "basics" of GIS implementation process issues and the required skills to conduct the primary case studies (although the intended setting for the actual primary data collection stage was going to be on retailing). An understanding of the entire GIS implementation process was needed to generate a "working" or "successful" system.

The findings, available from these interviews can also be used in substantiating the findings of the later case studies, resulting a more credible development of constructs, needed in generating the intended grounded GIS implementation process theory. The focus now was to apply the chosen themes in the data collection stage with retailers. No particular factors of GIS implementation process would be given more attention than another. Better understanding of the issues discussed in the DSS/GIS implementation process literature was achieved through the examples provided by both informants from the interview. For example, in the second interview, more attention was given to the issues (meaning of the phenomena) stressed in the first interview, e.g., senior management support and user involvement issues. The rationale of this action was to better understand the meaning of the phenomena discussed. In the next chapter, a thorough description on GIS implementation process in four UK retail organisations will be presented.

Chapter Eight

GEOGRAPHICAL INFORMATION SYSTEMS (GIS) IMPLEMENTATION PROCESS CASE STUDIES

8.0 Introduction

This chapter presents four case studies of UK retail organisations; 1) Tesco Stores Limited, 2) Somerfield Stores Limited, 3) Safeway Stores Limited and 4) Boots the Chemists. These organisations were chosen due to their willingness in sharing their extensive experiences in and developing and implementing the GIS. All of the retailers were directly engaged in the implementation and three of them were using a network-based GIS. By the time of this study (1997), GIS was used in a variety of applications including site selection decisions. Three time stages of GIS implementation activities (activities prior to the implementation, activities during the implementation and activities after the implementation) were utilised to back up the structure of each case studies as well as to answer the proposed research questions set in previously, "How do the retailers go about implementing the system in their organisation?" A focus was given to the department that dealt primarily with site selection decisions, due to the fact that these departments played key roles in implementing the system. The aim of this chapter is to develop an extensive description of GIS implementation process that will form a key part in the overall “picture” of UK retailers’ GIS implementation practices.

CASE 1

TESCO STORES LIMITED

8.1.1 Background of the Company

Tesco was officially founded by John Edward Cohen in 1931. The name Tesco was originated from a brand of tea Cohen sold. It was created from the initials T. E. Stockwell, a merchant from whom he bought the tea and the first two letters of his last name. Tesco rapidly grew from 1932-1940, as Cohen opened more than 100 small stores, mainly in London. In 1935, Cohen "brought back" a self-service supermarket concept from the United States (after he visited several leading American suppliers) but was temporarily thwarted by World War 2. In 1947, Tesco opened its first self-service store in St. Albans, Hertfordshire. Although the store was closed in 1948 (after falling to capture the interest of British shoppers), it was reopened in 1949 one year later to a much warmer reception. In the same year, Tesco also offered its first shares to the public.

In 1956, Tesco opened its first supermarket in Essex to carry fresh food in addition to its traditional products. In 1968, a first 40,000 square-foot superstore was opened in Sussex (the term superstore was referred not only to the store's size but also to its huge selection of inexpensive food and non-food products). Nearly

900 stores were operated by Tesco in 1976, on a "pile it high, sell it cheap" concept which again Cohen brought from the United States. Tesco's management found that the effectiveness of this strategy deteriorated over time, leaving the organisation with uncomfortably small margins and a serious image problem amongst its customers. Whilst Tesco was preoccupied with opening as many stores as possible and loading them with merchandise, it missed significant signs that its market was changing and had come to value merchandise quality. Most of the stores were cramped and difficult to operate, customer service was poor and the selection of merchandise in most of the stores was limited. In responding to its image, Tesco embarked on a massive modernisation programme. A significant investment was made not only in improving the physical appearance of its stores but also in improving the merchandise quality that customers wanted.

Superstores were seen as a way to generate higher volume of business at greater margins, so by the late 1970s, Tesco closed 500 unprofitable stores and extensively upgraded the rest. The superstore concept was pursued more aggressively than it was in the past in order to compete successfully with other leading food retailers. The size of superstores grew from an average of 25,000 square feet to 65,000 square feet. A heavy emphasis was placed on having a wide selection of fresh, high quality foods as well as a wide range of general merchandise such as household products. Moreover, in order to support these stores with their new high quality foods and the service oriented image, Tesco introduced its own private label product lines[41], developed through an extensive research and development programme. Tesco has also restructured its distribution system by opening its centralised warehouses for storing inventory that could be supplied to its stores as needed, instead of having to rely on manufacturer's delivery schedules. In 1983, Tesco changed its name to Tesco PLC. In the following year, Tesco linked forces with Marks and Spencer, the upscale British departmental store to develop shopping centres in areas outside the country's major cities. The first link was established in Cheshunt, with a 65,000 square foot Tesco superstore next to a 69,000 square foot Marks and Spencer store.

In 1989, Tesco had become one of the UK's top three food retailers and continued aggressively compete for the industry's leadership position. In 1991, Tesco has started its first Sunday trading to further strengthen its grasp in the market. In 1995, Tesco outperformed the sales and market share of its major rival Sainsbury's. Table 8.1 summarises Tesco's grocery market share performance for 1993-97.

[41] Tesco's own label penetration of the food market has grown by at least 1% a year since the late 1970s, with an acceleration in the past five years (Mintel, 1997). Tesco has stated its intention to develop its own label penetration through its own label offer. Tesco is expected to be aiming at an own label penetration at around 50%, in order to retain diversity of merchandise and customer choice.

8.1.1.a) Competition and Market Share

Major food retailers make up the bulk of Tesco's competitors. In 1995, Tesco had a marginally greater market share than its major rival Sainsbury's. Although Tesco's profits remained lower than those of it's competitor Sainsbury's. Tesco also had a larger sales area than that of any other UK food retailer. This area exceeded Sainsbury's total by 2 million square feet.

Table 8.1 - Grocery Market Share Performance (1993-1997)

Food Retailers	**1993** (%)	**1994** (%)	**1995** (%)	**1996** (%)	**1997** (%)
Tesco	**18.7**	**19.3**	**21.8**	**22.5**	**23.6**
J. Sainsbury	21.6	22.0	21.1	20.7	19.6
Asda	10.5	10.9	11.7	12.8	13.5
Safeway	9.1	9.2	9.6	10.3	10.8
Kwik Save	7.2	6.9	6.6	6.5	5.8
Somerfield	4.6	4.8	4.5	4.5	4.5
Wm Morrison	3.3	3.6	4.0	4.2	4.0
Iceland	3.3	3.4	3.2	2.9	3.0
Waitrose	1.5	1.4	1.6	1.6	1.6

Source: *Taylor Nelson Sofres/Mintel, 1998.*

8.1.1.b) Tesco's Store Development and Store Format

Out of town stores have proved to be a successful format, however, there has been a change in government planning policy, in which the government has sought to discourage shoppers driving to stores in order to reduce vehicle emissions[42]. Tesco reacted to this by continuing to develop different store formats to suit different customer needs. For example, in 1996, Tesco opened 29 new stores that included 10 superstores, 11 neighbourhood stores (store of less than 26,500 square feet), 2 metro stores and 6 express stores[43].

The four types of stores designed and operated by Tesco to meet the customer's needs were;

- *Superstore;* A format that carries a full Tesco ranges of merchandise and targets the one-stop customers.
- *Neighbourhood store;* A format that is situated at the edge of town, designs to offer the range of Tesco superstore merchandise and services on a smaller scale.
- *Metro store;* A format which is situated in prime high street areas, design to offer a range of merchandise to attract town centre customers.
- *Express store;* A format that combines a petrol forecourt and a convenience store stocking a range of 1,400 products.

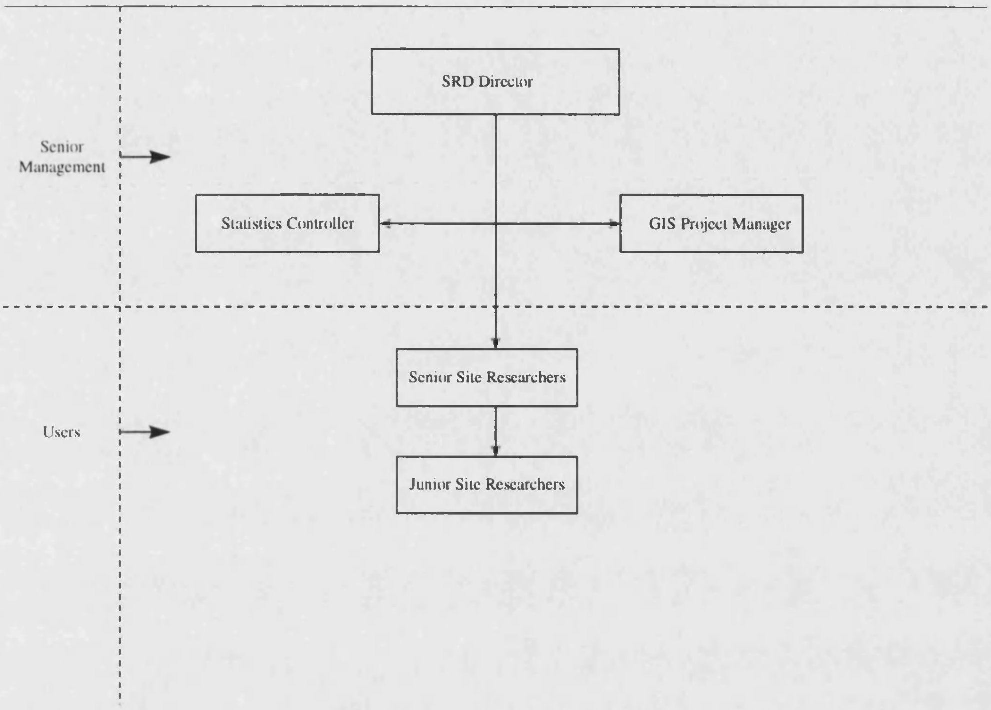
[42] This has resulted in local councils discriminating against the opening of new stores at the edge of towns where people usually prefer to shop.

8.1.1.c) The Importance of Site Selection Decisions in Tesco's Success and the Role of Site Research Department (SRD)

Over the years, Tesco's senior management has realised the importance of site selection decisions as part of their success story. As a result, the Site Research Department (SRD) was established in the early 1980s to formulate site research and sales forecasting models for its stores. At the time of this study, there were about 25 site researchers (including three managers) working as main users of the system. Figure 8.1 illustrates the organisational structure of the SRD.

[43] It is still possible but difficult to negotiate planning permissions for suitable sites with local authorities who want to stop bulk shopping taking place outside their local communities.

Figure 8.1 - SRD's Organisational Structure



The key function of the SRD was to advise Tesco on where should it profitably invest in new sites. In describing the importance of his department, a GIS Project Manager stated,

> *"We are a department that is in a central position for deciding how we spend between half a billion and a billion pounds a year for new stores."*

Averages of 25 major investment decisions were made every year on site selection decisions for new stores.

8.1.2 GIS Implementation Process at Tesco

Prior to the implementation of GIS, a lot of time was spent by SRD senior managers, manually evaluating Tesco's potential sites and their catchments through the overlaying of the available spatial information, i.e., Ordnance Survey maps. SRD also relied on its UNIX-based programming to further simulate its models[44]. This "traditional" approach to site selection decisions inherited four significant problems;

- The external (e.g., National Shoppers' Survey) and internal (e.g., EPOS) data sets were somewhat in disarray (as the amount of both sources data increased, so did the difficulties of storing and analysing the data).
- Site selection models were getting more sophisticated (see Chapter 2), as the number of variables needed to be considered were significantly increasing. In the race for sites that were available, site selection decisions had to be made more quickly[45].
- The outputs of site selection models were non-graphical. To graphically represent and analyse potential sites, SRD had to manually place different colour pins on paper-based maps (i.e., Ordnance Survey maps). As the GIS Project Manager described,

---

[44] UNIX-based programming was well entrenched in the department, in use in its site research and sales forecasting models.
[45] Tesco only allow itself five working days to produce a sales forecast model for a new site.

"So you have to get four Ordnance Survey maps, cut them up altogether and then get some sticky dots from WH Smith, put those on for store locations and competitors, write on them and that was a half day job for every forecast that we did."

- The internal pressure to lead the market (one of the company's aims) forced SRD to shorten the site selection process (the traditional approach of site selection decision process was somewhat very deliberate), thus increasing the overall SRD's working efficiency

Meanwhile, an increasing number of retailers were turning their attention towards GIS in their trading area analyses to help cope with intensifying competition. The proliferation of GIS (which were indicated by the large number of vendors available, for example, CACI, CCN Marketing, Pinpoint to name some but a few, also contributed to a decision to acquire a GIS. Table 8.2 summarises the internal and external forces that led Tesco to decide to acquire a GIS.

Table 8.2 - Tesco's External and Internal Forces of GIS Implementation

Internal Forces	External Forces
• Disorderly managed and increasing amount of data sets • Increased sophistication of site selection models • Non-graphical site selection models outcomes • Internal pressure to lead the market	• Intensification of competition • World-wide retailer's attention towards GIS • Increasing amount of GIS data and vendors

As a result of both sets of the forces, SRD decided to concentrate on installing a GIS, the latest developed system in spatial analysis. The idea to install GIS for site research and sales forecasting modelling was originated in1980 by Dr. Nick Penny (the SRD's head who was seen as the key advocate of the GIS). The system was first applied by SRD as a means of taking some of the risk out major investment decisions as the company sought growth through new stores. A GIS implementation "vision" was also established prior to the implementation of the system. As the GIS Project Manager described,

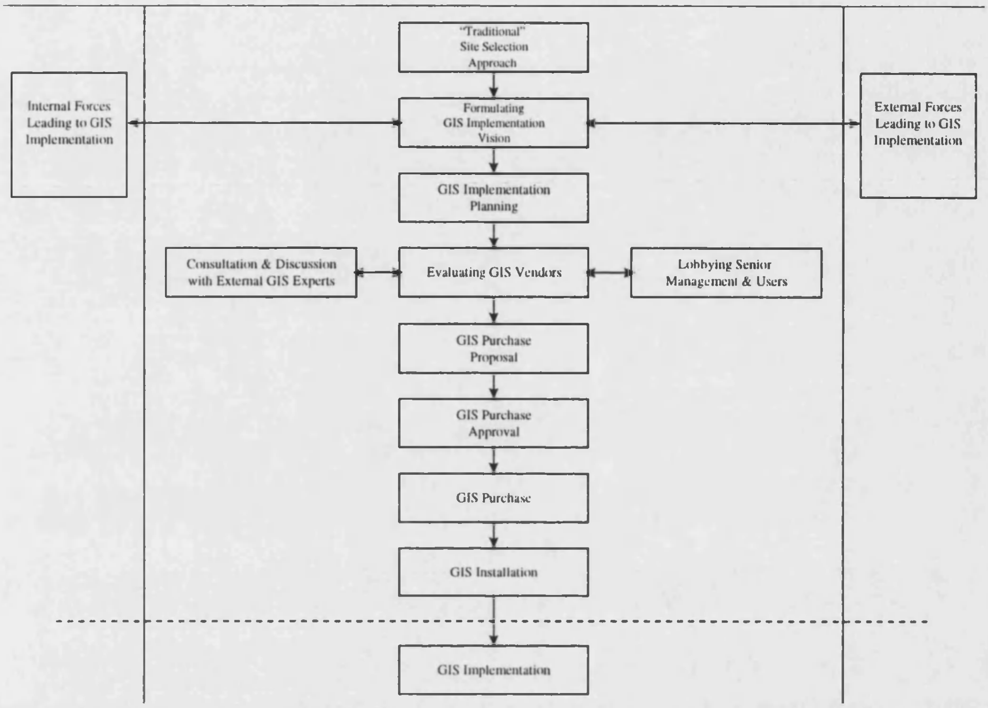
> *"We have a vision otherwise you don't do it in the first place because you don't know what you are doing it for. The vision is that we want everybody [any Tesco manager] to use everything [GIS] we do."*

A series of GIS implementation discussions were conducted with GIS specialists in non competing organisations outside Tesco examining how they implemented GIS in their organisations (e.g., discussions on the issues faced like senior management support) in order to have an idea on how successful the implementation would be. SRD senior managers also believed that throughout the world (especially in the USA) there was enough evidence of retailers who had been successful in implementing GIS in their companies. More responsibilities were taken by senior managers in running the implementation activities, for example, lobbying Tesco's key board members who were the Information Systems (IS) approving committee to sponsor the implementation project.

After a series of discussions, SRD senior managers decided to purchase their GIS from Smallworld (as a base system). It was purchased due to its ability to accommodate Tesco's present and future GIS needs through its customisation flexibility, for example, in developing the applications. The purchase of Smallworld GIS was made with the permission from the IS approving committee[46]. At present, besides evaluating site potential, Smallworld has also been used in evaluating Tesco's acquisitions and buy-outs (for example, Scottish food store chain, William Low which were acquired in 1994). Figure 8.2 summarises the activities occurred prior to the implementation of the system.

[46] Smallworld GIS was installed with the help from the IS Department (technical support).

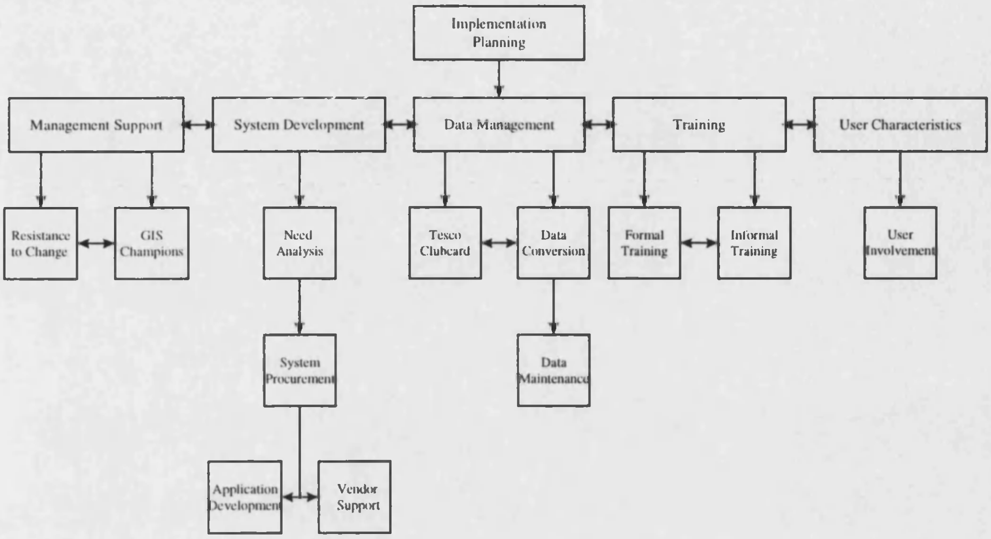
Figure 8.2 - Activities Prior to GIS Implementation Process



Once the system was in-house, there was much work to do in the implementation processes that had to take place. The Tesco interview revealed six major issues within the GIS implementation process;

- Implementation planning
- Management support
- System development
- Data management
- Training
- User characteristics

Figure 8.3 - Activities during GIS Implementation Process



8.1.2.a) Implementation Planning

Tesco's objective of implementation planning was to produce a more cost effective system and to establish a management framework within which implementation occurred to ensure that implementation was efficient and caused the least disruption. Figure 8.3 summarises the activities that occurred during the implementation of the system. Implementation planning proceeded in parallel with implementation activities, once implementation had begun (as activities proceeded, more details became known, permitting more detailed planning). SRD organised its GIS implementation on a "phased introduction" basis with most development and implementation activities being conducted by a GIS Project Manager.

Through effective planning, it was contended that the scope of GIS benefits could be broadened and benefits could continue for a longer period with less organisational trauma. The advantage of implementation planning was that less was left to chance. As the GIS Project Manager commented,

> *"When you launch something like this, you have a vision where you want to be in how many years and if we are not there we never will be but we are making progress and it is rapid. I believe it [GIS] to be successful because it is being used by so many people in a flexible way."*

8.1.2.b) Management Support

Responsiveness and support from senior management for initiating the technology was very good. Implementation of the system proceeded at an accelerated pace with continuous commitment and support from senior management. Although senior managers' commitment and support were present throughout this period, political support was never explicitly sought from them, for a comprehensive approach to incorporate the technology. Nevertheless, throughout the 5-year period of implementation (1992-1997), management support can be seen through notable progress in terms of upgrading of the equipment. To this day, the department has innovatively employed GIS in their site research models.

8.1.2.b.i) Resistance to Change

> *"Countless disaster are caused because people allow themselves to be pressured into committing to something they felt was impossible."*
>
> - Huxhold and Levinsohn (1995, p. 198)

In evaluating users' resistance to change, senior managers noted a variety of responses. Resistance is a complex phenomenon because it often results from a combination of motives. There were a few people who were "obsessed" with the system but resistance was still strong from those people who were unfamiliar with the system (not everyone sees GIS as beneficial). One of the approaches used to reduce resistance was to concentrate on the implementation activities such as training. It was believed to be significant in developing users 'faith' in the system.

Meanwhile, an extreme level of enthusiasm was shown by some of the users, which was used to counter the fear among other users. The fear was caused by the daily "tough" site selection decisions faced in the department (the nature of their working condition). It was the users personal interest that kept them coming back and continuing to work with the system.

In addition, to reduce users' resistance to change, regular meetings were conducted by the GIS Project Manager to demonstrate and discuss the latest developments of the system as well as the problems encountered by users whilst using the system. In this meeting, users had the opportunity to share their thoughts on one system with the GIS Project Manager and other system developers. This familiarisation of the system was an evolutionary process.

8.1.2.b.ii) The Role of GIS Champions

The respondents accepted that GIS implementation in Tesco was headed by a group of GIS champions. They played their roles by providing the support needed by working together as a team (where such energy and commitment were derived from). They also tirelessly pursued the aim of the implementation by continuously selling the idea to other senior managers and users, for example, the SRD Director, portrayed endless enthusiasm towards the system. The high level of enthusiasm shown by the SRD senior managers reduced users negative perceptions about the system. They kept the GIS "alive" by portraying their continuous commitment in confronting the implementation difficulties. In addition, SRD senior managers actively persuaded Tesco senior management to commit to the idea of implementing GIS within the entire organisation.

8.1.2.c) System Development

8.1.2.c.i) Need Analysis

Need analysis was a process of deriving the system requirements, where an observation was made of the existing system followed by a series of discussions with users. Need analysis can be categorised into two key need categories;

- *Data Needs;* Determining what are the data needs for GIS was more than merely listing the data that potential users say what they want to be stored in the system. In Tesco, the data needs were more than a "wish list" agreed by all users, it involved a systematic study of how valuable each type of data was. This process was significant to determine data maintenance responsibilities needed to keep the data up-to-date. An inventory of current data was used to determine the data needed for the system.
- *User Needs;* Perhaps user needs should be stated in the negative form. If needs cannot be defined adequately, GIS implementation would be doomed to failure. In Tesco, the GIS implementation process was based on the premise that senior managers had to first define the users needs where every effort was directed to understand these needs. Nevertheless, senior managers were aware of the users' frustrations that existed in the department. As the GIS Project Manager described,

"Some people will ask for that, some people will ask for this and we try to keep those two ongoing in parallel."

8.1.2.c.ii) System Procurement

In response to understanding the site selection decisions faced by Tesco and the strategies that emerge from such strategies, SRD senior managers initiated the purchasing process by purchasing an "incomplete"[47] GIS by Smallworld. The purchase of the system was in line with SRD's general expansion strategy (Smallworld GIS allowed its system to be configured accordingly by SRD). The selection criterion used in buying the appropriate hardware and software were determined from design specifications (a "tool kit" which was suitable for site selection decision activities), in line with the in-house needs which necessitated SRD to have remarkable system flexibility. Such a strategy allowed SRD to capitalise on its accumulated experience in the development of its applications. In addition, it was also due to the fact that SRD was more knowledgeable than anybody in its organisation, and in its daily activities. As a result, SRD senior managers were concerned to reflect their knowledge in the applications.

[47] "Incomplete" system is referred to GIS software without any data attached to it.

8.1.2.c.iii) Vendor Support

Smallworld provided continuous product support via its regular visits. In addition, during the initial stage of the implementation, Smallworld also developed several "introductory" GIS applications for the SRD in running the system (on top of the software licences) that facilitated a more speedy learning process in the users.

8.1.2.d) Data Management

Perhaps "data issues" were the most critical technical issues in the implementation of the GIS project. One of the data issues that SRD faced was the problem of the system's base maps, where the accuracy was a critical factor. As the GIS Project Manager described,

> *"The only and the most critical problem faced was the conversion of the maps, the base-maps of the system."*

Most of the internally generated data were stored in mainframes, resulting in minimal problems of data conversion. The external data were bought from data vendors and were also stored in mainframes (common GIS data needed by most of users were stored in a central position while individual or other data were kept by users themselves). There was a continuing attempt to keep both internal and external data together in one place.

Further, in transferring the data throughout the department, SRD used Local Area Network (LAN). The critical issues faced at this stage was the "downloading" of huge bytes of map files which were required in almost all the applications.

8.1.2.d.i) The Role of the Tesco Clubcard

As retail trading in the UK becomes more competitive, retailers are showing signs of turning to long term loyalty schemes as a means of enhancing the overall quality of their trading offer, in an attempt to retain as high a proportion of existing customer's expenditure as possible. In basic terms, loyalty schemes are meant to induce repeat visits.

Tesco also believed that a loyalty card was one way to show their appreciation to loyal customers and a means to create loyalty to their store brands. The card was launched nationally in 1995 after Tesco experimented with a series of pilot studies in 14 outlets throughout the country (after having GIS in house). Clubcard offered customers a point for every £5 spent above £10. At the end of each three months (quarter), accumulated points over 50 were converted into a

Tesco voucher. A spending rate of £100 per week would earn vouchers of the value of £12.50 per quarter. The key benefit of launching the card from a market analysis perspectives was to understand customer buying behaviour (for example, who are shopping where, where are they shopping, what are they shopping and how much they are spending). Many categories of customers data were secured from the scheme (in meaningful format), for example, customer's name, address, postcode, age, sex, marital status, income, length of residence and telephone number, providing most of the data SRD needs[48].

This knowledge was believed to be critical for the site researchers in performing their site selection decision models (to precisely understand the customer's buying behaviour and the likelihood of target customers being neglected is thus reduced). It was also used to focus marketing mix activities (e.g., experimenting the correlation between a new merchandise promotion and the resultant customer buying behaviour) and thereby creating the ability to target products and services more accurately towards customers through the existing Tesco stores.

Nationally, cardholders now exceed 8.5 million people[49] and as this number is increasing, the data offered in turn enable the SRD to update its databases on a continuous basis. On the other hand, it was also a significant way

[48] The data will thus add a useful dimension to the customer's profile of Tesco current databases by creating a bank of information.
[49] Tesco Annual Report, 1996.

of reducing the expensive data costs charged by external data vendors. The benefits could also be seen not just from the cost reduction but also as a significant way to reduce the department's dependence on external data. The scheme also increased the quality of the internal data. Ultimately this was the means to integrate GIS with other operationalised IS in a seamless environment.

8.1.2.e) Training

SRD senior managers believed that there was a need to create within the users an appreciation of the organisational issues so that successful implementation could proceed. If the users were to possess such knowledge, this could facilitate the changes necessary to take advantage of the new system. Providing users with a broader training perspective of the system (e.g., additional training on other relevant areas of the system such as database management and not just on system applications) helped to avoid implementation problems. SRD senior managers provided various modes of training as part of the development and implementation of the system. Careful attention was paid by them to the training of new recruits in the SRD. This was because site research was now seen as one of Tesco's core functions (GIS significantly changed the emphasis of the training and development of SRD's staff). Staff training and development can be classified into two key categories;

First, formal training which included introductory and monthly training. In the introductory training, junior site researchers were required to have at least a four-week training session, working alongside their seniors. During this session, application demonstrations were conducted once the system was installed. Trainees were exposed to GIS basic principles and applications, for example, in performing basic GIS queries. While introductory training was meant for junior site researchers, monthly training was conducted for senior site researchers. It was conducted on an on-going basis, introducing new GIS applications that had been developed.

Second, informal training was an on-job-training mode and was designed for those site researchers who were not familiar with the applications. It was regularly conducted by senior site researchers or those site researchers who were familiar with the applications, for example, in performing basic GIS analyses. As the GIS Project Manager described, *"So we must get them on board by helping."* Informal training allowed users to "play" with the system. In other words, they had the opportunity to make mistakes and at the same time be familiar with the system.

Both forms of training emphasised the key principles of GIS applications in site selection decisions. Site researchers were trained to run the system whilst helping the system developer to develop the interfaces. Further training of other "unfamiliar" or new users in the department was passed down from these "familiar" people. The approach was believed to have kept users up-to-date as implementation developed. In some cases, training was conducted on a step-by-step basis, for example, in the earlier stages, the emphasis was on building general system familiarisation and in later stages, the emphasis was on building detailed system and to also have them trained on the system.

In conjunction with Smallworld, the IS Department provided technical training to system developers. Such training was conducted in stages, to permit a sufficiently long familiarisation period prior to proceeding to more advanced applications. As implementation developed, training documents were developed and compiled for the next training sessions (as a result of the exposures to the system). User training progressed on an ongoing basis throughout all implementation activities. Long term training plans for site researchers were developed for those who operate and maintain the system. The emphasis was on functional components of the system and how the system worked.

8.1.2.f) User Characteristics

The importance of understanding user characteristics of the system was clear. SRD senior managers and system developers believed that without a clear definition of how users expect to use the system, it would be difficult, if not impossible to form the basis for determining system design (e.g., database development).

8.1.2.f.i) User Involvement

Improving business processes using GIS mean changing that process and overcoming the inertia[50] of current ways of doing things. The importance of user's involvement was clear in recognition to the fact that user involvement enhanced the chances of implementation success[51]. In Tesco, users were invited and taught to be involved with the implementation process. They were told how they would fit into the process and what would be expected of them, for example, holding primary responsibility in developing the applications and in controlling the quality of data.

[50] The tendency for the department to continue doing things in the same way and thus, to resist change.

8.1.3 The Role of the Information Systems Department (ISD)

In implementing the system, the Information Systems Department (ISD) supported the SRD by offering its expertise in a number of ways, for example, maintaining the system's hardware, system back-ups and the daily running of the system. An ad-hoc committee was established to ensure that efforts were channelled to these activities where a number of ISD staff were working on a "loan" basis in the department during the initial stage of the implementation of the system (i.e., 3-month loan period).

[51] The likelihood of success drops if this process (implementation) cannot overcome the inertia of current business processes (or if the implementation itself causes resistance).

8.1.4 The Benefits of GIS

Upon reflection of the implementation process, SRD senior managers saw two areas of significant benefits from their GIS;

8.1.4.a) Immediate Operational Benefits

As an "operational tool", GIS solved the inherited issues that occurred with "traditional" site selection approaches. It increased the effectiveness of site researchers in their site selection decision process by shortening the amount of time taken (working efficiency). GIS also acted as a "common interface" for various data sets possessed by the company, including the internally generated data (for example, the massive amount of data derived from the Tesco Clubcard) as well as the externally prefabricated data offered by the data vendors. As a result, better data set management was accomplished. Further, the outcomes of the analyses were "graphical" in nature, where better site selection models can be generated (for example, "cutting and pasting" the performance of existing and potential sites, thus enabling SRD to better understand its customers). The "sharing nature" of the system has opened a good co-operation between SRD and other departments within Tesco, for example, marketing and real estate, in which various departmental applications have been generated. The openness of exchanging the data through this technology yielded a useful communication with mutual benefits. As the GIS Project Manager described,

> *"We talked a lot more to other departments, we have a lot more requests for work from people for information. Before all requests seemed to come down through the hierarchy. My boss and his boss that was it. That's what we did but we can now see the catchments for our stores, the information we have before and that took over for a while because now this huge wealth of information is new to us. It wasn't within our original plan."*

8.1.4.b) Long-term Strategic Benefits

Within GIS lies the ability to accommodate SRD's strategic needs. More and more applications were realised after the implementation of the system. This is illustrated by where the amount of models generated by the system which has doubled and was continuing on an on-going basis.

8.1.5 Summary

Tesco is the market leader amongst UK food retailers. More sites throughout the country are being explored and evaluated for new business development. The implementation of Geographical Information System has supported Tesco in achieving its aim to lead the market by targeting locations where new stores can be developed that attracted new customers and ensuring that existing customers are retained. GIS has allowed a shortening of the period taken in site selection decision processes where a lot of potential sites have to be assessed.

CASE 2

SOMERFIELD STORES LIMITED

8.2.1 Background of the Company

Somerfield is the sixth largest food retailer in the UK with sales of around £3 billion[52]. Somerfield was officially founded by J. H. Mills of Bristol in 1875 which was first known as Mills Ltd. It started as a small family grocery store offering quality goods and services and has grown through a number of acquisitions. In 1900 Mills Ltd. expanded its business by becoming a limited company with 12 outlets. In 1950, Mills Ltd. was turned into Gateway and the 14 J. H. Mills shops were converted to self service supermarkets. In 1977, Gateway was acquired by Linfood Holdings who owned Frank Dee Supermarkets. At that point of time, there were about 100 Gateway stores throughout the country. Frank Dee Supermarkets (70 outlets) were turned into the Gateway banner and Linfood Holdings was renamed to the Dee Corporation by 1983.

Between 1983 and 1987, the Dee Corporation continued to expand, with a series of mergers and acquisitions (e.g., Keymarkets, Lennons, Fine Fare and Carrefour Hypermarkets). In 1988, the Dee Corporation was renamed as Gateway

Corporation that was then acquired by Isoceles in 1989. In 1990, Somerfield launched its first store under its own name. In May 1994, Gateway Foodmarkets Ltd was changed to Somerfield Store Limited and in August 1996, Somerfield Store Limited holding company, Somerfield Plc became independent of its parent company Isosceles with a large amount of debt[53]. Separate debt facilities were established for the company had allowed Somerfield to pay its debt.

8.2.1.a) Competition and Market Share

Key food retailers make up the bulk of Somerfield competitors. Somerfield's market share remains low compared with that of its competitors (see Table 8.3). The conversion of Gateway stores to the Somerfield format is improving both its sales and profit. As Somerfield grew rapidly during the early 1990s and has steadily increased its market share through the deployment of innovative marketing techniques (focusing its efforts on fulfilling market needs in evolving market segments). The concentrations of the stores were in Scotland, South West and East Anglia.

[52] Mintel (1997).

[53] Somerfield has £400 million in debt which it hopes to reduce through a floatation by 1998.

Table 8.3 - Grocery Market Share (1997)

Retail Organisation	**Market Share (%)**
Tesco	23.6
J. Sainsbury	19.6
Asda	13.5
Safeway	10.8
Kwik Save	5.8
Somerfield	**4.5**
Wm Morrison	4.0
Iceland	3.0
Waitrose	1.6

Source: *Taylor Nelson Sofres/Mintel, 1998.*

8.2.1.b) Store Development and Store Format

Somerfield operates about 615 stores nationwide. The key store categories are summarised in Table 8.4 below.

Table 8.4 - Somerfield Key Store Categories

Type of stores	Size	Number of stores
Somerfield core stores	less than 4,500 sq. ft.	423
Community stores	More than 4,500 sq. ft.	164
Food Giant	Large discount stores	28

Source; *http;//www.somerfield.co.uk/*

Somerfield core stores include stores with Gateway and Somerfield facias. The Community stores include Gateway and Solo facias. Somerfield is in the process of changing its facias, i.e., several of the Gateway stores are too small to carry the range of products for Somerfield. In 1997, Somerfield decided to phase out the Gateway name, by converting its entire Gateway stores to Somerfield facias (the diversity of facias impeded the development of Somerfield's brand). The company has also formed a buying alliance with some European retailers such as Superunie of Holland and BML of Austria, to form Euro partners. The totals of the partnership stores are more than 2,280 across Europe.

8.2.2 GIS Implementation Process at Somerfield

8.2.2.a) The Role of Sales Forecasting Department

Sales Forecasting Department's (SFD) primary function was to forecast sales for Somerfield's new stores. The department also helped other departments by providing requested information on the "micro" marketing activities such as geodemographic analysis for sales promotion activities. At the time of the study, there were about 5 sales forecasters working in the SFD (this is four times smaller than Tesco).

8.2.2.b) Historical Development of the System

The idea to use GIS technology for sales forecasting in Somerfield was originated in the late 1980s when SFD was driving its utilisation. It was initially aimed to enrich the sales forecasting of new stores in which Somerfield planned to invest. GIS was expected to improve the accuracy of the sales forecasting data and decisions through;

- Better control over data
- Better control over costs

In addition, the ever increasing sophistication of site research models as well as the senior management pressure to maintain Somerfield's present position in the market were the internal forces for the implementation of the system. The intensification of competition faced by Somerfield in the food market industry and the mushrooming number of GIS data and vendors were the external forces for the implementation of the system. Table 8.5 summarises the internal and external forces that led Somerfield to acquire a GIS.

Table 8.5 - Somerfield's External and Internal Forces of GIS Implementation

Internal Forces	External Forces
• Better control over data • Better control over costs • Increasing sophistication of site research models • Senior management pressure to maintain company's present position in the market	• The intensification of competition • The mushrooming number of GIS data and vendors

An implementation process started in 1986 with a preliminary analysis on the systems available in the market (the finance for the system were available through the organisational funding). The head of SFD, who was seen as the key advocate of Somerfield's GIS, decided to purchase GIS software from Spans-Tydac.

As a result of the ownership turnover, GIS development and implementation at Somerfield was hindered. Employment of the technology remains low to this day with some progression despite of the difficulties encountered in the turnover period. GIS was used throughout but has never been developed any further and has only been recognised as a tool to strengthen sales forecasting for new stores. It was only sporadically used for performing the key sales forecasting activities. In addition, hardware and software were not replaced or upgraded as necessary to meet the expanding needs but the external data sets have been well maintained. Although Somerfield had utilised GIS for a long time (about ten years), not much development has occurred.

8.2.2.c) Database Management Systems (DBMS)

With respect to database management, Somerfield has demonstrated three crucial database management tasks that should not be overlooked, e.g., gathering, converting and standardising (there was a continuing attempt to keep both internal and external data sets together in one place).

At the beginning, the chosen system did not seem to have any apparent potential difficulties. GIS implementation was solely performed by the SFD manager, who utilised the system for a definite task (e.g., site research and sales forecasting) which could be specified in advance. Implementation of the technology proceeded with further acquisition of multiple external data sets from various data vendors (GIS was bought primarily to access the 'external data' provided by the data vendors). There was more than one source of data bought by Somerfield (part of the required data were available from one source and the balance from another). As the Site Research Manager noted,

> *"The very big problem which is almost overbearing is that once you start going out and source the data from different sources, you will get incredibly complicated data management issues."*

Various data set sources led Somerfield to severe database management problems. The multiple sources of data were available in various incompatible formats. There were problems in terms of integration and standardisation of data sets, e.g., the changes of the postcodes on an on going basis. As the Site Research Manager noted,

> *"The biggest problem is the post office, the change of postal sector geography on an on going basis, whereas the data vendors won't change their data except on an annual basis, perhaps or at best a three-month basis."*

It was very hard to standardise the data from various data set sources, i.e., different data vendors had provided different format of data sets. Standardisation of data constituted a pervasive problem in GIS implementation (documentation of data quality is often haphazard and incomplete). These data sets included some internally generated data. As the Site Research Manager noted,

> *"We bought data from a whole lot of sources. We bought sets of the roads from the AA, postal sector boundaries from Geoplan, Mosaic data sets from CCN Marketing, the National Shopper's Survey from CFT and the census from CACI and try to build it together."*

Although some of the data sets could be converted, it could not be converted in a short space of time. Somerfield was unable to bear the additional work required in the conversion tasks, which was the key source of the cost. As a result of this failure, Somerfield decided to concentrate solely on a single data vendor and system, which was Mosaic Micromarketer by CCN Marketing. In this context, Somerfield's attempt to convert and standardise all the different data failed due to their inability to cope with incompatible data formats.

8.2.2.c.i) GIS and Somerfield Premier Points Card Scheme

At the time of this study, Somerfield database marketing activities were still in its introduction stage and its real benefits of tracking customer behaviour were not yet realised (early stage of its evolution) with some of the managers still at the stage of creating the databases. Besides sales forecasting, the system was also utilised in other database marketing activities, e.g., promotions. There was a plan to merge GIS with their existing sales forecasting formulae in the near future.

8.2.2.d) Management Support

Senior management support was critical in GIS implementation. The interviews revealed that Somerfield senior managers were not very interested in developing the system. They were just interested in having the system's outcomes. As the Site Research Manager noted,

> *"There is no way that any of the managers within this organisation will want to sit down in front of the computer screen and look at GIS generated graphics."*

In addition, Somerfield senior management had not been "sold" by the benefits of the system which has resulted in a very minimum level of system awareness and interest (except in the provision of funds). As the Site Research Manager noted, *"I mean they have no interest whatsoever in GIS."* Senior management support were not strongly convinced by the champion[54] (that it would be to their advantage to support the system). As the Site Research Manager noted,

[54] A champion is an individual in the organisation who makes decisive contributions to the system by actively and enthusiastically promoting its progress through the critical stages of its development and implementation.

"There was no demand from management for me. It's all up to me. I am just the GIS man fitting in to provide the best solution and I was left free to provide the best solution that I saw fit."

Although the senior management support was present throughout this period, there was no ambitious plan for implementation of the technology. It was clear that senior management understanding was a paramount factor required throughout the entire system implementation process. Thorough senior management understanding was required to increase the level of support required in facing the implementation and counter implementation threats. This understanding was required to encourage senior managers to further commit themselves to the project.

8.2.2.e) GIS Champion

The likelihood of success could be increased through increasing the champion activities. At Somerfield, there was only one Site Research Manager who had an interest in pushing the system forward, thus reducing the chances of the system success. The "champion" had an insufficient amount of faith in the system to make it work. His faith was more towards spreadsheets rather than on GIS.

8.2.2.f) Needs Analysis

A more subtle effect of poorly conducted needs assessment concerns the participation of staff who will be using the system. It should be a process that establishes dialogues between system designers and system users. At Somerfield, incomplete or inadequate need assessment led to misidentification of the requirements of the system hardware, software and data. Productive interaction between system developers and users did not take place and users were alienated by the process of the system, leading to personal resistance. System developers did not adequately understand data sources and requirements of users' applications (they were likely to merely perpetuate existing procedures in an automated form, rather than take advantage of new capabilities in data acquisition, display or analysis).

8.2.2.f) User Involvement

In the introductory stage, there were not many interested users within Somerfield except the Site Research Manager. Over the years, the degree of user's resistance was high. User responses were varied and their involvement was minimal and not participative in nature. There was a general perception in the company that there was a lack of user acceptance. The involvement of the users ("inherited" users) was self initiated and spontaneous. After a stalling period, users finally indicated that they preferred spreadsheets rather than GIS. Most of the potential users have indicated that they had no intention of utilising the system at all. They were not actively involved in the GIS implementation.

8.2.2.g) GIS Training

The significance of sufficient training should not be overlooked. At Somerfield, due to the small number of the users, there were no formal in-house GIS training sessions conducted by the Sales Forecasting Department (SFD). It relied solely on the training conducted by its vendors. Users were trained by CCN Marketing for its system and Information Systems Department (ISD) for IS knowledge. Users also participated in the annual GIS user conferences conducted by the key vendors, e.g., CCN Marketing. Parts of the users were "half" trained on the system. At the point of this study, Somerfield was still using a PC-based GIS provided by CCN Marketing.

Initial and on-going GIS training was critical to successful GIS use. Unfortunately, its significance had been under rated or in other way rejected. Training meant educating the users, potential users and the organisation in the overall purpose of the system. It does not just tell them how significant their contributions were but it lets them to see that they are a significant part of the entire system implementation process and that the success of the system depends on how well they do their tasks.

8.2.2.h) Vendor Support

The idea of establishing a good relationship with key vendors (e.g., CCN Marketing) was to have a good system support (i.e., a "benchmark testing" could sometimes be performed). This approach enables a substantial cost reduction in the system implementation process. As the Site Research Manager noted,

> *"It's always good to maintain strong link with as many players as possible because it keeps your key vendor honest."*

Somerfield's experiences indicated that key GIS vendors in the market are very good in providing the system support, i.e., CCN Marketing and CACI. However, most of them were only interested in selling the completed system (solution). As the Site Research Manager noted,

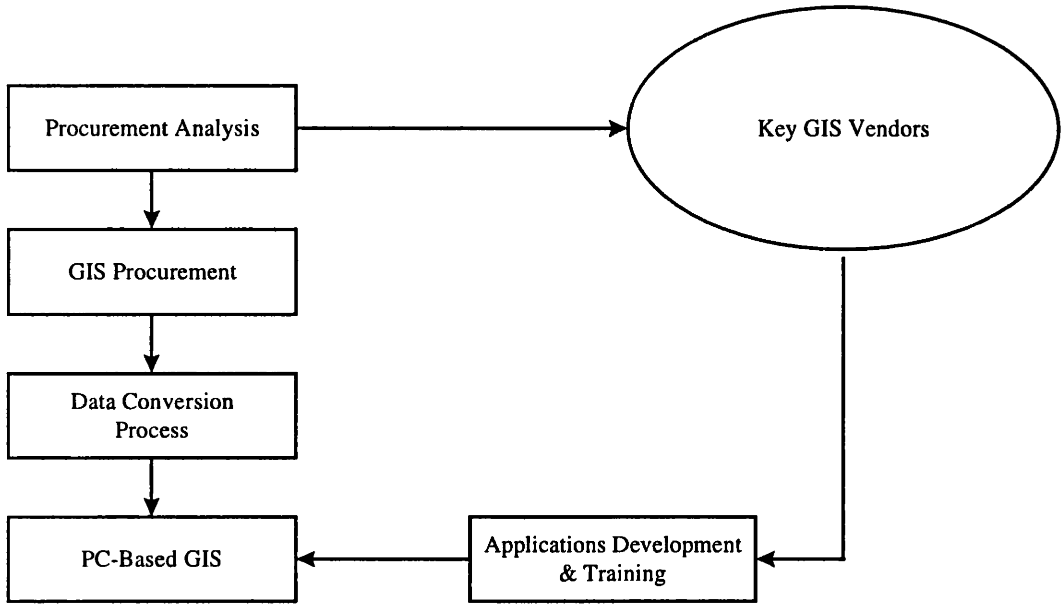
> *"Their only concern is selling you the full solution. They are not really interested in selling you a bit of data or a bit of software. They are very good usually. The support you get is quite good."*

Collaborations were established in developing site selection models (e.g., gravity modelling) with the vendor CACI. However, there were also vendors who had provided marginal system support

8.2.3 Summary

Due to the nature of this organisation (experiencing many management turnovers), Somerfield GIS development and implementation was hindered which resulted in a very slow rate of growth. Their GIS had not been employed to its full capability (it was only confined primarily towards geodemographical analyses, including sales forecasting activities). Throughout the years there was minimal progress, i.e., both in the upgrading of equipment and the system's use. Somerfield has pursued a different approach in implementing the technology. The GIS implementation process is summarised in Figure 8.4.

Figure 8.4 - Somerfield's GIS Implementation Process



This case revealed that GIS implementation process started with a procurement analysis without any framework of implementation planning. Many external datasets were bought from outside without any assurance on compatibility (the most often alternative utilised by retailers involves going to a third party who provide all or a part of the data sets needed). The in-house data conversion processes proved to be costly, time consuming and labour intensive. It was suggested that a pilot test (e.g., compatibility test) should be performed prior to making any commitment to buy those data sets and official assurance be secured to reduce the risk of implementation failure. Somerfield then relied solely on a single source of supply for both the GIS data and software for better data and cost management.

To say whether their inability to understand and take advantage of GIS tools was due to inadequate training or poorly documented data, clumsy hardware and software may be an arbitrary distinction. Incomplete knowledge of GIS tools often starts with an incomplete introduction to the system but problems may be perpetuated by technological barriers such as unfriendly user interfaces. Most users required support from specialists to customise the tools provided by a full-functioning GIS (they could not be expected to work through many hundreds of commands and options to determine the few that are applicable to their needs). When forced to learn GIS with little assistance, most users found out a few things that they could accomplish and venture no further.

The behaviour encountered at Somerfield was a clear example of marginal implementation of GIS. The adoption failed on both organisational and individual levels (sporadic indirect users). GIS technology, however, remained under-utilised, with only a few of its capabilities exploited and indirectly used as a source of hard copy maps. Marginal system implementation was due to the following organisational and technical drawbacks (see Table 8.6).

Table 8.6 - Organisational and Technical Drawbacks

Organisational drawbacks	Technical drawbacks
• *Undefined goals and plans* There were no system goals and plans established by Somerfield in implementing the system. As the Site Research Manager has noted, " I did not plan it at all. We just went out, we bought the system, we bought the data, put the data into the system and we realised that we have no application in mind." • *Insufficient senior management support* The support provided by senior managers was very limited except in the provision of funds which was insufficient and is believed to have somewhat jeopardised the system implementation. They have not played their critical roles in the system implementation, i.e., they did not even interested to see the outcomes of GIS produced on the screen. • *Insufficient senior management and user awareness* The benefits of GIS were only realised by a small number of senior managers and users in the organisation. • *Insufficient "roles" played by the GIS champion* The manager responsible was unable to perform all the required tasks alone in implementing the system. He was also unable to fight the counter-implementation threats posed by the organisation.	• An often heard maxim that technical problems can always be solved given sufficient time and money. If the technical barriers to GIS use were strictly shortcomings in the technology itself, i.e., software that could not perform the analyses or data that would not be converted, this maxim would be valid. However, many technical problems are manifestations of underlying organisational issues. Technical problems can arise in the implementation process, leading to problems in the use of the system. It has several elements in common, including data problems to determine technical functionality and a system design procedure to fit GIS technology into an organisation. System developer's lack of experience has distorted the data conversion and standardisation activities.

Implementation of GIS technology in a retail organisation was seen to be a complex, selective and situation-bounded process. Once GIS technology was acquired by a retailer, its pattern of implementation toward the organisational units and/or individual user was seen as unique to that organisation. Differences arise with regard to type, time and level of involvement with the technology. Adoption and use of GIS in particular involved change in the organisation's way of doing things.

CASE 3

SAFEWAY STORES PLC

8.3.1 Background of the Company

Safeway is the fourth largest food retailer in the UK, a subsidiary that belongs to Argyll group of companies. As part of the Argyll group, since 1987, Safeway has become the group key retailing face (accounting for over 80% of the group retail sales)[55]. Throughout the country, Safeway had a total of 490 stores that comprised of 400 Safeway stores and 90 Presto stores[56]. In 1996, Safeway accounted for about 92.5% of Argyll's operating profit and turnover. As a result, Safeway's Board of Directors decided to change its name from Argyll to Safeway Plc. Safeway has had a successful period terms of sales growth. In 1991-1996 period, it has achieved the third highest growth rate, beating J. Sainsbury. During this period, Safeway's sales performance has been impressive (whose sales area in 1991 was less than three-quarters of that Asda)[57]. It ranked second after Asda in terms of sales density growth. A key factor behind the increasing sales was, however, increase in sales footage.

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[55] FT Discovery, 1998.
[56] *Ibid.*, 1998.
[57] Mintel (1998).

8.3.1.a) Competition, Market Share

Key food retailers make up the bulk of Safeway's competitors. Safeway competed with other large food retailers while facing a high degree of competition as one of the leaders in the industry. Table 8.7 shows the Safeway's performance in terms of market share and operating profit amongst other key food retailers. Both sets of data show the same trend, notably the ever-growing concentration of power among the key grocers. Moreover, Table 8.8 shows the performance of the UK top four grocers.

Table 8.7 - Safeway's Market Share and Operating Profit Performance Amongst Other Key Food Retailers (1997)

	1997	
	Market Share (%)	Operating Profit (£m)
Tesco	23.6	760
J. Sainsbury	19.6	661
Asda	13.5	365
Safeway	***10.8***	***410***
Kwik Save	5.8	74
Somerfield	4.5	115
Wm Morrison	4.0	134
Iceland	3.0	65
Waitrose	1.6	74

Source: *Taylor Nelson Sofres/Mintel, 1998.*

Table 8.8 - The UK Top Four Food Retailers' Performance (1997)

	Turnover (£m)	Operating profits (£m)	Operating profit margins (%)	Sales per square foot per year (£)	Operating profit per square foot per year (£)
Tesco	13,118	760	5.8	935	54
J. Sainsbury	10,852	661	6.4	1,045	67
Asda	6,883	365	5.3	713	42
Safeway	***6,590***	***410***	***5.9***	***655***	***48***

Source: *Taylor Nelson Sofres/Mintel, 1998.*

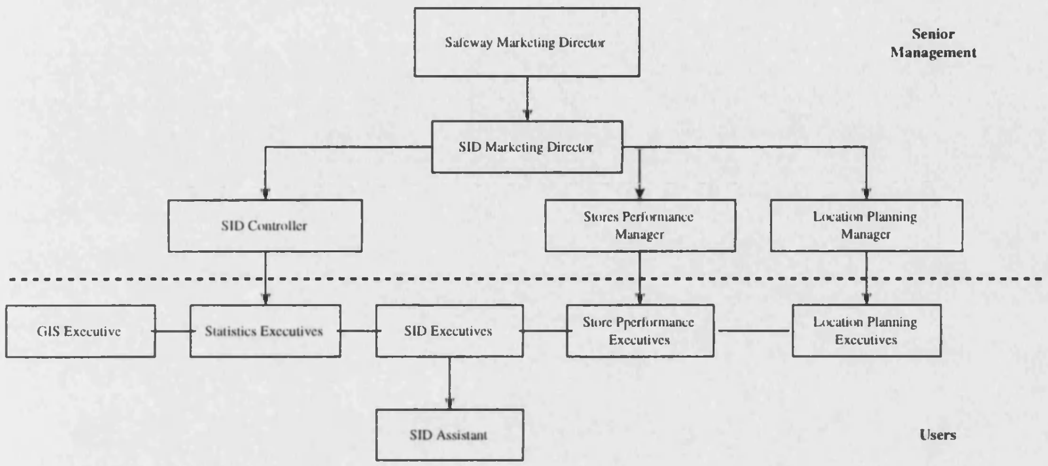
Although Safeway's average store size has grown up, it remains smaller than that of its key competitors, with the exception of Waitrose.

8.3.2 GIS Implementation Process at Safeway

8.3.2.a) The Role of Stores Information Department (SID)

Operating in a mature market where there were many competitors offered a challenge in terms of analysing which stores should close and where new ones should be opened. The Stores Information Department (SID) key function was to advise Safeway on where the organisation should invest in new sites. An average of 25 key decisions was made every year on site selection for new stores. SID also provided advice on the performance of existing stores. As one of the top three food retailers, SID was responsible for monitoring about 490 Safeway's stores. There were about 16 site researchers working with the department. Figure 8.5 illustrates the SID organisational structure.

Figure 8.5 - Stores Information Department (SID)'s Organisational Structure



Much work has been done on streamlining the stores by eliminating the poor performers. Safeway reduced its number of stores while raising its total selling space (see Table 8.8). Furthermore, during the 1995-96 period, 20 Safeway stores were closed. The development trend was to have a relatively small store size. Although the average size of the stores was smaller than most of its competitors, Safeway managed to cram in a wide range of services including coffee shops, dry cleaners, petrol stations, pharmacies and even post offices in many of their larger stores. These were seen as significant complimentary services to their main store offering.

8.3.2.b) Historical Development of the System

Prior to the implementation of the system, much time was spent by SID managers in manually evaluating Safeway's potential sites and their catchments through the overlaying of the available spatial information e.g., Ordnance Survey maps and census data. This traditional approach to site selection decisions inherited three significant problems;

- The external (National Shoppers Survey) and internal (EPOS) data sets were somewhat in disarray (as the amount of both data increased, so did the difficulties of storing the data)
- The outputs of site selection approach were in the form of non-graphical data. To graphically represent and analyse potential sites, SID had to manually place different colour pins on paper-based maps
- Senior management pressure to hold its current position in the market (one of the company aims) forced SID to shorten its site selection process (the traditional approach was somewhat deliberate)

At Safeway, two basic reasons for investing in GIS were;

- That GIS would lead to a productivity increase by expediting the site selection process, e.g., more sites could be analysed and selected for expansion
- That GIS would save money by automating the collection and storage of surveyed data for use in site selection decisions

Table 8.9 summarises the internal and external forces leading to GIS implementation at Safeway

Table 8.9 - Safeway's Internal and External Forces of GIS implementation

Internal Forces	External Forces
• Inefficient management of external data sets • The non-graphical outcomes of "traditional" site selection approach • The senior management pressure to hold present company position in the market	• The intensification of competition within the grocery industry • Competitors' investments in GIS • The mushrooming number of commercial GIS data and vendors

The first system used by SID was a PC-based GIS (standalone) which ran on an MS-DOS platform. The system was primarily undertaken for operations support to the site selection decisions. It represented significant operational tasks vital in the day-to-day running of the department. As the amount of data increased, the system was incapable of managing effective existing databases (in which greater volumes of data were flowing into the department). The system was also incapable of providing customised SID internal site selection needs, i.e., the requirement for more rigorous and sophisticated analysis (an increasing significant feature as GIS applications had developed). In addition, the Director of Stores Information was increasingly frustrated at his department's inability to accurately select new sites for Safeway's stores because with the traditional method of analysing potential sites, there was always a backlog of surveys to analyse. As a result, he decided to go for a thorough network-based GIS implementation.

An investigation into the suitability of GIS was started by an enthusiastic champion. A series of GIS implementation discussions were conducted with GIS specialists in non-competing organisations outside Safeway, examining how they implemented GIS in their organisations, i.e., discussions on the issues faced in designing the databases. Further, by engaging users with the implementation project, SID managers had the opportunity to reinforce the sense of users' ownership and commitment to the GIS through participating in the project's conception. Through presentations and discussions, users at all levels developed a reasonable understanding of what was being built and what was going to be built. Safeway GIS had been developed with emphasis upon human-computer based interfaces that were easily utilised by site researchers which required minimal support from ISD.

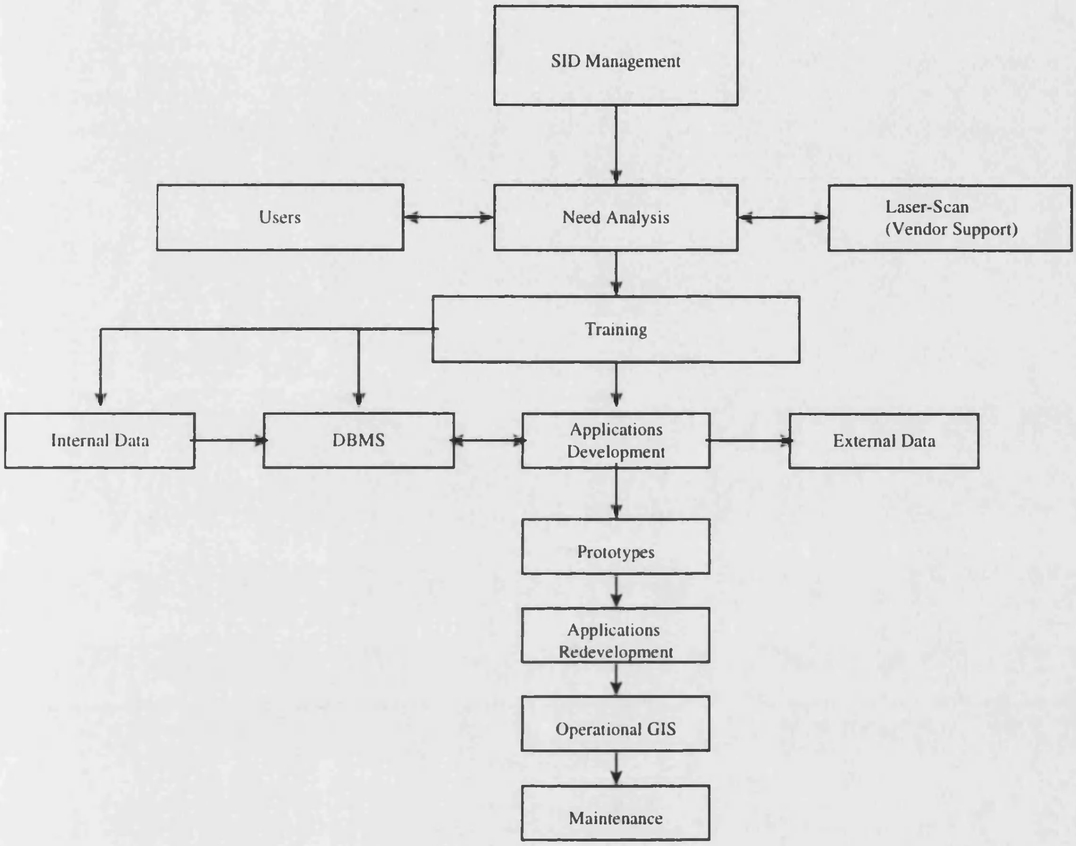
It was not possible to purchase an off-the-shelf GIS solution. This was because off-the-shelf GIS were unable to be customised. The system chosen was an Object-Oriented (OO) network-based GIS by Laser-Scan (known as Market Analysis) which ran the on the organisation's IBM workstations. It was chosen to be the backbone of the Safeway GIS. The applications were developed by both Laser-Scan and SID specifically in location planning and other marketing activities, e.g., promotions and product development. The flexibility of this system was described by one of the SID managers as,

> *"Laser-Scan's solutions gives us the flexibility to analyse spatial data against a geographical backdrop and thereby make the optimum decisions."*

After the final conceptual framework of the entire GIS implementation process were established (after a series of discussions amongst SID managers and through the wide involvement of managers and site researchers in various job roles, a team was able to develop the system). The purpose of the framework was to create a shared understanding of the general GIS once it was operational. The network based GIS was installed in the organisation in the early 1990s. The ultimate objective was to implement a system that met all critical departmental business needs. The database (servers and workstations) was accessible throughout the various departments and was associated with remote posts, through distributed terminals. GIS technology was used throughout this period and was recognised as a decision support tool for SID.

At the time of the study, Safeway was using Laser-Scan's Strategist to great effect in assisting their site selection and development programmes. Site selection decisions could be achieved in a much shorter period (it had facilitated strategic decision-making and helped to ensure the integrity of the organisation, particularly as competitive pressures increase). As the SID Director described, *"We see this type of technology as key in maintaining our competitive edge."* The introduction of GIS by Laser-Scan was seen as offering the potential of spreading the applications around other departments within Safeway (it was significant to integrate the GIS into the entire corporate information systems). The interest in the technology opened a good co-operation between SID and other departments. Its openness to exchange data yielded an infrequent but useful communication of mutual benefits. Figure 8.6 summarised the SID's GIS implementation process framework.

Figure 8.6 - SID's GIS Implementation Process Framework



8.3.2.c) Applications and Design Prototypes

At Safeway, system developers paid careful attention to users in developing the applications (they believed that applications, e.g., user interfaces should accommodate user needs and not the other way around). They had taken a problem-based[58] approach in designing those applications. Application prototypes

[58] Problem-based approach focuses on defining the problem so thoroughly that the appropriate

were developed for the applications and database design were implemented to evaluate the system prior to its actual implementation (different applications necessitated a careful prototype design to meet the needs of a particular situation). The experience gained enabled progress to be made towards the implementation process. The prototyping processes demonstrated a real working GIS to the users. Users gained more confidence with the system in which they were able to perform routine site selection decisions.

8.3.2.d) Management Support

Implementation of the technology proceeded slowly with commitment and support from SID management (initially, there was only a minimum level of users involved which existed to support the implementation) due to the belief that lies in the ability of the technology. Management support was described by one of the users as,

> *"Initially it was not brilliant, it was not brilliant. It tended to be a real mix of people. Some users are really forward, some executives are really forward but not everybody. So it's a real mismatch. We did not have a broad level of support."*

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solutions are almost obvious. Central to this approach is the development of a list of performance

She further added by stating,

"I am very lucky because my boss [SID Director] is the person that has fought for the implementation of the GIS. So he is very interested. It is good to actually have a manager who is really into the GIS."

The SID Director played his role by supporting the project. He made the ultimate decision to purchase a Laser-Scan GIS and led the purchasing negotiations. The purchase was made with the departmental funds with the permission from the Safeway Board of Directors. SID managers stressed the need for a joint effort by management, users and ISD so that system developers understood their perspectives on the implementation problems.

8.3.2.e) GIS Champions

Champions tirelessly pursue the goal of GIS implementation and its benefits by "hardly" selling the idea to management and co-users. At Safeway, they initiated the project and communicated the needs of GIS implementation activities up front. They make potential users comfortable and productive when they understood what was expected of them more. The SID Director committed himself entirely to the idea of implementing the system within Safeway (he was seen as the key advocate of the system and led the Laser-Scan network-based GIS

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criteria that defines how the final application should perform.

purchase). Besides him, there were also a few managers and users who also acted as champions. It was widely accepted that without champions, Safeway could not successfully implement a GIS. They also spread the news about GIS to potential users in other departments.

8.3.2.f) User Needs, Training and Participation

Building a GIS was a matter of constructing graphic and non-graphic databases, developing its processing capabilities, installing the appropriate hardware and software and implementing the procedural changes needed to operate and use the system successfully. These were the essential tasks to be accomplished but could not be started until all participating users knew what was they expected the system to do for them.

Addressing the users' needs assisted in the implementation of the system by encouraging users to participate in this process allowed refinement of Safeway's GIS implementation as well as exposing strengths and weaknesses of the system. User issues raised under the prototyping process brought up to the meeting for further discussion, i.e., should a GIS be installed as a common resource to meet all departmental requirements or should several be implemented to provide task-specific applications? It was the responsibility of SID managers that users were identified as being involved in the process.

User training was the process of ensuring that the system participants knew what they need to know about the system. The SID Director ensured that anyone whose work was affected by GIS was properly trained. Training strategies were determined by SID managers. There were two modes of training offered by Laser-Scan as the key vendor of Safeway GIS;

- *Scheduled courses;* Laser-Scan ran quarterly scheduled training courses for managers, developers and users. Individual training sessions range from one to six days' duration and were held at Laser-Scan's premises on the outskirts of Cambridge
- *Non-scheduled courses;* Besides the planned courses, there were also non-scheduled courses. These training sessions were usually conducted at Safeway premises

Users developed considerable expertise and acquiring an excellent reputation for reliability in running the system. A training need analysis was carried out by SID managers to survey users needs and to ascertain what was the needed training and support. A training assessment was conducted based on the users' tasks (as implementation progressed, there was an attempt by the managers to avoid the "blanket approach" in training users). The SID Director expected that the effort could be repaid by ensuring users had the right training they needed. In addition, training manuals were developed as the implementation process went on by both SID and ISD while the training facilities were allocated within SID premises to facilitate the training process. The outcomes were described by one of the users as,

> *"They will have the chance to make mistakes, when that is [GIS] installed on the PC, they are not scared of everything, they are quite familiar."*

8.3.2.g) Database Management Systems (DBMS) and Loyalty Card

Database management system (DBMS) was an appropriate tool for effective GIS management. Without it, fast access to internal and external data out of the large amount of operational data collection was difficult to achieve. Besides relying to external data vendors, internal data were converted internally by SID with some help from ISD. Further maintenance, e.g., updates of the databases was handled internally by SID (e.g., on day-to-day basis). Data were gathered on a regular basis and fed into the system. The data was available to be distributed so that each site researcher had fast access to it. It was revealed in the interview that there was a potential to link the systems to real-time monitoring of the system. As part of their operational data, Safeway was using a loyalty card scheme to acquire information about their customers. The loyalty scheme was an attempt to secure a greater proportion of each customers total spending. The company claimed that its loyalty card has brought them real benefits. By March 1996, 4 million customers had signed up for the Safeway's ABC Card[59]. Safeway believed that much of its 5% profits and sales increase (1995-96) were due to ABC Loyalty Card[60].

Safeway's loyalty card scheme acted as a milestone, not just for site selection decisions, but also for other marketing mix activities. A significant aspect of this scheme was the degree to which the information in the spatial database was maintained. Through their GIS Safeway launched a promotion aimed at encouraging regular ABC Card use and recruiting new cardholders to the scheme. Safeway planned to use its ABC Card database to full advantage, e.g., a linked has been established with Lloyds Bank to market insurance products direct to ABC cardholders.

8.3.3 Summary

Safeway is one of the strongest contenders (fourth in rank) in the UK food retailing. More sites throughout the country are being explored and considered for development. The implementation of Geographical Information System (GIS) has supported Safeway in determining locations where new stores can be developed that attracted new customers and ensuring that existing customers are retained.

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[59] Safeway Annual Report, 1996/97.
[60] *Ibid.*, 1996/97.

GIS allowed a shortening of the period taken in site selection decision processes where a lot of potential sites have to be assessed.

Safeway's GIS implementation experience once again confirmed that management support, GIS champions, application and design prototypes, user need, training and participation were the critical factors for successful GIS implementation process. These factors are in line with the factors emerged from the first case study (Tesco).

SID management offered a range of supportive efforts (in most cases, the efforts were facilitated by champions) to reduce users' resistance towards the system. An example of this was in new skills training, which facilitated their adjustment towards the system (it was also difficult for users to resist the system in which they participated in). Users training was designed based on both departmental and users needs on the system.

At Safeway, GIS had been employed not just for site selection decisions but also for other marketing mix decisions such as product developments and promotions. Throughout the years there was a lot of implementation progress, e.g., in hardware upgrading and data update.

CASE 4

BOOTS THE CHEMISTS

8.4.1 Background of the Company

Boots The Chemists (Boots) is a leading health and beauty retailer with stores throughout the UK, ranging from small community stores to city centre departmental stores. Boots is a subsidiary of Boots The Company, one of the UK largest multinationals. Within Boots The Company, there are seven subsidiaries;

- Boots The Chemists (health and beauty)
- Boots Opticians (opticians)
- Halfords (auto-parts)
- Homestyle (home decorating)
- Do It All (Do-it-yourself home products)
- Boots Contract Manufacturing (contract manufacturing) and
- Boots Property (real property development)

Boots continues to be successful in leading the health and beauty market with its own brands through the manufacturing abilities of its sister company, Boots Contract Manufacturing (BCM)[61] which facilitated the introduction of numerous own brands. Boots has the largest Electronic Point of Sale (EPoS) network with over 13,000 till across Europe and more than 1,200 of its stores were linked through the electronic business communication network. At the time of the study, Boots's sales (over-the-counter) account for a quarter of the sales (over-the-counter) of medicines market[62]. There were about 3,600 pharmacist working at the company, providing day-to-day consultation to its customers[63]. In sum, Boots is a market leader in virtually all health and beauty product categories. They have maintained this position in the face of heavy price competition which has intensified among health and beauty retailers.

8.4.1.a) Competition and Market Share

Major health and beauty retailers make up the bulk of Boots's competitors. Boots leads the health and beauty market by showing a steady growth in its profits and turnover since 1993. Boots believes that in the next decade they will be confronted with tough challenges from its competitors and GIS was

[61] Boots Contract Manufacturing (BCM) is one of the three largest contract manufacturers in Europe. It develops and manufactures a wide range of own brand products for BOOTS.
[62] Boots Annual Report, 1997.

viewed as the means to attain and increase its competitive advantage[64].

8.4.1.b) Store Development and Format

As the largest subsidiary within Boots The Company, Boots was responsible for more than 1,200 stores, offering a wide range of health and beauty products. Most of the Boots's stores were located in city and town centres. The remainder was in suburban departmental stores and malls. There was also an increasing amount of stores in airports and railway stations. These stores can be set into four categories as detailed in Table 8.10.

Table 8.10 - Boots the Chemists (Store Categories)

Type of stores	**How many**
Small (< 600 metres square feet)	192
Large (> 600 metres square feet)	1,050
Free-standing photocentres	5
Healthcentres	11
Total	1258
Smallest store in square metre (East Grinstead)	16.5
Largest store in square metre (Manchester)	3,923

Source; *http;//www.homestyle.co.uk/finance/finhigh.htm*

[63] *Ibid.*, 1997.

[64] GIS Project Manager (GPM) believed that it was likely that GIS would rise to dominate as a key tool for Boots's strategic planning.

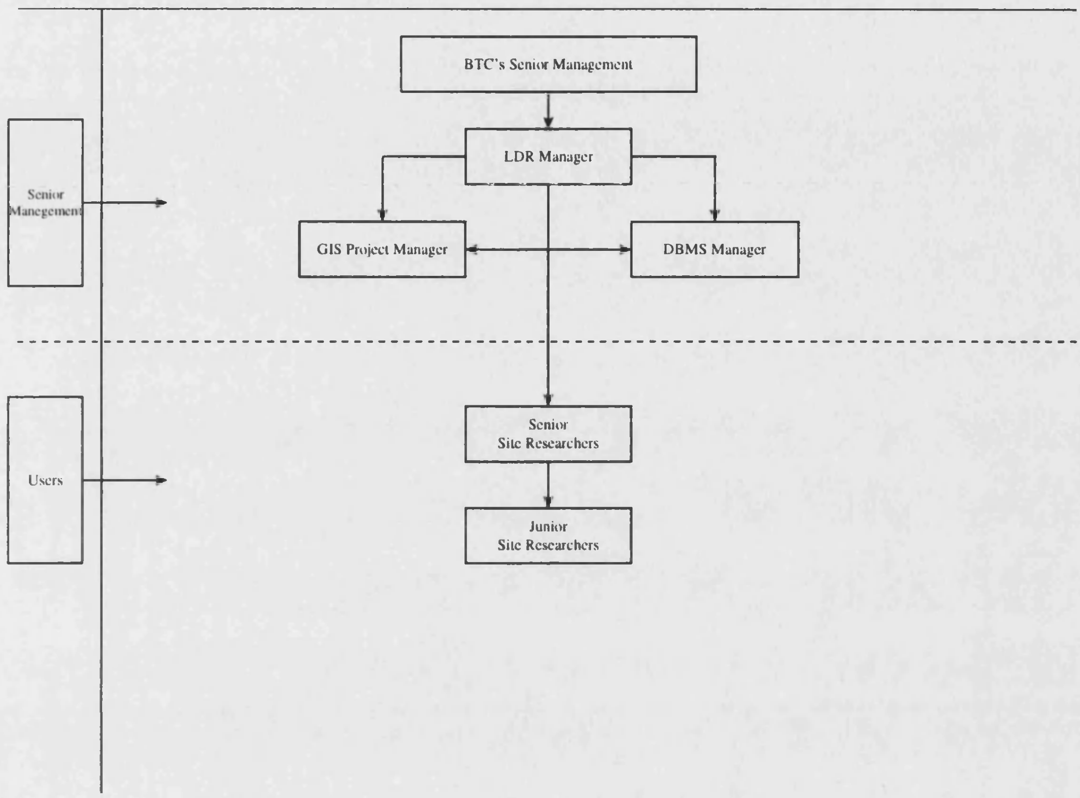
Boots continued to grow through the acquisition of independent pharmacies into their existing chains (Boots competitors';, AAH Trading, Lloyds, and UniChem were employing the same approach) and a significant amount of development activity, e.g., store renovations were undertaken as a result of this approach.

8.4.2 GIS Implementation Process at Boots

8.4.2.a) The Role of Locations and Development Research (LDR) Department

The key business objective of the Locations and Development Research Department (LDR) was to advise Boots on where it should profitably invest in new sites (new store openings). There were about 15 site researchers working with the department. They also provided advice to Boots's senior managers in their attempt to acquire independent pharmacists into their existing chains. At the time of the study, LDR was monitoring more than 1200 Boots stores throughout the UK. Figure 8.7 further illustrates the LDR's organisational structure. GIS was employed by LDR in predicting consumer expenditures and sales volume for new sites and to determine the its appropriate size.

Figure 8.7 - LDR's Organisational Structure



8.4.2.b) Historical Development

The ideas behind GIS were first introduced by LDR during the early 1990s in identifying new sites after a period of dissatisfaction and unhappiness with 'traditional' site selection decisions approach (hard copies of maps were "unable" to satisfy the department accelerating pace of development). This idea was also in line with Boots's aim of consolidating market position through the acquisition and opening of new stores. The situation was further described by the GIS Project Manager as,

> *"We were in the position of knowing lots about town centres and lots about chemists' business but we know nothing about out-of-town retail. So we started to look around for tools that would help in our decision making process."*

Initially, site researchers at LDR were using different colour pins on paper-based maps to represent their current and proposed locales as well as competitors' sites (typically they also had to do their own data collection and analyses). In 1995, a PC-based GIS (stand-alone) from CCN Marketing[65] was introduced by LDR in selecting Boots's new sites, especially in developing sales forecasting models (e.g., gravity models). The system was chosen as it was "stand alone" which gave the key benefits of helping them to develop their understanding of a GIS without disrupting other DSS and data. This system revealed a new era of GIS

[65] CCN Marketing is based in Nottingham, UK, which primarily involved in developing the PC-

technology to Boots. Following the evolution of GIS technology (strategic benefits in the system), LDR decided to purchase Smallworld GIS. The process of implementation took place in a series of many parallel operations, which occurred simultaneously. Based on the presentation made by the champion's, e.g., GIS Project Manager, a large amount of funding was secured by LDR to purchase a GIS. The project was jointly managed by LDR and Information Technology Department (ITD). ITD played its role by offering its technical expertise, i.e., ITD representatives worked alongside LDR site researchers in developing the system throughout the implementation.

The first stage of the implementation started with the modelling process of the entire framework of the implementation management (see Figure 8.9). Their vision was to bring all the sub-components (separate databases, hardware and software) under one system as a "corporate tool" for all Boots's subsidiaries[66]. The planned GIS was to have a profound impact upon how they viewed their markets and how they developed their business based on those views of the market. Initially, it was not perceived as having a major influence on Boots's information technology planning.

Once the system was in hand, many development activities commenced in parallel within a short space of time. By this stage (first 3-4 weeks), users were

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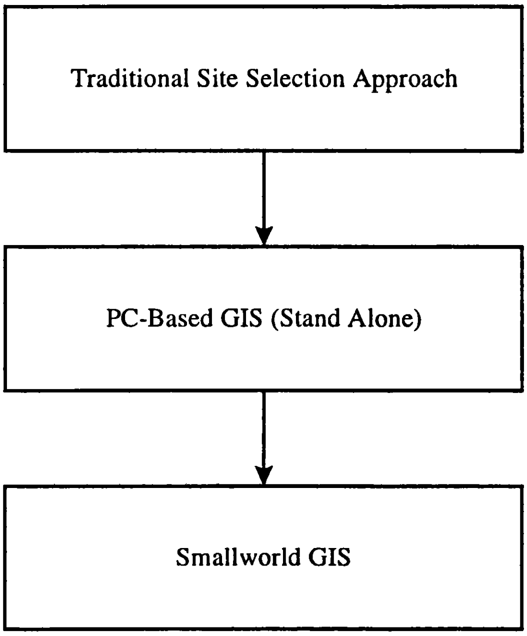
based GIS.

[66] GIS sub-components are referred to the existing hardware and software used in making the system works.

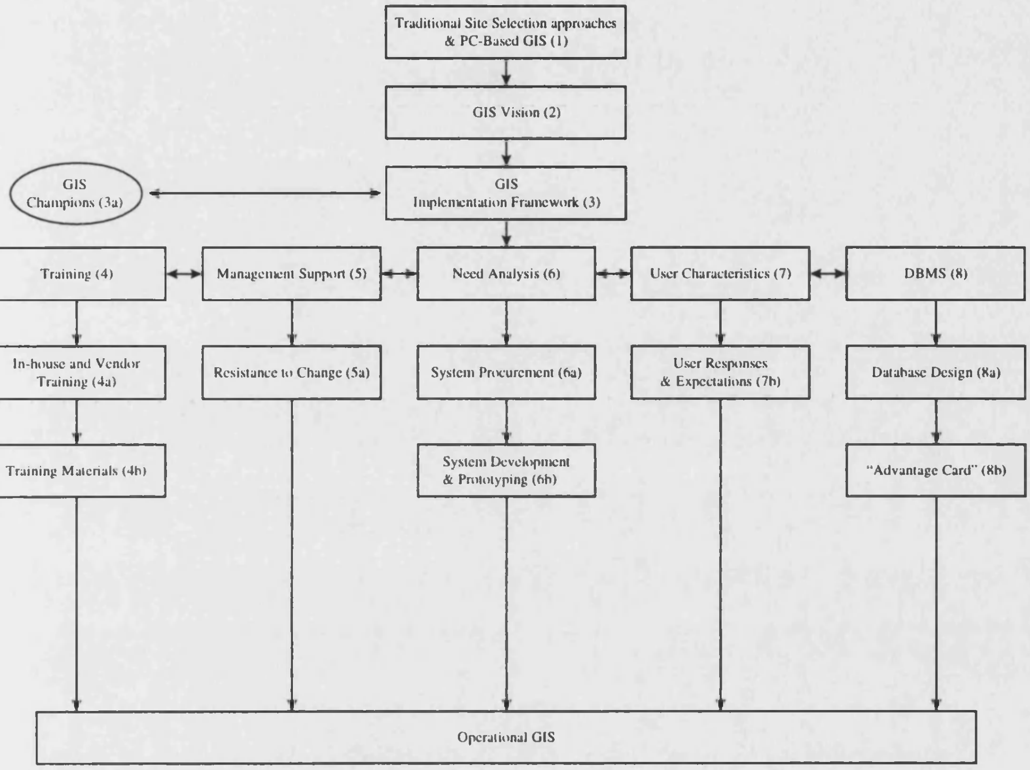
experiencing a period of "system crashing". Part of this was due to user discomfort in using the technology. This may be considered as natural in any systems implementation. Users with "faith" in the technology kept coming back to scrutinise the system. It was revealed in the interviews that users' familiarisation period was dependent upon the level of their experience in GIS and their efforts in scrutinising the system (e.g., an average user will take about 4-6 months in familiarising themselves with the system). Figure 8.8 further illustrates Boots's historical evolvement of the technology.

Figure 8.8 - Boots GIS Development



Meanwhile, the implementation of the system was aided by the siting of both LDR and ITD at the same location, the corporate headquarters that is in Nottingham. As a result, exchange of data and communication were effective and rapid, which may contrast with organisations that have a decentralised ITD away from their corporate headquarters. At the point of this study, there were about ten site researchers working in the department. The relatively small departmental size facilitated effective formal and informal communication amongst its members. Figure 8.9 summarises the Boots GIS implementation process framework.

Figure 8.9 - Boots GIS Implementation Process Framework



8.4.2.c) GIS Champions (3a)

The adoption of the technology in Boots was driven by a group of GIS enthusiastic senior managers and users. This approach was described by the GIS Project Manager as, *"So it's striking a balance between making people feel involved or not."* There was a group of site researchers (senior managers and users) who actively supported the implementation effort and who may be known as system champions. They acted as an interface between both the users and senior management (who can vigorously support the initiative).

8.4.2.d) Training (4)

At Boots, a high emphasis was placed on training its site researchers. At the initial stage of the implementation, users were somewhat annoyed with the sophistication of the system. The situation was describe by one of the users as,

> *"They get annoyed because they cannot use it [GIS] and they feel that they should go for some formal training." She further added by describing, "The utilisation of the technology was considered as a big jump by most of the users at LDR. Most users have not had any experience. I sort of went into Boots with no experience at all."*

They ensured that anyone whose work was affected by the system was properly trained. The emphasis of the training was on familiarisation with the system. Users were exposed and trained in the same manner as senior managers including specific knowledge on;

- The underlying concepts of GIS and site selection decision models
- Functional components of GIS and how the system will work e.g., specific tasks which have to be performed

In addition, continuous informal training was given by those who participated in the training courses conducted by the vendors and in-house trainers', e.g., Smallworld (as a major vendor for Boots) which often provided off site training on their system. These sessions include both lectures and hands-on training in a focused environment. Those users who were left out for the training courses, e.g., conducted by the Smallworld were found to be somewhat uncomfortable with the system. Senior managers were aware of these dissatisfactions. As result, they played their own role in convincing users about the "irrelevancy" of general training courses conducted by the vendors. The approach conducted by the vendors was described by one of the champions as,

> *"They [Smallworld] will be telling you lots of thing which retail companies don't really need to know. It was not really "angled" towards our needs."*

8.4.2.d.i) Training Materials (4b)

In planning for the system's training, LDR senior mangers and ITD system developers realised the importance of well-prepared training materials. It was difficult to over-stress the importance of adequately documenting the database design and subsequent implementation efforts. Boots believed that documentation was necessary if site researchers were to have confidence in the data and if the database was expected to remain functional beyond the tenure of those that originally conceived and built it. Proper compilation of training materials was organised to smooth the implementation process as well as for future users' references. In addition, independent consultants were brought into LDR to help with the building and training of the system.

8.4.2.e) Management Support (5)

Management commitment and support were critical and essential for successful implementation of the system. Maintaining support for a GIS implementation required a deliberate balance between enthusiasm and reality. As a result of a series of successful presentations to senior managers and users by the champions, GIS was well received and was consequently given a priority for implementation. Continuous management communications (e.g., electronic-mail announcements, regular departmental meetings) were perceived as essential in smoothing the implementation process as well as clearing the "doubtful thoughts" possessed by senior management and users. As one of the users described,

> *"I think management has a very big role to play in helping and guiding you and we know it will take longer to use initially because you are not use to using this. Its quite a radical change in how do you work."*

Most users at Boots were "sold" by their superiors (senior managers) on the features of the system in performing their tasks (due to the small number of staff members within LDR, face-to-face communication was used as a major mode of discussion). Various types of support could be seen at Boots, e.g., GIS literature (circulars, magazines and manuals), were made available by senior managers to help users further understand the technology. Meanwhile, senior managers were also aware of the increasing difficulties in managing the system (e.g., resulting from the increasing amount of data). They believed that the team working spirit was high within their department, which in turn has smoothed the implementation process. There were also a few expert users who were "wandering" around the department to help other users with their queries about the system. In addition, after exposing the system to other influential senior managers (perceived to be potential champions), more discussions were held by the GIS Project Manager to promote GIS further.

8.4.2.e.i) Resistance to Change (5a)

Nevertheless, there were also user resistance (users who were somewhat uncomfortable in using the technology) but as the implementation activities proceeded, resistance was slowly being overcome by users themselves, through the support provided by their senior managers. In encountering these resistances, the GIS Project Manager described his approach as,

> *"There has been resistance and it's a bit like sort of rugby playing. All you can do is just bend down your head and keep going."*

8.4.2.f) Need Analysis (6)

The design of a GIS can only be as good as the analysis of the need for that system. At Boots, need analyses were established within the context in which the system was to be used. Prior to the purchase of the system, a survey on user needs was conducted by the GIS Project Manager. As the GIS Project Manager (GPM) described,

> *"We felt that we needed to understand how the GIS was going to be used before we could reasonably select a GIS."*

Once the "understanding" of users was in hand, the GPM moved forward by searching for a GIS, which was available in the market that could fulfil these specified needs. The quality of information elicited during the need analysis stage depended upon how successfully system developers and managers established mutual understanding with users.

8.4.2.f.i) System Procurement (6a)

At this stage, prior knowledge (GIS lessons learned) gained whilst employing PC-based GIS acted as a guideline for the procurement of a better GIS. First, GIS vendors were "scanned" for their system's functionality (features) and flexibility. Some of the GIS were unable to meet the expectation outlined by LDR. Following this scanning process, Smallworld GIS was found to be the most suitable in achieving the specifications outlined by the department. Having thoroughly conducting the reviews, a recommendation to purchase Smallworld was made to senior management. One major influential factor in leading LDR to Smallworld procurement was the flexibility of the system[67]. In general Smallworld was able to meet the "open systems" requirements characterised by LDR.

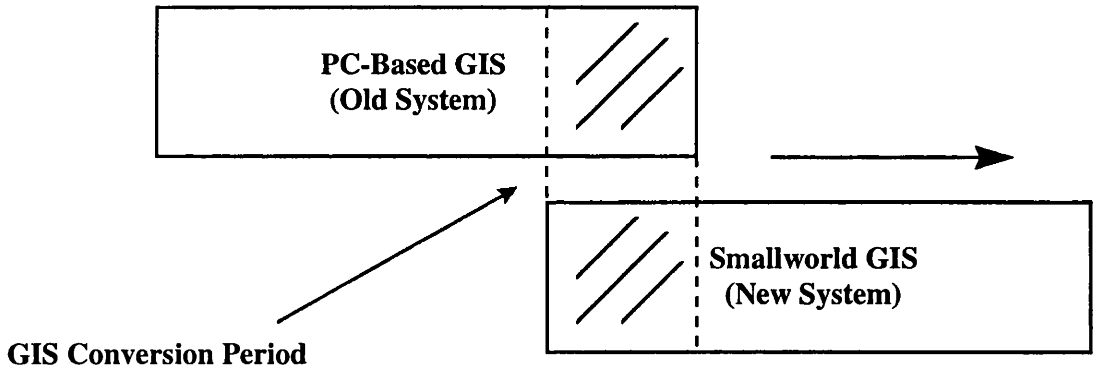
[67] System flexibility refers to the system's ability to accommodate operational and strategic uses, not just in site research applications but also in various GIS-related applications such as routing and transportation management applications.

8.4.2.f.ii) System Development and Prototyping (6b)

A part of Boots's GIS implementation was the process of developing and prototyping the system's applications. During implementation, users often experienced difficulties in that they could not foresee the implications of their job structures. Running prototypes (live trials) offered a very effective way of revealing the implications and was employed to experiment with difficult job structures and test the flexibility of the application. In developing and strengthening the system's application, a consultant (who was used to develop Tesco's GIS) was brought into LDR to develop some basic GIS applications through GIS prototypes. System's prototyping was created not just to evaluate the "technicalities" of the system but also to understand users' feedback and responses. Encouraging users to participate in these piloting processes allowed refinement of their requirement interface, as well as exposing the strengths and weaknesses of the recently developed applications. The use of prototyping ensured that implementation users were delivered a system that not only fulfilled their requirements but also possessed an important property of familiarity. The process of prototyping allowed senior managers to clearly demonstrate the necessity of GIS in the attainment of LDR's key business objectives.

Moreover, in implementing the system, "a parallel" conversion strategy was used by LDR senior managers in converting the old PC-based GIS to the new system (see Figure 8.10). The advantages of running both systems in parallel included the possibility of checking any errors in the new system. Parallel processing also offered a feeling of security to users who were forced to make abrupt changes by the new system (it was understandable that site researchers within LDR who were faced with a choice between two systems would continue with the old one because of their familiarity with it).

Figure 8.10 - The "Parallel" GIS Conversion Process



8.4.2.g) User Characteristics (7)

In facilitating user involvement, regular team meetings were conducted by LDR senior managers to further understand user characteristics. In these meetings, users were encouraged to share their insights on the system. As one of the users described, "*We all say what we wanted GIS to do and everyone could give their* *ideas."* These meetings were beneficial in developing the system based on user responses and expectations.

8.4.2.g.i) User Responses and Expectations (7a)

Although users were fundamentally involved and encouraged to participate in the implementation process, there were still some "uncomfortable" users. There were users who were somewhat "negative" particularly during the introductory stage of the system. This situation was described by one of the users as,

> *"There is a lot of resentment if you introduce a system and don't train people on it. They get annoyed because they can't use it and they feel that they should go for some formal training as well."*

She further added,

> *"Everyone is getting a bit angry. They were just trying to do the work and the old system has been out. Instead, we have this new system and we don't know how to use it. So for a few weeks there is a quite a lot of people using the old system rather than the new system."*

Users expected senior management to continuously inform them about the developments of the system especially in events such as a system's crash. This expectation was described by one of the users as,

> *"If you tell people why it is crashing or why it is slowing, everybody is a lot happier."*

However, a user "negative" characteristic does not always hinder implementation process. It was also revealed that there were also some advantages of having a group of system "sceptics". The characteristics of these sceptics were described by the GIS Project Manager as,

> *"I think sceptics have a really useful role to play because as someone who are supporting it tend to get enthusiastic but sceptics will say, "Hang on! How's it again to do that, all that?" I think that's very valuable to keep some sceptics in the team."*

8.4.2.h) Database Management System (DBMS) (8)

LDR approached the process by systematically assessing user responses and expectations in developing the database design. Data sets were automated in house, immediately after GIS installation. This often occurred because users were pressured by senior management to demonstrate results that were obtained with the newly acquired system. The consequence of this pressure was often hasty action that could potentially lead to a series of ill-conceived systems.

The transfer of data from analogue documents to digital forms represented one of the most time consuming and costly steps in creating an operational GIS. Much of the conversion activity typically involved a human operator who was interacting with instrumentation, e.g., digitiser or scanner, that transforms two or three dimensional data stored in the hardcopy format into precise digital co-ordinates. GIS data can be very quickly accumulate into very large volumes, even for a geographically small area, especially if many types of information were to be stored or the needed spatial resolution was high. The total volume of data needed for a given application is the primary determinant of the required efficiency and storage capacity of the computer hardware environment that is needed.

8.4.2.h.i) Database Design (8a)

It was the responsibility of senior managers that users were identified and involved in the process, which in turn allowed database design to be conducted. However, a system cannot be successful unless the ultimate users felt a need for the system. Some of the major factors that influenced LDR GIS database design included the evaluation of the data needs for system's applications which will be developed. LDR believed that it was important to understand these issues before implementation began. As a result, a review was conducted of data resources and a review of how the data would be maintained. Database designs and implementation plans more often than not required modifications.

8.4.2.h.ii) Boots's Loyalty Card and GIS (8b)

As retailing becomes increasingly competitive and retailers showed signs of turning to long term loyalty schemes as a means of enhancing the overall quality of the trading offer (in an attempt to retain as high a proportion of existing customers' expenditure as possible), a scheme was designed by Boots to reward its loyal customers and to provide the company in its development with new and detailed data on customer shopping characteristics databases. This approach was perceived to be more comprehensive than their traditional market research.

The data derived from the scheme were perceived to be crucial for site researchers in running their site research models (e.g., better understanding of the variables involved) and thus enriched the dimension of current site research profiles. This scheme was introduced to encapsulate the increasing amount of customer's data which allowed the updating of current customer needs (also reflecting the latest market conditions significant to LDR).

8.4.3 Summary

Boots is the market leader amongst UK health and beauty retailers. More sites throughout the country are being explored and considered for development. The implementation of Geographical Information System (GIS) has supported Boots in achieving its aim to lead the market by targeting locations where new stores can be developed that attracted new customers and ensuring that existing customers are retained. Their GIS allowed a shortening of the period taken in site selection decision processes where a lot of potential sites have to be assessed.

The implementation knowledge represented a more thorough understanding of the systems development and implementation process. During the preparation of this case, the following became obvious concerning the implementation steps;

- The implementation steps were not independent but interrelated. One step may lay groundwork for another step or the extension of still another step, e.g., user responses and expectations and database design activities
- These steps were not sequential and several steps may be done simultaneously, e.g., management support and database design
- These steps were not a one-time function but are interative. One step may feedback and improves or reinforces another step. The results of one step may require revision or improvement of a previous step, e.g., database design activities and user responses and expectations

The implementation process forced LDR senior managers and users to work closer with each other i.e., discussing new procedures of using the system. GIS implementation was smoothly completed by LDR due to the high level of commitment within the department together with a close support provided by the

ITD. The ability of senior managers to determine whether the information to be presented in the system outcomes was perceived as useful or significant to the success of the system. Successful implementation involved the development of a strategy for controlling the implementation process. Senior managers analysed user characteristics and the environment of those characteristics to determine the felt need for the proposed GIS.

User suggestions generally were elicited and considered for applicability. One of the major obstacles to user involvement, was fear. Fear caused by imagined threats (fear of the unknown). Fear was seen to be reduced by well developed and thought out indoctrination and training programmes. In short, user input was essential to reduce fear and to benefit from their suggestions throughout the implementation process.

Searching for a potential champion was generally seen to be vital to initiate GIS implementation. If no one was found to champion the system, senior managers should consider either abandoning the project or making it more attractive to a potential champion. In other words, if no one of high status in the organisation had any interest in pushing the system, its chances of success were probably quite low.

A prototype that incorporates all elements is strongly encouraged before embarking on large-scale development network. In this case, it yielded several benefits, including;

- Identifying the obstacles by testing the physical hardware and software performance
- Enhancing participation by encouraging users to participate in the evaluation process that allows refinement of their needs. A GIS that provides a quick, interative design response with a "demonstration" database may become totally overwhelmed as the "real" database becomes available for use. Whilst directly affecting users, most system implementation fails because of inadequate training. Proper training does not just tell users how important their contributions are; it lets them see that they are an important integral part in the entire process and that the success of the system depends on how will they do their job.

Chapter Nine

Cross-Case Analyses

9.0 Introduction

This chapter is divided into three key parts. The first part outlines the underlying reasons for conducting the cross-case analyses as well as the data verification process and its method. The second part describes the grounded theory approach employed in analysing the key outcomes of the four case studies that have been presented in Chapter 8. The aim is to develop and integrate core categories[1] and sub-categories that emerged from each case study for building the grounded theory. Finally in the third part, a theory of Geographical Information Systems (GIS) implementation success of UK retail organisations that was generated using the grounded theory approach is presented.

[1] The core category, e.g., the central idea, condition, event or happening and is defined as the phenomenon (Pandit, 1996).

9.1 Cross-Case Analyses

9.1.1 Reasons for Cross-Case Analysis

Each individual case has been presented, they are unique and relevant in their own right, and it may be argued that is how they should stay. However, there are arguments for comparing similarities and dissimilarities that may exist between these cases.

The first reason is *to enhance the generalisability of the study.* Although it is argued that this goal is inappropriate for qualitative studies (Denzin, 1983; Guba and Lincoln, 1981), the question does not go away. Readers would like to know something about the relevance or applicability of the findings to other similar settings (e.g., the non-food retailing industry such as banks or insurance). As Miles and Huberman (1994) posited, *"Do these findings make sense beyond this specific case?"*

The second reason is *to deepen an understanding and explanation of the study* (Glaser and Strauss, 1967). They argued that by using comparisons to find out under what sets of structural conditions the findings are minimised and maximised. Multiple case studies not only pin down the specific conditions under which a finding will occur but also help the researcher to form a more general set of categories of how those conditions may be related. As Silverstein (1988) put it,

> *"We are faced with the tension between the particular and the universal; reconciling and individual case's uniqueness with the need for more general understanding of generic processes that occur across cases".*

9.1.2 Method of Analysis

The data were analysed across the four sites to detect similarities and differences. Within Tesco (the first site), the iterative approach to collecting, analysing and coding of data were more open-ended and generative than at Somerfield, Safeway and Boots, in which the focus was on the development of core and sub-categories[2]. Content analysis was employed in analysing the data. The data was read and categorised into concepts and sub-concepts (that were suggested by the data rather than imposed from outside[3]). This process is known as "open coding" (Strauss and Corbin, 1990). It relies on an analytic method for identifying possible core categories, sub-categories and their dimensions. Once all the data were analysed, the core and sub-categories were organised by recurring themes. These themes then became key candidates for a set of common and stable categories that linked with a number of related concepts. This process is known as "axial coding" (Strauss and Corbin, 1990). It relied on an analytic method of making relations between sub-categories. The Tesco data was re-analysed and re-coded using the proposed method with the aim being to determine the set of core and sub-categories that covered as much of the data as possible. The iterative re-analysis yielded a set of broad core and sub-categories and related concepts that described the salient conditions, consequences, events and experiences associated with GIS implementation process. These initial sets of categories and sub-categories guided the second (Somerfield), third (Safeway) and fourth (Boots) case studies, allowing the process of collecting, analysing and coding the data to be more targeted.

[2] Following the descriptions of how to generate grounded theory set out by Glaser and Strauss (1967), Eisenhardt (1989) and Pandit (1996).

Following the "constant comparative analysis method" as proposed by Glaser and Strauss (1967), Somerfield, Safeway and Boots data (experiences) were contrasted with those of Tesco. The analysis also employed Miles and Huberman (1984) method for across site contrast and pattern clustering that involves matrix displays (to contrast key experiences, events and consequences). The same process was employed for analysing Somerfield, Safeway and Boots data. The data was first sorted into the initial concepts and sub-concepts generated by Tesco's data.

It soon became clear; however, that the initial concepts generated by the first site (Tesco) did not accommodate some of the findings emerging from the second, third and fourth sites. Accommodating Somerfield, Safeway and Boots experiences led to significant clarification and elaboration in that an emerging theoretical framework forced a reconsideration of some of Tesco's core and sub-categories. Redefining the initial concepts to incorporate considerations of Somerfield, Safeway and Boots experiences required a re-examination of Tesco data and re-analysing and re-coding them to make account of deeper relationships and richer concepts[4]. The iteration between data and concepts ended when sufficient categories, sub-categories and related concepts had been defined to explain what had been observed at all sites and when no additional data were being collected or found to add or develop to the set of categories and sub-categories. A situation Glaser and Strauss (1967) described as "theoretical saturation".

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[3] Agar (1980).
[4] This ability to incorporate unique insights during the course of the study is one of the benefits of a grounded theory research approach, an example of what Eisenhardt (1989) labels as *"controlled opportunism"* where *"researchers take advantage of the uniqueness of a specific case and the emergence of new themes to improve resultant theory"* (p. 539).

The resultant framework is empirically valid because it can account for the unique data of each site and can generalise patterns across the sites (Eisenhardt, 1989) and precautions were taken to corroborate the interpretations made by re-asking another respondent with the same information in the same department (Miles and Huberman, 1984; Yin 1994). Emerging concepts were checked for representativeness by examining them across participants and with triangulation of methods. Triangulation across sites and across data collection methods (interviews, observation and archives) further served to strengthen the emerging categories, sub-categories and concepts. The constant comparative method also requires checking of contrasts and searching for negative evidence, thus forcing the confrontation of emerging explanation with possible alternative ones.

9.2 Verification of the Case Data

Verification of the case data was achieved by cross-checking the data collected from the respondents. The data collected was cross-checked by re-interviewing other respondents using the information that had been gathered from interviews conducted earlier in the same organisation. In this case, key contents of previous interviews were reviewed by re-asking the same questions (confirming the gathered key contents). For example, in the case of Tesco, the first interview was conducted with the GIS Project Manager and his data were transcribed, forming a "draft" that served as a framework. Feeding findings back to informants is a venerated, but not always executed, practice in qualitative research. Bronfenbrenner (1976) classified feeding findings back to informants as a source of "phenomenological validity" while Guba (1981) built it into his repertoire of devices for assuring the "comfirmability" of findings. As noted by Miles and Huberman (1994, p. 262), *"Sometimes the interpretations of case respondents do not match those of the researchers [mine]"*. This strategy is in line with the strategy proposed by K. Y. Yin (1994, p. 35) in increasing case studies construct validity (through the establishment of multiple sources of evidence and a chain of evidence). This strategy of multiple sources of data and methods increased the robustness of research results.

9.3 The Emerging GIS Implementation Process Core and Sub-Categories (Core and Sub-Concepts)

Several core and sub-categories have emerged from the cross-case analyses[5] through the employment of the System Development Life Cycle (SDLC) and "constant comparative analysis method" (Glaser and Strauss, 1967) as guidelines in developing the conceptual framework. In short, these core and sub-categories are summarised in Table 9.1 followed by a detailed analysis presented in Table 9.1.1, 9.1.2, 9.1.3 and 9.1.4;

[5] With the aim to understand the GIS implementation process phenomena.

Table 9.1 – Summary of the GIS Implementation Process Core and Sub-Categories Cross Case Analyses

Core Category	Sub-categories
1) Organisational context	• Nature of business • Rank in industry
2) Store development context	• Number of stores • Store development format • Number of site researchers
3) GIS used	• Site-selection approach prior to GIS • Current GIS employed
4) Forces towards GIS implementation context	• Internal forces • External forces
5) System Development Life-Cycle	
i) Activities prior the implementation of GIS	• Implementation planning • Implementation objective • Senior management awareness • Senior management support • Role of GIS champion(s) • Need analysis • Application and system development • System procurement • Database Management Systems • User awareness and involvement • Resistance to change • User training • Vendor support • Role of the Information Systems Department (ISD)

Table 9.1 (continued)

Core Category	Sub-categories
System Development Life-Cycle (continued)	
ii) Activities during the implementation of GIS	• Implementation planning • Senior management awareness • Senior management support • Role of GIS champion(s) • Need analysis • Application and system development • Database Management Systems • User awareness and involvement • Resistance to change • User training • Vendor support
iii) Activities after the implementation of GIS	• Implementation planning • Senior management support • Role of GIS champions (s) • Need analysis • Application and system development • Database Management Systems • Loyalty Card • User awareness and involvement • Resistance to change • User training • Vendor support

Table 9.1.1 - GIS Implementation Process; Activities and Findings

Categories	Sub-categories	Tesco	Somerfield	Safeway	Boots
Organisational context					
	Nature of business	Food Retailing	Food Retailing	Food Retailing	Health and Beauty Retailing
	Rank in industry (market share[6])	1^{st}	6^{th}	3^{rd}	1^{st}
Store development context					
	Number of stores	870[7]	615	490	1260
	Store development format	It develops 4 different store formats (super, neighbourhood, metro and express store) to suit different customer needs. Out of town stores have proved to be a successful format	Unlike Tesco, it supports the government's stance in opposing the mushrooming of large out of town stores. Key concentration is in town centres	Key development trend was to have a relatively small store size (average store size was 20,500 square foot) in which was smaller than its competitors. Out of town centres have proved to be a successful format	Key development trend was in city and town centres. There is an increasing amount of stores in airports and railways stations
	Number of site researchers	25	5	15	10

[6] As of 1998 (http;//www.infoseek.com/Content?arn=9046&qt=tesco&sv=A2&col=HV&kt=A&ak=copdir).
[7] As of 1997 (Tesco Annual Report, http;//www.tesco.co.uk/report97/accounts/page15.html).

Categories	Sub-categories	Tesco	Somerfield	Safeway	Boots
GIS used	**Site-selection approach prior to GIS**	Manual evaluation of potential sites and their catchments by pasting different colour pins on paper-based maps	Stand-alone PC-based GIS	Manual evaluation of potential sites and their catchments by pasting different colour pins on paper-based maps Stand-alone PC-based GIS	Manual evaluation of potential sites and their catchments by pasting different colour pins on paper-based maps Stand-alone PC-based GIS
	Current GIS used	UNIX-based programming site research simulation Network-based GIS by Smallworld Systems	Stand-alone PC-based GIS by CCN Marketing	Network-based GIS by Laser-Scan	Network-based GIS by Smallworld Systems

Categories	Sub-categories	Tesco	Somerfield	Safeway	Boots
Forces towards GIS implementation context	**Internal forces**	• Disorderly managed and increasing amount of both internal and external data sets • An ever-increasing sophistication of site research modelling • Non-graphical site selection modelling outcomes • Continuous internal pressure to lead the market by senior management	• An ever-increasing sophistication of site research modelling • Internal pressure to maintain its current position in the market	• An ever-increasing sophistication of site research modelling • Prolonged frustration faced in using the old system, i.e., it was unable to provide customised Store Information Department (SID) site research needs • Non-graphical site selection modelling outcomes	• Disorderly managed and increasing amount of both internal and external data sets • An ever-increasing sophistication of site research modelling • Non-graphical site selection modelling outcomes • Continuous internal pressure to lead the market by senior management
	External forces	• Intense competition faced within the industry • Competitors' investments in GIS • Mushrooming amount of GIS data and vendors (which had facilitated the evolution of GIS) • World-wide retailer's attention towards GIS	• Intensification of competition • Mushrooming amount of GIS data and vendors (which had facilitated the evolving of GIS)	• Intensification of competition • Competitors' investments in GIS	• Intensification of competition • Mushrooming amount of GIS data and vendors (which had facilitated the evolving of GIS) • World-wide retailer's attention towards GIS

Table 9.1.2 - Activities Prior to GIS Implementation

Categories	Sub-categories	Tesco	Somerfield	Safeway	Boots
System Development Life Cycle (SDLC)					
Activities prior to implementation					
	Implementation planning	Planning was initiated by the Site Research Department (SRD) Director. A vision was established for GIS implementation	There were no goals and plans established in implementing the system	Planning was initiated by the SID Director. A series of discussions were conducted with GIS specialist in non-competing organisations outside SID prior to GIS implementation	Planning was initiated by Location and Development Research (LDR) GIS Project Manager. It was not perceived, as having a major influence on BTC's overall IT planning
	Implementation objective	The system was first applied as a means of taking out some risk from key investments decisions (as the company sought growth through new stores).	The system was first applied as a means of improving the accuracy of the sales forecasting models and decisions through; a) A better control over data b) A better control over costs There was no ambitious objective for GIS implementation	The objective was to implement a system that will meet all critical departmental business requirements, i.e., improved site research decisions	The objective was to bring all the sub-components (separate data sets, hardware and softwares) under one system as a "corporate tool"
	Senior management awareness	Sufficient senior management awareness. A small number of senior managers were starting to realise the benefits of the system	Insufficient senior management awareness. GIS benefits were realised only by a small number of senior managers in the organisation	Senior management was fully aware of the technology. GIS was given a priority for implementation	Sufficient senior management awareness. GIS was well received and was consequently given a priority for implementation
	Senior management support	Senior management was responsive and supportive, i.e., commitment was seen through the development of site research models and upgrading of system equipment.	Support received from senior management was very minimum except in the provision of funds. The minimum level of support is believed to be one of the contributing factors towards the marginal applications of the system	Implementation of the technology proceeded slowly with commitment and support from senior management	Senior management was responsive and supportive. Continuous management communications, e.g., regular departmental meetings, face-to-face informal meetings and electronic mail announcements were perceived as essential in smoothening the implementation process

Categories	Sub-categories	Tesco	Somerfield	Safeway	Boots
	Role of GIS champion (s)	Led the system implementation by working together as a team. Tirelessly selling the idea to other potential users about the system	Insufficient roles played by the champion. The manager responsible was unable to perform all the activities required on his own in implementing the system. He was also unable to fight the counter implementation threat posed by the organisation	SID Director led the system implementation by working together as a key team player	Senior managers drove the adoption of the technology by providing a series of presentations
	Need analysis	1) Data needs involved a systematic study of how valuable each type of data was. 2) User needs were determined by SRD senior managers through a series of formal and informal meetings, e.g., face-to-face interviews	Incomplete need analysis had led to the misidentification of the system requirements	Conceptual framework of the entire GIS implementation process was established through a series of need analysis based on users expectations, e.g., face-to-face interviews	A survey on user requirements was conducted by GIS Project Manager prior to the purchase of the technology
	Application and system development	System development strategy was based on SRD's e accumulated knowledge and experience, i.e., its daily site research activities	In terms of application and development, not much development has occurred (although it has employed GIS for about 10 years). Hardware and software were not replaced or upgraded as necessary to meet the expanding needs	Development strategy was based on SID's previous experience on its PC-based GIS	An experienced consultant was brought into the company to develop some basic GIS applications
	System procurement	An "incomplete" system was purchased by Tesco that was in line with the in-house needs which necessitated remarkable system flexibility	Procurement tasks were solely performed by SFD Head	An object-oriented GIS by Laser-scan was chosen due to the flexibility in its features in accommodating in-house GIS needs	Prior knowledge gained whilst employing the stand-alone GIS acted as a guideline for the procurement of the technology. Having thoroughly conducted the reviews, a recommendation to purchase Smallworld was made to senior management

Categories	Sub-categories	Tesco	Somerfield	Safeway	Boots
	DBMS	Multiple external and internal data sets were previously stored in mainframes, resulting in minimal problems of data conversion	Multiple external data sets were acquired from various data vendors	Besides relying on the external data vendors, internal data were converted into GIS format internally by SID with some help from the ISD	Database design was developed based on user responses
	User awareness and involvement	Users were invited and taught to be involved with the implementation process. They were told how they would fit into the process and what would be expected of them	There was a general perception that there is a lack of user awareness. User involvement was self-initiated. GIS benefits were realised only by a small amount of users in the department	Initially, there was only a minimum level of users involvement	Meetings were conducted to facilitate users awareness and involvement
	Resistance to change	Resistance was strong from those site researchers who were unfamiliar with the system	Resistance was strong from those senior managers and users who were unfamiliar with the ability of the system	Resistance was strong from those users who were unfamiliar with the ability of the technology	Resistance was strong from those users site researchers who were somewhat uncomfortable with the technology
	User training	Emphasis was given on the key principles of GIS applications in site selections. Junior site researchers were required to work alongside their seniors	Users were trained by CCN Marketing for the Mosaic system	Training strategies were determined by SID senior managers	Formal training was designed by the GIS Project Manager. Its emphasis was on the familiarisation of the system
	Vendor support	Several introductory applications were set-up by Smallworld	In-house and off-site training courses were provided by CCN Marketing to Somerfield on a regular basis. There was also a link with PinPoint in developing Somerfield's gravity models	Basic GIS applications were developed by Laser-Scan for Safeway. It has also conducted basic GIS training courses	In-house and off–site training courses were conducted by Smallworld Systems, the key vendor. Several introductory applications were set-up by Smallworld
	Role of the Information Systems Department	Primary function was to help SRD in maintaining the system hardware, back-ups and its daily running of the system as well as in training	Primary function was to help SFD in maintaining the system hardware	Primary function was to help SID in maintaining the system's hardware, back-ups and its operation	Primary function was to help LDR to advise Boots The Chemists (BTC) on where it should profitably invest in new sites

Table 9.1.3 - Activities During GIS Implementation

Categories	Sub-categories	Tesco	Somerfield	Safeway	Boots
System Development Life Cycle (SDLC)					
Activities during implementation					
	Implementation planning	GIS implementation planning was developed on a "phased introduction" basis	There was no "ambitious" plan for implementation of the technology	The implementation activities was jointly managed by SID' senior managers and users	The implementation activities was jointly managed by LDR and ITD senior managers and system developers
	Senior management awareness	The benefits of the system were realised not just by a large number of senior managers but also by other potential users	The abilities and benefits of the system were realised only by a small number of senior managers of the organisation	GIS ability and benefits were realised by a small number of senior managers and other potential users	GIS abilities and benefits were realised only by a small number of senior managers of the organisation
	Senior management support	Senior managers' commitment and support was present throughout this period	Senior management support was marginal	The role played by the SID Director in supporting the project was seen as the key advocate of the system	There were a few expert users who were assigned to wander around in the department to help other users with their queries about the system
	Role of GIS champions (s)	Kept GIS alive by serving continuous commitment in confronting the counter implementation threats faced	There was only the SFD Head who had pushed the system forward	SID Director was seen as the key advocate of the system, i.e., leading the Laser-Scan purchase	Most users were "sold" by LDR senior managers on the ability of the system in performing their tasks
	Need analysis	Observations were made by SRD senior managers on the existing system and discussions were held with users	No further need analysis was conducted at this stage	An analysis was carried out by SID senior managers and system developers on users expectations and ascertain what support and training were needed	Only informal discussions were conducted by system developers to understand users' expectations
	Application and system development	System developers paid careful attention to users' feedback in developing the applications.	GIS was employed throughout SFD but had never been developed further and has been recognised as a tool to strengthen sales forecasting and site research models	Application prototypes were created prior to the actual implementation of each application	System prototypes were created not just to evaluate the technical feasibility of the technology but to ensure that the system matched users expectations

Categories	Sub-categories	Tesco	Somerfield	Safeway	Boots
	DBMS	The most critical technical issue of data management was the problem of the system's base maps	The multiple sources of data sets were available in various format have caused severe data set management problems	Database management was handled internally by SID, i.e., maintaining and updating	Data sets were automated in-house immediately after GIS installation
	User awareness and involvement	Users held prime responsibility for maintaining and updating the system, i.e., the data sets	Users were becoming more aware and familiar with GIS	Users were holding primary responsibility in maintaining and updating the system	In order to be involved, users expect senior managers to continuously inform them about developments of the system
	Resistance to change	Extreme level of enthusiasm was shown towards GIS by the champions have reduced the strong level of resistance among other users	Difficulties were encountered during the turnover period	The prototyping processes have demonstrated a real working GIS to potential users	Resistance was slowly being overcome by users themselves, through the support provided by the senior managers
	User training	Careful attention was paid by SRD senior managers to the training of new recruits	No formal in-house training sessions conducted by senior management. Relied solely on the vendors	Scheduled and non-scheduled training courses were conducted by ISD and Laser-Scan in developing site researchers' GIS skill	User feedback was encouraged by LDR GIS Project Manager and system developers in developing the structure of the training courses. Informal training was also given by senior to junior site researchers
	Vendor support	Product and training support were provided through a series of regular visits	Vendor-client relationships had been established with key vendors	Collaborations were established between both Safeway and Laser-Scan, e.g., in training	Collaborations were established Boots and Smallworld, e.g., in applications developments and in training

Table 9.1.4 - Activities After GIS Implementation

Categories	Sub-categories	Tesco	Somerfield	Safeway	Boots
System Development Life Cycle (SDLC)					
Activities after implementation					
	Implementation planning	Implementation planning proceeded in parallel with implementation activities	Plans have been established to enhance the present ties with key GIS vendors	SID's plan was to have GIS employed throughout the organisation	LDR's plan was to have a profound impact upon how they viewed their markets and how they developed their business based upon those views of the market
	Senior management support	Can be seen through notable progress in terms of upgrading the system's equipment. GIS has been continuously employed by the department in developing the site research models	The level of support were still marginal	Senior management support was increased as the project starts to develop	Various types of support can be seen, e.g., GIS literature (circulars, magazines and manuals) were made available by senior managers to help users further understand the technology.
	Role of GIS champions (s)	Actively persuaded other senior managers to commit to the idea of implementing GIS within the entire organisation	The champion himself had an insufficient amount of faith in GIS to make it work.	Senior management at SID stressed the need for a joint effort by all senior managers, users and ISD staffs	They had acted as an interface between both the senior managers and users (vigorously support the implementation initiative)
	Need analysis	Continuous discussions and observations were made by SRD senior managers on the technology	No post implementation need analysis was conducted	Only informal discussions were conducted by system developers to understand users' expectations	Only informal discussions were conducted by system developers to understand users' expectations
	Application and system development	System developers, senior managers and users were both involved in creating the standards needed to run the applications	There was a plan to upgrade the SFD system hardware	Laser-Scan (the key vendor) commitment to open systems has ensured sufficient flexibility in choosing hardware database and users interface platforms which has enable them to produce a GIS that met SID's specific in-house needs	A "parallel" conversion strategy was employed in converting the old system to the new technology. It offered a feeling of security to users who were forced to make abrupt changes to the technology

Categories	Sub-categories	Tesco	Somerfield	Safeway	Boots
	DBMS	Local Area Network (LAN) was employed by SRD to transfer the data throughout the department. It was employed in transferring the "huge" bytes of map files. Internal and external data were maintained and updated on a regular basis	The existing external data sets acquired were maintained and updated	Internal and external data were maintained and updated on a regular basis	Database design was more often than not require modifications
	Loyalty card	Data derived from the loyalty scheme was linked to GIS. It enriched the site research models as well as other marketing mix activities, i.e., the promotional programmes	Somerfield database marketing activities were still in its infancy stage and its real benefits were not yet realised	GIS enabled graphical and non-graphical analyses of the information derived from the loyalty card	The information derived from the loyalty card scheme were perceived to be crucial by LDR in enriching its site research models (i.e., encapsulating a better understanding of the site research variables involved)
	User awareness and involvement	Users kept themselves aware of the system's development through their continuous involvement	Users were becoming more aware and familiar with GIS but the overall users involvement level was relatively low in contrast to users in other retail outlets	Users kept themselves aware of the system's development through continuous involvement as well as the senior management support	There were also some advantages of having a group of system "sceptics"
	Resistance to change	Regular meetings were conducted by the GIS Project Manager to demonstrate and discuss the latest development of the system as well as the problems encountered by users whilst using GIS. Familiarisation of the system was an evolutionary process	Employment of the technology continued to be low to this day	Resistance was being overcome by users themselves. They have gained confidence with the technology in which they were able to perform routine site research tasks	Resistance was being overcome by users themselves, through the support provided by senior managers

Categories	Sub-categories	Tesco	Somerfield	Safeway	Boots
	User training	Formal monthly in-house training was conducted on a regular basis by SRD in enhancing its site researcher's GIS skill	Still no formal in-house training sessions conducted by senior management. Relied solely on the vendors	Site researchers have considerable expertise in running GIS. Proper compilation of training materials was organised for future users' references	Continuous formal and informal training was given by those who have participated in the training courses conducted neither by the in-house trainers or the vendors. Proper compilation of training materials was organised for future users' references
	Vendor support	Continuous product support and training were provided through regular visits	Close relationship had been established with GIS key vendors (key players in the market) to develop GIS applications	Collaborations were established between both Safeway and Laser-Scan, i.e., developing the applications and training	Further collaborations were established between both BTC and Smallworld, i.e., in conducting users' basic and advanced training

9.3.1 Internal and External Forces to GIS Implementation

The analysis starts with the internal factors that acted as "forces" towards GIS implementation. As indicated earlier in most of the case studies, the internal factors leading to the implementation of network-based GIS were inherited as a result of using the "traditional" site research approaches or PC-based stand-alone GIS. Based on the analysis, the five key forces were;

- Poorly managed and an increasing amount of both internal and external data sets
- An ever-increasing sophistication of site research models
- The non-graphical outcomes of site research models, i.e., the inability to put the outcomes on a map (the outcomes were in the form of non-graphical or statistical presentations)
- Prolonged frustration faced in using the old approach, i.e., "traditional" or PC-based GIS, for example, PC-based GIS was unable to provide customised internal site research decisions (it cannot be customised and was designed to meet the universal need of the retailers)
- Continuous internal pressure to lead or maintain present organisational position in the market by senior management and investors

All these categories and sub-categories indicate that there was a "struggle" by senior management in improving the productivity of their site research decisions. It also shows that previously, various approaches had been employed by them in their deliberate attempt to achieve their quest for better site research decisions but unfortunately, had resulted in failure. In addition, there were also some external forces towards the GIS implementation, which were closely connected to the continuous internal forces by senior management to lead or maintain present organisational position in the market. The four key external forces were;

- The intensification of competition faced within the industry
- Increasing competitors investments in GIS
- World-wide retailer's attention towards GIS particularly in Europe and USA
- The mushrooming of GIS data and vendors (that facilitated the evolvement of the technology)

In short, most leading retailers (Tesco, Safeway and Boots) possessed similar internal forces. Somerfield on the other hand was still experiencing some of the factors which Tesco and Boots had experienced.

9.3.2 GIS Implementation Planning and Objective

Implementation planning refers to the process of translating the strategy into a series of specific implementation tasks (Huxhold and Levinsohn, 1995). Most of the implementation planning tasks were usually initiated and developed by a site research departmental head or the GIS project manager. GIS implementation was initiated in response to the forces and the opportunity lies in employing the system. Through effective implementation planning, it was contended that the scope of GIS benefits could be broadened and benefits could continue for a longer period with less organisational trauma. Its purpose was to arrange the implementation tasks into a logical sequence and to schedule resources for each activity. In strengthening the implementation plans, Tesco, Safeway and Boots site research departmental senior managers had conducted a few discussions with GIS specialists from non-competing organisations. In contrast, Somerfield had proceeded its implementation without having any plan developed in hand ("trial and error" approach). These tasks were mostly conducted jointly by three common parties; site research senior managers, users (site researchers) and system developers (usually ISD staff).

It was revealed in the analysis that the basic implementation objective was to solve the problems that lay in using the previous GIS (sometimes "traditional"). The new system was hoped to improve site research models through a better control over data and costs and thus taking out some of the risk from key investment decisions as organisations sought growth through new stores. GIS was also employed as a means to bring together all the sub-components (separate data sets, hardware and software) under one management, known as a "corporate" tool.

9.3.3 Senior Management Awareness and Support

It was revealed that senior management awareness on the ability and benefits of GIS was one of the leading forces in ensuring the smoothness of the system implementation[8]. At Tesco, Safeway and Boots, the ability and benefits of GIS were realised by a large number of senior managers prior to the

[8] However, the argument is, "*What is the sufficient level of senior management awareness enough in leading other GIS implementation process activities?*"

implementation and thus the idea of GIS implementation was well received. Senior management commitment and support were critical and essential for successful GIS implementation.

At Tesco, SRD senior managers were very responsive and supportive. The support was seen and understood by the users through the development of site research models and in the upgrading of the system (e.g., hardware). Senior management commitment and support were present throughout the implementation period, i.e., the department had continuously employed GIS in developing the site research models and through continuous communications between senior managers and users, e.g., regular departmental meetings, informal discussions and electronic mail announcements. There were also a few assigned GIS specialists (some of the senior managers) who were wandering around in the department to help other users with their day-to-day queries about GIS. Senior management commitment and support was considered as sufficient enough to start the system (generate a "go" situation). Maintaining commitment and support for a GIS implementation required a deliberate balance between enthusiasm and reality.

Moreover, Safeway's SID Director was seen as the advocate of GIS implementation. He had portrayed his "faith" in the system by leading the purchase of Laser-Scan network-based GIS. The amount of his support was increased as the project started to develop. However, at Somerfield, the level of support provided by senior management was somewhat marginal except in the provision of funds. It was believed to be as one of the contributing factors towards the system not realising its full potential. GIS was realised only by a small number of senior managers within the organisation, resulting a minimum amount of senior management support.

9.3.4 The Role of GIS Champions

A GIS champion is someone who is entirely committed to the idea of implementing GIS within the organisation. They tirelessly pursue the goal of GIS implementation by selling the idea to senior management, co-workers and anyone who is willing to listen. It was widely accepted that without a champion, an organisation could not successfully implement a GIS.

At Tesco, GIS implementation was headed by a group of GIS champions (senior manager, users, and system developers). They led the implementation by working together as a team. They also tirelessly sell the idea to other potential users about the system and kept it alive by confronting the counter implementation threats. Once the system started to develop, they continued to actively persuade other senior managers and users in the organisation to commit to the idea of implementing GIS in the entire organisation.

At Safeway and Boots site research departmental heads themselves had led the project as GIS champions by working with their subordinates, e.g., led the purchase of the system and made the introductory presentations. Attention was focused at the joint effort with senior managers, system developers and users. Moreover, at Boots, GIS champions had driven the adoption of the system by holding a series of presentations and meetings and as the system started to develop more users were "sold" on the ability and benefits of the system. They acted as interface between both senior managers and users in vigorously supporting the implementation initiative.

On the other hand, at Somerfield, there was only one senior manager who can be considered as a GIS champion that had tirelessly pushed the system. As a result he was unable to perform all the tasks required on his own in implementing the system. He was also unable to counter the threats posed during the implementation process.

9.3.5 Need Analysis

User needs analysis served to educate the senior managers and system developers about the structure of the system to build and how it will be employed. This analysis process, along with implementation planning, also helped to educate potential users about the concept of GIS and what they can realistically expect the system to do for them.

At Tesco, the analysis was categorised into two key categories; 1) user needs and 2) data needs. Discussions were held with the users and observations were made onto the system (as implementation process proceeded). Moreover, At Safeway, the experience gained by senior managers and system developers while they were using the old system was employed to improve the new network-based system. A conceptual framework of the entire GIS implementation process was also established through a series of need analysis based on user expectations e.g., in applications development and in training. A continuous formal and informal support and training was ascertained by the departmental head and discussions were held with users in their attempt to improve the system. As GIS started to develop, further discussions were held by senior managers, system developers with users on a regular informal basis. On the other hand, at Somerfield, an incomplete analysis led to the misidentification of data and system purchase. As the system was in hand, no post need analyses were held.

9.3.6 Applications and System Development

Application and system development issues are technical issues of GIS implementation process. Detailed application design should be focused on the design of the user applications. The applications should be designed to include pull-down menus and graphical user interfaces (GUIs) that will meet the needs of all potential users, e.g., at Tesco, careful attention was paid to user feedback in developing these applications. A standard application design procedure was finally developed by the department for its applications. Its menus presented a set of clear choices, in a consistent manner.

A significant part of the development effort in GIS implementation was a post-implementation evaluation. As users become more sophisticated, they frequently demand more from GIS. Deficiencies with the system may be discovered. Users reported problems and requests for new features to system developers who were responsible for managing the maintenance effort, e.g., at Tesco, system development tasks were based on SRD accumulated experience and knowledge. A joint team of senior managers, system developers and users had been set-up to deal with these problems.

At Safeway, a system and applications development strategy was also based on SID's experience on its previous PC-based GIS. Application prototypes were developed prior to the actual implementation of each application. Further Joint Application Design (JAD) tasks were organised by SID and Laser-Scan in developing the applications in which internal and external data were maintained on a regular basis. Moreover, at Boots, an experienced consultant with knowledge of Tesco's GIS applications was brought into the organisation to help with the basic set-up of the applications. System prototypes were created not just to evaluate the "technicalities" of GIS but also were designed to accommodate users' expectations and requirements. On the other hand, at Somerfield, implementing GIS applications had generated specific and general specifications for the applications. Although, GIS had been recognised as a tool to strengthen sales forecasting and site research models, the hardware were not upgraded according to user expectations and requirements (there was no plan to upgrade the system).

9.3.7 System Procurement

Most of the procurement strategies employed by senior managers and/or system developers allowed them to capitalise on their accumulated experience, e.g., at Tesco and Safeway an incomplete system was purchased, allowing them in setting-up their own in-house application designs (maximum customisation flexibility). Moreover, at Boots, procurement management was administered by a team consisting of senior managers, system developers and users. Prior experience gained whilst employing the PC-based GIS was employed as guidelines for the procurement tasks. On the other hand, at Somerfield, procurement tasks (e.g., evaluating the vendors) were performed solely by the site research head of department.

9.3.8 Database Management Systems (DBMS)

Perhaps, the "data issues" were the most critical technical issues within the implementation process. There were several issues faced by senior managers, system developers and users in managing the databases, e.g., conversion and maintenance processes. For example, at Somerfield, multiple sources of data sets were one of the key factors that resulted in limited applications of the system in the organisation. Most of the data sets were in various data formats that caused severe data problems. At Tesco, careful attention was given prior to managing the data sets. Its design tasks were based on senior managers and user's feedback. The data was digitised immediately once the system was installed. At Safeway and Boots, the data was merged internally by the ISD staff and then was maintained and updated on a regular basis. Relevant external GIS data sets were acquired to strengthen the internal data sets as the process started to develop.

9.3.9 User Awareness and Involvement

The changing nature of the organisational context suggests a need for appropriate approaches to facilitate better communication between users, system developers and senior managers. Although formal communication and documentation can be valuable, it was revealed from the case studies that these might not be workable because of the informal nature of the system implementation practices. Although participative design was seen as improving the communication between them, however, it was illustrated that the senior manager-user involvement is not practically feasible due to the effects of organisational norms[9]. One way to overcome their effects could be to support the mechanisms to improve communications with intermediaries such as GIS champions. As was evident from Tesco, participative design was employed to deal with the continuous changing conditions. Excellent communications among system developers, senior managers and users throughout the SDLC was essential. The success of the eventual GIS implementation rests on their ability to communicate in a meaningful way. In addition, users were invited to be involved with the implementation process. As the system started to develop, users began to hold primary responsibility in operationalising the system, e.g., in maintaining and updating the data. Users were told how they would fit into the process and what would be expected of them (vast majority of ISD staff had publicly espoused the position that users should get involved in the development of their own applications) and various attempts had been made to facilitate users' involvement (e.g., regular meetings).

[9] For example, the degree to which senior management provide clear assistance, communications and support to other subordinates.

At Safeway, there was only a minimum level of user involvement because only a few senior managers and users realised about the ability and benefit of the system. However, as the process continued, more senior managers and users were involved with the system. At Boots, senior managers were expected to continuously feedback to users about the development of the system. There were also some sceptical users and it was argued by the Boots GIS Project Manager that the advantage of having "sceptics" for senior managers and system developers was to have to "think" thoroughly throughout the process prior making any commitments (articulate). On the other hand, at Somerfield, although users were familiar with system, users' involvement was self-initiated. The benefits of the system were realised only by a small number of users.

9.3.10 Resistance to Change

Understanding resistance to change is significant. At Safeway, Somerfield and Tesco resistance to change was strong during the initial stage of the implementation. It was basically due to the unfamiliarity faced by senior managers and users in operating the system. GIS implementation difficulties were at their peak at the "turnover" period (the stage when the old system was about to be terminated and replaced with a new system) of the System Development Life Cycle. An extreme level of enthusiasm displayed by the champion, e.g., Tesco helped to reduce the strong level of resistance amongst other users.

At Boots, resistance to change was slowly being overcome as GIS started to develop through the support provided by senior managers. Once users' confidence was gained, they overcame resistance on their own. Some of the resistance to the use of GIS was reduced by providing an opportunity for users to experiment with the system, e.g., developing the application prototypes. It is contended that this approach made GIS accessible to a wider audience of users.

9.3.11 Training

At Tesco, Safeway and Boots, training strategies were determined mostly by senior managers. There were also off-site training courses conducted by their key vendors. As implementation proceeded, scheduled and non-scheduled training courses were conducted either by senior management, system developers or key vendors. The emphasis in earlier stages of implementation was on building user awareness (familiarisation) through regular meetings. Informal day-to-day training was given by senior to junior site researchers, monthly training was also conducted on a regular basis. Proper compilation of training materials was developed for future training references. Training was the process of ensuring that the GIS user knew what they wanted. The training included specifics on;

- The underlying concepts of GIS and site research decisions
- Functional components of GIS and how this system worked, e.g., specific site research tasks that had to be performed

On the other hand, at Somerfield, GIS training was organised by users on a self-initiated basis. Somerfield relied solely on its key vendors for training arrangements for in-house and off-site training courses.

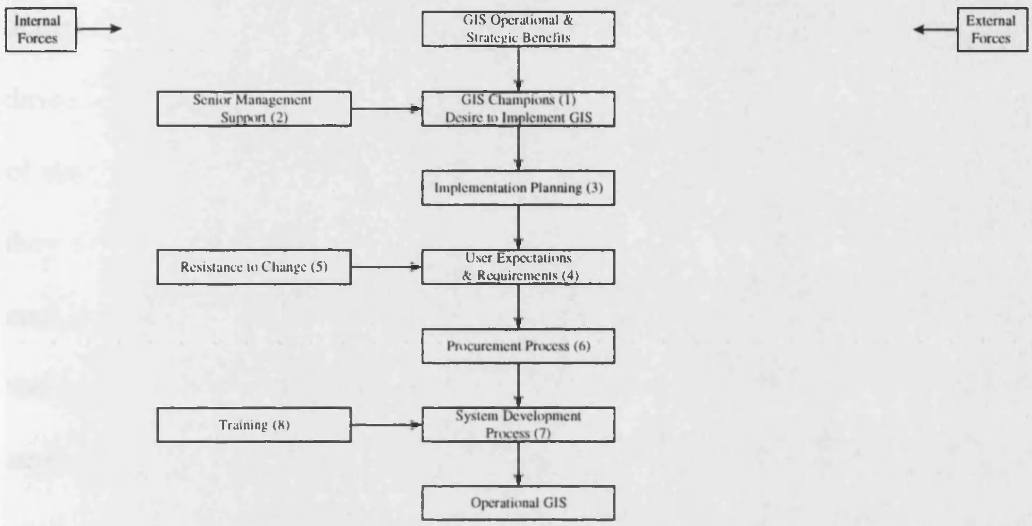
9.3.12 Vendor Support

At Tesco, Safeway and Boots, collaboration was set-out with key vendors in developing several of their applications during the introductory stage of the implementation (several applications were set-up by them). As the implementation proceeded, they provided a continuous training course through a series of regular visits. The key aim of having a good relationship with the vendor was to have good support for the system. Various levels of training could be set out by working together with the vendors, e.g., in organising the introductory seminars.

9.4 The Emerging Theory of GIS Implementation Process

The likelihood of a GIS succeeding and having the desired organisational impact depends strongly upon the understanding on how to manage GIS implementation process over time. A generalised approach to the GIS implementation process is proposed, based on the System Development Life Cycle (SDLC). The methodology differs from the traditional SDLC in several essential ways, i.e., the process itself is iterative and strictly consequential. A fundamental assumption of the traditional SDLC methodology is that the requirements can be completely specified during the planning stages (Chaudry, *et al,* 1996) but this does not translate since user may not fully understand or be able to articulate needs early in the SDLC. A sequence of tasks can be arranged that approximately follow the implementation process. A framework of GIS implementation process is presented in Figure 9.1 based on the cross-case analyses. It incorporates the emerging framework of GIS implementation process that is developed based on the eight key concepts that emerged form the cross-case analyses. It is by no means the only one that could be developed. Other kinds of framework may also be developed. Whatever the kind of framework suggested, however, it has to be operational and specific enough to lead to the implementation.

Figure 9.1 - The Emerging Framework of the GIS Implementation Process



It is clear to see that effective implementation processes depends very much on the behaviour of senior managers and users and that success increases with the willingness and motivation of these senior managers. The proposed framework requires a more active user participation in all stages (prior, during and post implementation stages) and employs a development strategy which allows for working concurrently on design, development and implementation. An evolutionary and participatory implementation process provides excellent opportunities to motivate users. It requires a great deal of patience and perseverance on the part of everybody involved. It is hoped that retailers forearmed with this information will better able to analyse their own department/organisation in managing the process (avoiding spontaneous processes and voluntary participation) or not as the case may be.

In terms of GIS champions (1), the likelihood of implementation success could be increased through the tasks that the champion takes on. A key individual should be identified in the department/organisation to champion the project and be actively involved in its design and development and will continue to provide the commitment and support throughout the implementation of the system and its usage. When senior managers become convinced of the benefits of the system, they become the sponsors and make resources available even though the system may not have been cost justified in advance. It is likely that the champions will have to "sell" GIS from the beginning of the process (Lucas, 1991). As GIS implementation process starts, senior management can show commitment by empowering the champions.

As for senior management support (2), it is recommended that before embarking on a GIS implementation effort, senior managers should ensure that it will enjoy appropriate levels of awareness and support from their co-workers, user involvement and expert-domain collaborators (e.g., system developers and vendors). These are significant issues to GIS implementation process and senior management should not proceed in their absence.

In terms of implementation planning (3), as more details of the practicalities of GIS implementation become known, more detailed planning of subsequent tasks could be done. As implementation planning proceeds in parallel with implementation tasks, departmental heads (site selection) can start to plan for the entire organisation, by sharing some of the applications with other interested departments. The department heads should ensure appropriate commitment in their responsibilities. Although there are many GIS conversion strategies available which can be followed, one of the most frequent strategies followed was a "phased introduction" model. This strategy allows step-by-step implementation tasks to be conducted by the retailers. The process can be categorised into a number of relatively distinct, sequential stages. It is significant to note that parts of the implementation process may be repeated.

Stage (4) involves the analysis of user expectations and requirements. It should be a process that establishes dialogue between senior managers, system developers and users. If productive interaction between them does not take place, users may be alienated by the process. The process of need analysis and its specifications for a GIS is best characterised as a learning process that takes place continuously during the implementation. There may be some limitation and weaknesses in users' need analysis to some extent, though the extent of such weaknesses remains to be fully understood, e.g., users may also lack awareness of some outcomes and inputs. Possible fear and uncertainty about the nature of the system may also make it difficult for users to make an objective assessment.

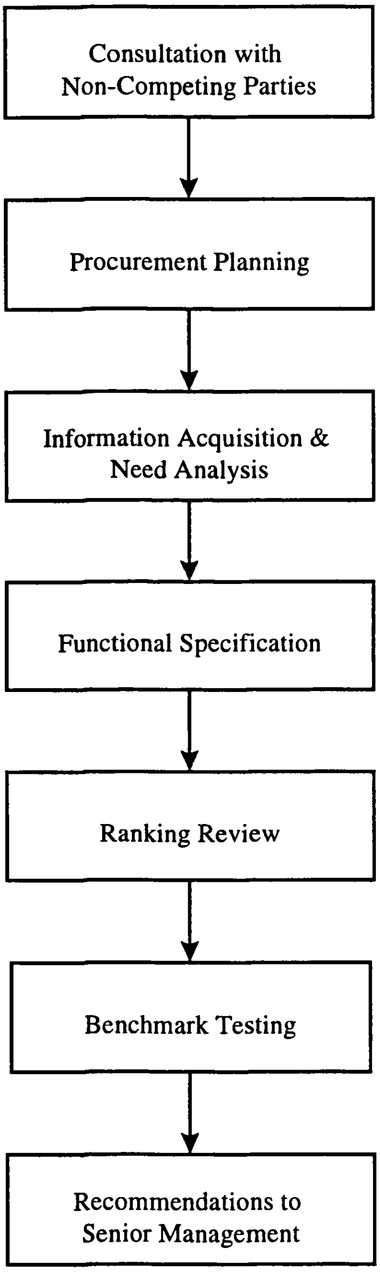
In terms of resistance to change (5), the phrase resistance to change is a common theme in DSS/GIS literature. By looking in detail at the GIS implementation process, the findings highlight the fact that resistance to change may not be pathological but a very reasonable response. In line with Prerau's (1990) work on attempts to minimise users' resistance, senior managers should establish courses for users to explain the potential of GIS, e.g., in its ability and benefits. Explanations can also be done through developing application prototypes. Application prototypes can help users to realising their needs better. Senior managers can also appoint an independent party, such as, their key vendors, to evaluate users' needs (some users are more comfortable by talking indirectly to their superiors due to organisational culture).

User involvement is vital to ensure the chance of implementation success. Once a GIS is acquired by an organisation, its pattern of implementation process toward the organisational unit and individual is unique for that organisation. Involvement with a GIS is not uniform across all users. Building the system in stages, with users feedback provided continuously, contributes greatly to user acceptance of the system, e.g., continuous discussions with senior managers. Users are supposed to be holding the primary responsibility in developing the applications and in controlling the quality of the data. This does not happen within one distinct stage, familiarisation of GIS is an evolutionary process.

In terms of system procurement (6), the selection criterion employed in procuring the appropriate hardware and software was determined during the applications and design stage. The procurement process is dependent on the policies and practices of the organisation. However, the process may be outlined in a general manner. Figure 9.2 illustrates the framework of the system procurement process. The framework contends that the process should be initiated with procurement planning. A good procurement plan can be developed by discussing and sharing the insights of the subjects (procurement issues) with non-competing parties such as experts from the local government authorities or Ordnance Survey.

Senior managers, system developers and users need to work together as team in analysing the potential system that need to be purchased. Besides understanding the functional specifications available offered by the vendors, they should also be able to share their expectations. Potential vendors can be ranked according to the services offered by them. The vendors can then be selected after the "bench marking" tests and interviews. Once the selection criterion is fulfilled, a recommendation to purchase the particular system can be forwarded to senior management.

Figure 9.2 - The GIS Procurement Process



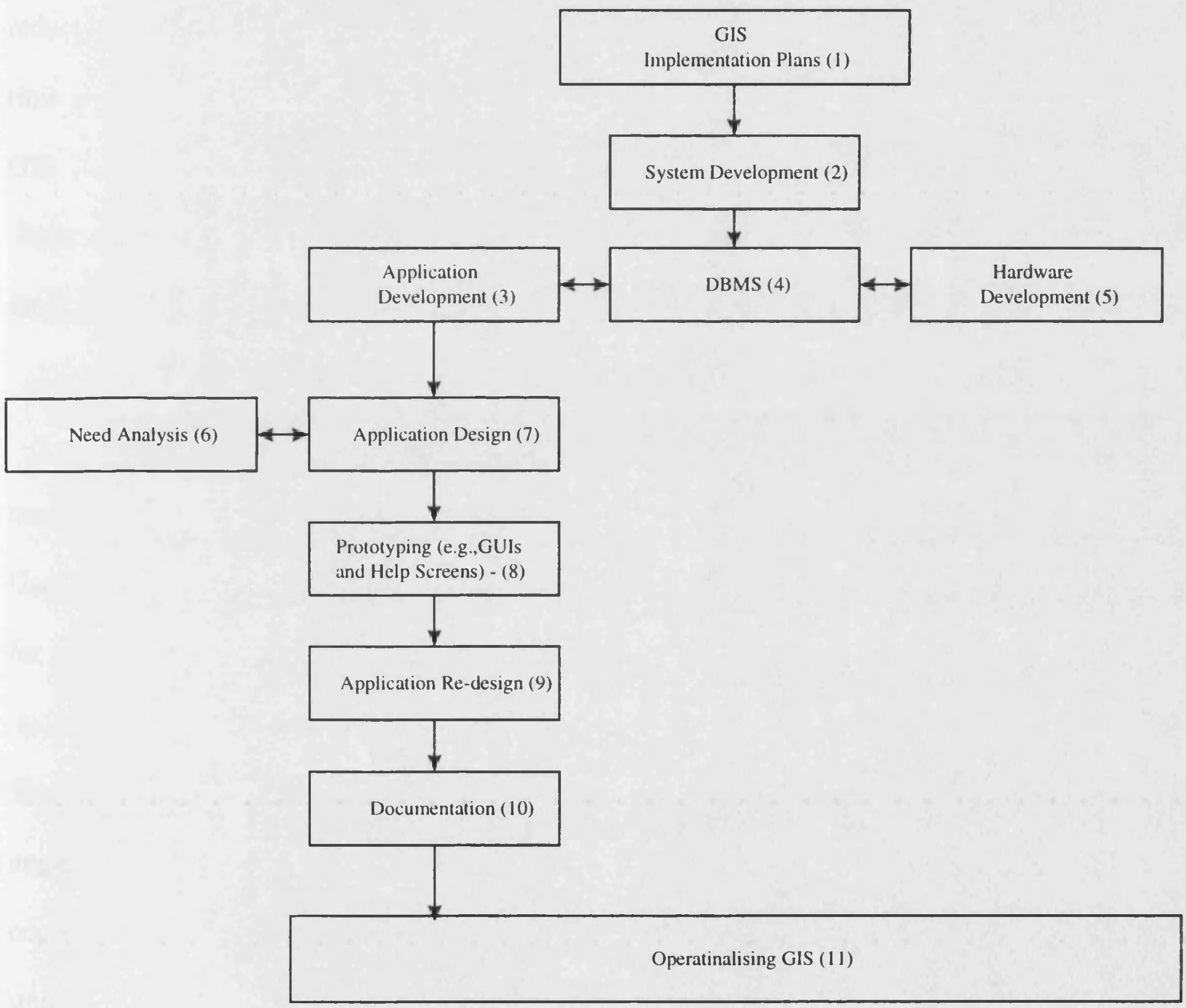
For the system development process (7), implementation tasks can be more manageable with the aid of an applications and system development methodology. Failing to adapt this methodology to the needs of the department/organisation may result in the *"square peg in a round hole"* syndrome, forced into a solution that does not recognise their unique needs. This iterative process should continue as the applications and system is enriched, adding more knowledge of the underlying processes[10]. A high degree of senior manager, system developer and user participation are needed and the design should be presented to both for feedback. Based on the cross-case analyses, Figure 9.3 illustrates the framework for the applications and system development process of GIS implementation. The figure incorporates the framework of both the applications and system development of GIS implementation process.

As revealed by Tesco and Boots, who were market leaders in their own sector, the development process should be initiated with thorough planning specifically for this task. System development tasks can be categorised into three key categories; 1) Application development, 2) DBMS development and 3) Hardware development. Applications development should be designed and developed based on the outcomes of the organisational and user need analysis. In addition, application prototypes should also be developed to clarify the systems developer's understandings towards the applications. It can also be used in reducing the resistance to change portrayed by the unfamiliar senior managers and users.

[10] For example, in the process of designing the database, a database model should be designed and developed to allow user to create, access and integrate mathematical models easily.

Finally, all the methods and procedures for designing and developing the application as well as the system should be documented for easy future reference.

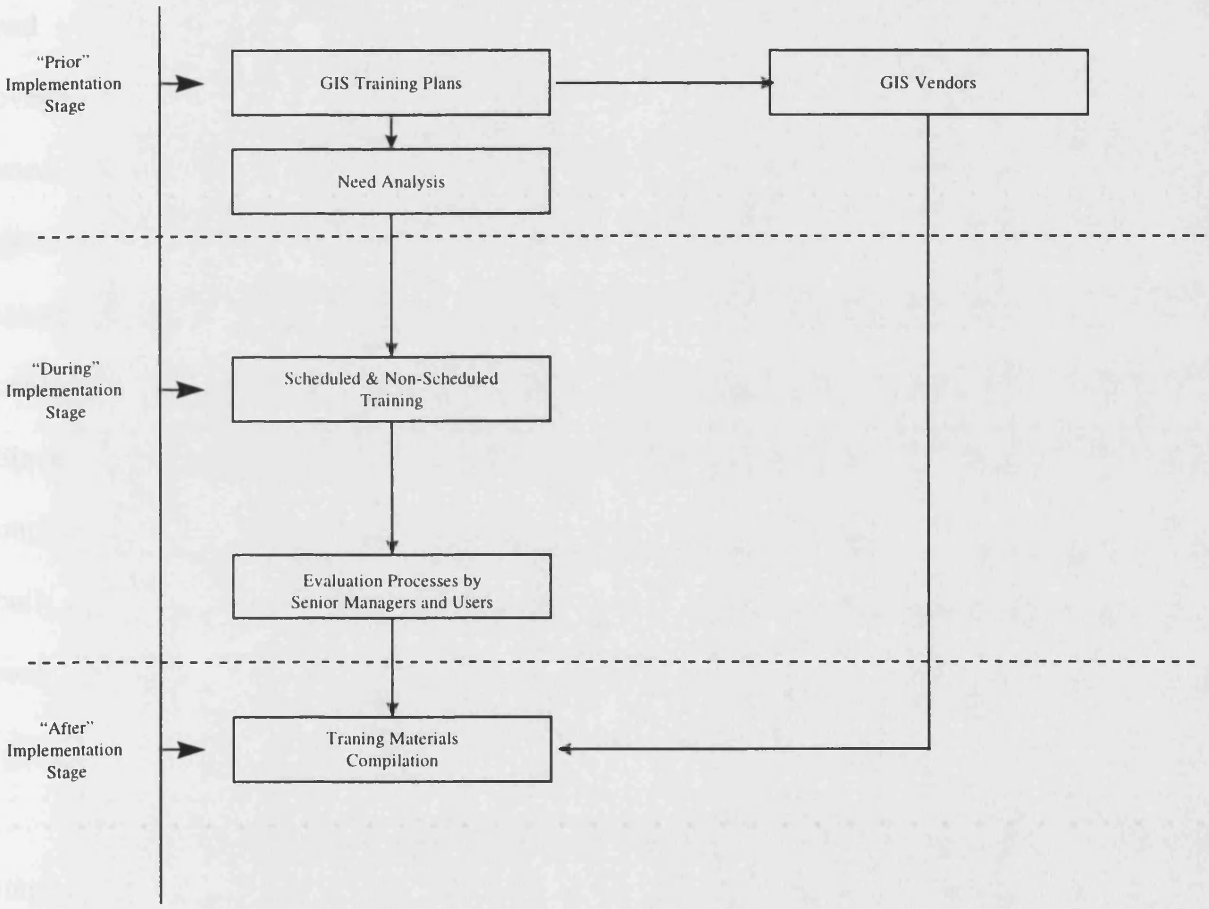
Figure 9.3 – The Application and System Development Process



A key part of the system development process is training (8). There is a need for senior managers to cultivate an on-going management support for GIS applications in general (perhaps by ensuring a few successful GIS applications with obvious benefits to the organisations). A definite allocation of time is necessary for user learning through training to take place. This would involve reduction in responsibilities for a project, change in deadlines or withdrawal from certain tasks. Lack of time was the most frequent justification (legitimate) for no involvement or discontinued involvement in GIS implementation process. On-going training is crucial to successful GIS. Figure 9.4 further illustrates the training framework that is developed based on the cross-cases analyses. The figure shows the training activities that should occur from the prior till after implementation stages.

GIS implementation entails bringing a system into operational use and turning it over to the end user by analysing user's characteristics to determine the felt need for GIS (give inputs into the system). User's suggestions should be elicited and considered for applicability and they should be given reasons for rejection if their idea is not implemented. Users may also have mixed feelings about GIS. However, once the system is installed, it should be possible for users to make a better assessment of the system. Senior managers must remember that a lot of users make decisions based on emotions and if users have negative feelings about GIS because of unexplained rejection of their inputs, problems are likely to occur. If implementation is viewed unfavourably, resistance may develop and continue even after implementation. The advantages of the system to user should be explained. Many users are non-committal to GIS because they do not know what it can do for them. It was revealed that after the implementation had taken place, users were equipped with considerable expertise in operating the system.

Figure 9.4 - The Training Process



9.5 Conclusions

The theoretical framework developed here meets the criteria of practical ability proposed by Glaser and Strauss (1967). While all research methodologies have their own strengths and weaknesses, the use of a grounded theory approach here was particularly appropriate, generating a set of concepts, and insights that address the GIS implementation process issues to date, which had been largely overlooked in the GIS implementation literature. The methodology employed offered excellent conditions for the "surfacing" and understanding of subjective elements in GIS implementation process, i.e., in understanding user awareness and involvement along with organisational and technical issues. For example, research that introduces new concepts and elements and/or any research of the constructive replication variety can be evaluated in terms of relative significance and contribution. Since formal methodologies do not exist for GIS implementation to the same extent as DSS implementation studies, the proposed framework was based largely on respondents' experiences. It built on the broad understanding which already exists about how to introduce and implement a GIS in such a way that is taken up and employed productively to good effect.

The concepts and relations posited as central are intimately related to the actual GIS implementation process (because they are derived from the data). It covered not only the GIS implementation process but also the tasks and forces that lie within the process.. Both researchers and practitioners alike should find the framework useful. It suggests that before the implementation of a technology such as GIS, key players (e.g., senior managers and users) in the department/organisation should articulate their intentions with respect to the context of GIS implementation process. Having articulated these key issues, they can effectively plan the GIS implementation process and facilitate the action to enact the project. By recognising the nature of the influences (some insights into this context, i.e., structure of GIS implementation process), senior managers and system developers might be better able to understand, commit and support the implementation process (the framework can assess and manage what is typically poorly understood).

Moreover, this framework can be of value to other researchers in DSS/GIS development and implementation in general, as a basis for further investigation. It is also significant to recognise that these case studies involved British retail organisations across two key sectors (food retailing sector and health and beauty retailing sectors). Therefore, replications within other sectors or countries are desirable. In the next chapter, a conclusion drawn based on these emerging grounded concepts is presented.

Chapter 10

10.0 Introduction

This chapter is divided into four key parts. The first part of this chapter describes and draws conclusions based on the emerging grounded GIS implementation process theory. These conclusions will then be contrasted with the existing theories available in the GIS implementation literature. The key objective of contrasting both sets of theories is to evaluate any similarities between them. If there are, it shows that this research has confirmed that the determinants of GIS implementation in retail organisations are about the same with GIS in other areas. If there are not, the dissimilar findings of this research have contributed towards the development of GIS implementation body of knowledge. The second part of this chapter describes the conditions in which the outcomes of this research can be transferred to Malaysia for retailers there. The third part concludes the author's thoughts on the research methodology used in conducting this research. Finally, this chapter discusses the directions of future research in GIS implementation process.

10.1 Comparison between the Emerging Grounded Theory and the Existing GIS/DSS Theories of Implementation

It is recognised that GIS has become a powerful business tool for retailers to gain competitive advantage (Feigenbaum, *et al,* 1988; Liebowitz, 1990). As the investment in the technology grows, so does the need to carefully understand the elements of implementation process that is related to success or failure when applying the system. As indicated earlier in the previous chapter, eight core concepts emerged from the analyses;

- GIS Champions
- Senior Management Support
- Implementation Planning
- User Expectations and Requirements
- Resistance to Change
- Procurement Process
- Training
- System Development Process

10.1.1 GIS Champions

One of the most significant factors for success in GIS implementation is to obtain an executive champion (Barrow, 1990). GIS champions play a key role in fostering acceptance of the system. A champion does not need extensive technical knowledge, however, they should be at least somebody who possesses " senior" decision making ability within the organisation and who understands and supports the project. They should also be considered to be a peer within the executive ranks, someone who can influence his or her constituents. The role of the champion is essentially political and social, e.g., to sell, to lead, to respond and to help overcome the resistance involved in the adoption of the system (Curley and Gremillion, 1983; Huxhold and Levinsohn, 1995; Smith, 1997). My observations, both in the field and literature, suggest that the presence of a champion is indeed a significant factor in determining successful GIS implementation process. This conclusion is supported by a considerable body of research, e.g., the outcomes also provide consistent evidence of significant generic issues for success in DSS implementations. In general, champions should be looking for solutions that will have a significant impact on the organisation's direction for the implementation of the project.

10.1.2 Senior Management Support

Cultivating on-going management support has a direct relationship with the successful GIS implementation process (Rubenstein, *et al,* 1967; Bean, *et al,* 1975; Schultz and Slevin, 1977; Huxhold and Levinsohn, 1995). A GIS implementation team is more likely to receive sufficient funds for the acquisition of the necessary GIS if a high level of management support is received from senior management. The same is likely to be true in cases of an expensive experimental GIS project, where users and senior managers would be concerned about wasting their resources.

My observations, both in the field and literature, suggest that senior management must support and be involved in the implementation process. First, it is because users are much more prone to act when their senior managers are interested in the outcome. Second, the capital sources required for the implementation to take place are increasing significantly. However, if senior management does not openly oppose the system, and are only lukewarm in their support, the probaility of the GIS not being implemented is high.

10.1.3 Implementation Planning

GIS implementation is likely to be a difficult process involving both technical and organisational processes. The lure of a new DSS such as GIS to enhance organisational productivity remains powerful despite recent admonitions that the system may only be the price that must be paid to stay in business. For any retailer in the future, it is likely that the tasks of technology design and organisation will become even more closely intertwined as evidenced in the case of Tesco, Safeway and Boots. As the number of retail organisations implementing GIS increases and applications within retail organisations proliferate, understanding the elements significant to success becomes essential.

My observations, both in the field and literature, suggest that while several of these core issues cannot be directly controlled in the short term, e.g., senior management support and user awareness, senior managers can be more aware of potential GIS implementation difficulties (Kuhlman, 1983; Rogers, 1983; Adler, 1987; Yoon and Guinmaraes, 1993; Ventura, 1995). Further, the findings of this research indicate the significance of implementation planning to successful GIS implementation. Senior managers have to ensure a proper GIS planning process (Yoon, *et al,* 1995) and they are likely to benefit from efforts to establish good relationships with system developers and users. They should also encourage strong collaborations between the parties. Such cooperations must be secured not only in principle but also operationally (e.g., time scheduling) throughout the implementation process, whenever necessary.

10.1.4 User Expectations and Requirements

Stone (1995) suggests that a DSS that includes well-designed feedback can improve the effectiveness and efficiency of decision making. Most researchers agree that feedback (acknowledging the expectations) is a necessary condition for learning (Einhorn and Hogarth, 1981; Hoch and Loewenstein, 1989). However, the conditions in which alternative forms of feedback are useful to decision making are a relatively unexplored research issue (Sengupta and Adel-Hamid, 1993).

My observations, both in the field and literature, suggest that users vary in their expectations of the system. Implementation amongst them depends upon the operations performed by the department;

- Users present involvement throughout the process
- Senior managers tolerance for experimentation of new tasks approaches
- Expectations about users performance
- Users experience and knowledge (Lucas, 1975; Zmud and Cox, 1979; Alavi and Joachimsthaler, 1992; Stone 1995)

The design of a GIS can only be as good as the statement of the requirements for that system. In requirements specification, system developers need to capture a description of what the eventual system will be expected to provide. The introduction of prototypes[1] can greatly change the focus of the user activities by providing "more" thorough evaluation during the design process. It is also significant to realise that a prototype is not an end product and it can be difficult for system developers to throw away several months of hard work (i.e., when user testing shows that user will not be able to use the system in its current design).

10.1.5 Resistance to Change

Realistically, implementation project managers may experience resistance from users who are uncomfortable with the system. To overcome these negative feelings, implementation project managers should make the users feel that they "own" the system and that they are active involvers in its creation and growth. Users should be involved in the implementation process on an on-going basis as the GIS are developed. Implementation project managers should educate users by showing them how the system can help them access the databases and monitor the critical site selection decisions.

Hirschheim and Newman (1988) in their review of the theory and practice of user resistance stated,

> *"User resistance to the development and implementation of computer-based information systems is legendary and can take many forms. It can range from the physical sabotaging of a new system, as was the case of the US postal workers pouring honey and inserting papers clips into their data entry devices, to the simple non-use of a system, to the more subtle and covert political manoeuvring which accompanies a system which is perceived to redistribute organisational power."*

My observations, both in the field and literature, suggest that, there are several things that senior managers can do to reduce users' resistance to change, for example, users can acquire skills in database design by active involvement in the performance of design tasks (Lewis and Anderson, 1985; Ahrens, *et al,* 1995; Chau, 1996; Ahn and Skudlark, 1997). Senior managers should strive to give users a chance to feel ownership over the particular GIS being developed. The findings show that user involvement in three out of four retailers studied (e.g., Tesco, Safeway and Boots) are directly related to the value of the GIS outcomes to users. User involvement should be cultivated by senior managers to benefit from the psychology of ownership. It is also significant for senior managers to ensure management support does not waiver when it is needed the most.

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[1] One approach to deal with the uncertainty presented in a less rigorous design.

10.1.6 Procurement Process

The current focus during the system procurement process is functional requirements (Ahrens, *et al,* 1995; Huxhold and Levinsohn, 1995). My observations, both in the field and literature, suggest that, much of the procurement process depends upon the general procurement policies and practices of the organisation. The process will vary somewhat by organisation and the products or services being purchased. Most retailers attached themselves to only one key vendor and tried to capitalise on their vendor's strengths, i.e., in developing the applications as well as in training the users.

Moreover, if benchmarking of GIS takes place during the process, it frequently involves the Information System Department staff rather then the potential users. Thus, there is no opportunity for usability testing with users and within the context in which the system is to be used and prototypes provide a window of opportunity (but again technical issues will dominate). As a consequence there are often systems of poor usability. Senior managers should allow room for users to become involved in this process.

10.1.7 GIS Training

Smith (1997) defined system training from a human-computer interaction as,

> *"The systematic acquisition of skills, knowledge, and attitudes that will lead to an acceptable level of human performance on a specific activity in a given context."*

My observations suggest that a great amount of learning occurs in an unplanned manner (known as on-the-job training). Whoever delivers the training, there is a significant benefit involving benefits in the development of the training programme. Without them, there is a danger of focusing solely on what the new system does (technical) and neglecting how it will affect the user roles. They are after all are the customers of the training and to them the critical issue is not the system itself, but how it is to be implemented and the manner in which it might affect the job.

10.1.8) System Development Process

Designing a useable system depends on understanding and then solving the dynamic interacting needs within which the work is done (Barrow, 1990). As the number of non-professional GIS users has risen with technological developments, so designers can no longer be considered as representative of the system users. A division can exist between user needs and how the system developer interprets those needs. My observations, both in the field and literature, suggest that designing a GIS requires a different approach than most DSS project managers are accustomed to, i.e., rather than waiting to get all the details perfectly aligned, GIS project managers should start with a small but tangible element that can be incorporated into a prototype. This prototype needs not to be "perfect" but should be an example they can use to garner the users' interests. DSS project managers should remember that most users are extremely busy and will not be willing (or able) to devote a lot of time to assist in the development of the GIS.

Moreover, traditional systems development involves a need analysis and detail specifications that DSS project managers usually want to complete before they present their system to users to review. This long process will not work with a GIS because it is a dynamic system, perhaps because a GIS that analyses current needs may not accommodate the site selection needs next year or even next month. A GIS however, will have the ability to satisfy the needs as they change.

In addition, in user-centred design approach, a technique that has been advocated by many people (Mumford, *et al,* 1978; Eason, 1988; Palvia and Chervany, 1995), attempts to overcome these problems by bringing user considerations into the System Development Life Cycle. One of the common assumptions made by the proponents of a user-centred approach is that system developers have unlimited access to users. In reality this is achieved only in those companies who are producing large bespoke systems and who as a consequence have access to users. Generally they can only gain limited access to users within their large, diffuse and multi-vocational user population and this may only be during system customisation and for a short period afterwards.

My reflections on the comparisons made with the existing DSS/GIS implementation theories, both in the field and literature, suggest that GIS implementation process is a situation-bounded process. The eight core concepts emerged from the analysis have proven that we need at least these factors in order to successfully implement the system. These concepts are also similar to the requirements of other successful DSS or GIS implementation in other sectors such as local government authorities. There is no determinant that I found "entirely" distinct here in this study from other established areas of successful GIS implementation.

10.2 The Implications of the Study to Malaysian Retailers

The UK market leaders in retailing such as Tesco and Boots are making great strides through the technological abilities of GIS, not just in site selection activities but also in other marketing mix activities such as in physical distribution management, product development and sales management. Loyalty card schemes have been launched in conjunction with the system to encapsulate the consumer and competitor behaviours. Press releases[2] have indicated that Tesco and Boots are moving to the Far Eastern markets for new business development programmes (e.g., Thailand) by acquiring local retail chains (Marks and Spencer have already established its position in that region and have started to gain popularity). These retail giants have the ability to develop their own GIS (employing their own subsidiaries data) and do not have to wait for any independent GIS consultants or vendor for help in developing their GIS abroad. In addition, GIS consultants and vendors are also developing within the region (ESRI has an office in Malaysia and are committed to developing a GIS for the region). Malaysian retailers have to prepare themselves to compete with these retail giants through the development of GIS[3]. Malaysian retailers will need GIS for site selection decisions and all other marketing mix decisions. GIS will enable them to make a more "objective" decisions in their attempt to better understand their consumer and competitors activities.

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[2] Boots turns to East for a pick-me-up. (1998, June 1). The Times.

[3] As indicated in Chapter Three, GIS is a new technology that promises to impact Malaysian retailers more than other site selection models due to its user friendly features and the ability to

The findings of this study indicate that implementation issues change throughout an implementation life cycle, initially centring around technical issues such as software and hardware problems, and then progressing to data problems such as data collection, conversion and standardisation issues. As progress continues, the issues become more organisational in nature, revolving around difficulties concerning the ownership of the system. Malaysian retailers will have to face and solve the same pattern of issues faced by the UK retailers.

The eight core categories (lessons) emerge from this study can be employed as a guidance by Malaysian retailers in their attempt to develop GIS in their organisations (it suggests that the effective utilisation of GIS would have been aided by addressing these core categories). Experience and insights shared with four key UK retail players; 2 of them are market leaders while the rest are followers, revealed that these are the minimum requirements needed for GIS implementation.

In observing these organisations, I have been struck by the applicability of the idea that a champion is required for system implementation success to be achieved. In particular a champion can be a significant determinant of system implementation outcome. In all the cases, a champion is a key individual in the system implementation process. Their significant roles should not be neglected by

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produce graphical layouts, thus not alienating retailers not proficient in statistical outcomes.

the Malaysian retailers in their attempt to implement GIS. Champions will be much more effective if they received adequate senior management support. Senior management support is crucial in system implementation process, not just in providing adequate funds but also in facilitating all the activities within the process.

A change agent is usually needed as catalyst for the system implementation process to take place (Lu, *et al,* 1989). It may be someone from the ISD or experienced senior managers. In Malaysia, this change agent would most likely be an outside consultant, given the lack of qualified personnel within the organisations. This change agent should work with the senior management of the organisation to establish the framework for the GIS implementation (the outside consultant as the change agent role corresponds to Alter's entrepreneurial stimulus (1980) in which the change agent attempts to sell the people in the organisation on a DSS that she would like to implement). Seeking help from an experienced and qualified outside consultant is a logical way to fill the change agent role, i.e., initial implementation success of GIS generally instils confidence in users for this essential GIS.

Senior manager should also be able to sustain adequate support through the process. The existence of both GIS champions and senior management support should result a better implementation planning. Implementation planning issues are presented in Chapter 9 as guidance for the Malaysian retailers. Of course we have to consider the different planning processes that exists for Malaysian retailers (different individual decision making processes and styles owing to cultural variations should be considered and incorporated in the implementation process), e.g., individual differences such as "dogmatism" (the extent to which a senior manager is positive about his beliefs and opinions) and "risk taking propensity" may also play a significant role in the process. However, this scope is beyond the scope of our discussion.

On the other hand, in order to achieve a high level of effectiveness in implementing the system, a GIS should be tailored to its user's expectations and requirements because the most common reaction to GIS implementation is their resistance. To users at work, new technology such as GIS can spell all kinds of disruption of known procedures. However, thorough implementation planning should be able to reduce the level of resistance faced. Some practical guidance is outlined in Chapter 9 for the retailers in Malaysia to follow in encountering and reducing the resistance. Besides thorough implementation planning, user training can also minimised resistance. Users should have sufficient provision of hardware and software skills to enable effective interaction with GIS under consideration. The next critical issue is the system procurement process. Careful attention should also be given by senior managers in choosing the system (data, hardware and software) but also the vendor who will provide the continuing support.

Although the development of GIS may still be regarded as a leading-edge practice of retailing, we can expect the technology to become a common component of modern Malaysian retail organisations as were the case of Tesco, Somerfield, Safeway and Boots. Consequently, Malaysian retail organisations will have to go through the system implementation process and therefore benefit from knowledge about the process. The timing of the research effort is appropriate. Implementation of the system is in its premature stage in Malaysia. However, in the UK, GIS adoption has evidently taken off. The early system implementation effort has been burdened with difficulties faced by senior managers, system developers and users. The early GIS adopters went through trial and error processes that resulted in a valuable accumulated experience that can be studied. This research is to advance this knowledge and this knowledge is relevant for designing system implementation strategies known as implementation management. Its purpose is to ensure that the expected benefits from introducing GIS technology are achieved, i.e., that often large investments of funds are justified.

10.3 Concluding Remarks on the Employed Research Methodology

This research project has explored the elements of successful/unsuccessful GIS implementation process based on the system that had been deployed by the retailers throughout the food and health and beauty industry. A theory of successful GIS implementation process had then been developed based on these emerging categories through the employment of a grounded theory approach to theoretical building (Glaser and Strauss, 1967) with a phenomenological viewpoint. The advantage of this view is that it not only explains an organisational situation but it shows where the solution lies immediately and practically. Any other view leaves the solving of the problems to wait for other events and requires an extra (future) time scale (Gray, 1980). Three out of four case studies were successful GIS implementers. Success was ascertain by asking the users' opinions on their reliability towards the system, e.g., if they were asked whether they can do their job without GIS and the answer is yes, it means that GIS is not an integral part of their daily work and can be considered as failure or vice versa. The pilot research has been in context to give some ideas of what the thoughts and attitudes are to GIS (conducted prior to the primary interviews for building common themes). Comparisons were then are made with existing studies available in the literature in order to strengthen the theory building process.

This research of the GIS implementation process presented another application for using the case research method. The most challenging part of this method was before proceeding into the "field" (collecting real-life data means finding "willing sites" that is organisations which allow interviews and observations to be made, i.e., in this case, the key hurdle was to find a willing informant).

The outcomes are within the retailing industry, thus the only comparison made was with different industry such as local government. It is also significant to recognise that this research involved British and Malaysian retailers. Therefore, replications of these outcomes within other countries or other industries are desirable. Although case studies empirical work on corporate GIS has only a relatively short history in the literature, it appears to be growing as research method of choice. However, there has been recent debate about how "scientific" such work can be. The debate centres on whether conclusions extracted from observations in uncontrolled single (or multiple) field situations, in the absence of formal, testable hypotheses, where falsifiability of theory and a theory's implications and the generalisability of a study's findings are perhaps differently construed than in the natural sciences, can be considered as valid scientific work.

Although it is not possible here to examine the intricacies of this epistemological debate, researchers in DSS seem to have formulated two distinct responses. One group has cast case study methodology in terms of the canons of mainstream, positivist science, while the second groups seems to have taken a more interpretive point of view where understanding and theory building outweigh traditional hypothesis testing. The approach used differs somewhat, in the value placed on interpretive insight and analysis, the hallmark of much case study research. The concepts of theory presented in this research follows the notions proposed by Glaser and Straus (1967), Strauss and Corbin (1990) and Yin (1993).

In providing an opportunity to pause and reflect upon what has been learned from past work on DSS/GIS implementation as well as what needs to be accomplished in the future, this research provides a milestone toward the encapsulation of the GIS implementation process phenomena. The outcomes of this study have strengthened the contention that it is valuable to view GIS implementation as a process. It stresses the significance of considering the entire system implementation process as relevant to implementation. This is inline with Ginzberg (1979) findings in which he has argued in his study on DSS implementation process.

10.4 Directions for Future Research

Generally, the introduction of a new system (an innovation), e.g., GIS, especially in form of a more advanced technology (PC-based to network-based) is assumed to bring improvements in organisational performance. GIS is expected to benefit retailers activities (such as site selection and other marketing mix decisions) at operational and strategic level of the organisation. However, retailers that have already adopted the technology, experience varying degrees of success in implementing it (Campbell, 1991). The "instalment" of GIS does not necessarily result in its adoption, i.e., internalisation into organisational functions and processes. Retailers face numerous obstacles during the system implementation process. Those obstacles are reported even by retailers that have successfully implemented GIS (e.g., Tesco and Boots). Careful design and management of GIS implementation process is essential for ensuring desired outcomes of the technology for the retailers. The variety of factors may influence the outcome of implementing the system. Those factors range from technical, economical, organisational to personal factors. In fact, the system itself presents less of a barrier to the adoption of GIS when weighted against other factors (Chorley, 1988). This research reflects a step in the effort to derive a better understanding of GIS implementation practices in the retailing industry. Considerable opportunity exists for others to expand on and otherwise improve these initial efforts to incorporate increasing theoretical complexity of GIS implementation process.

Successful GIS implementation process involves a highly organised series of process design and management. It differs from other DSS because GIS implementation process tends to be much more evolutionary and iterative in nature.

This research also represents one of the first attempts to identify the structure of the GIS implementation process. The outcomes suggest interaction effects among these key elements of implementation process that seem to impact on the GIS implementation process. Thus, future research efforts in GIS implementation process should be directed toward developing causal models that weave these key elements together in a form that makes their interrelationships explicit. A model consisting of an interacting process of relationships among these elements and other variables will be a realistic means of representing GIS implementation process phenomena. I hope my research motivates more research in the suggested areas resulting in the most "significant" process being included in future GIS implementation process research, thereby minimising the consequences of implementation failure. This should ultimately lead to the development of a new generation of methods, strategies and tools for the effective treatment of GIS implementation issues. There is also a need to re-test the proposed construct relationships with new data sets to strengthen the theoretical basis for GIS implementation process studies over time. An ongoing systematic re-testing process of this phenomenon is likely to be necessary as the technology and its use change over time. Some of the significant questions left unanswered and deserve more attention in future studies, e.g., Are these findings generalisable to other industry besides retailing? Are these findings generalisable to other countries (e.g., Malaysia)?

It is now recognised that GIS implementation is an organisational process. It is a highly resource-intensive process often involving senior managers and users possessing scarce talents and whose is over committed. It does seem that the earliest activities, e.g., those related to implementation planning, gaining management support and user involvement are generally more significant for GIS implementation success (Kivijarvi and Zmud, 1993). The outcomes had also shown why GIS implementation processes only succeeded when retailers were able to restructure its implementation process framework and not just to overlay the new GIS on the old GIS. By emphasising the problems associated with the introduction of GIS where there is a *strong professional lobbying*, this research further confirms the increasing significance of organisational issues and the need to explicitly address them in future GIS implementation process research. Further research, in this area that needs to be undertaken especially with regard to the specification and treatment of organisational issues.

While increases had been observed in both the use and research on GIS, it is clear that technological advances had occurred as a faster rate than the understanding of successful GIS implementation processes. It is impossible to guarantee a successful GIS implementation in organisations without an improved understanding of the complex implementation processes that are involved. This understanding should enable senior management to prevent or at least moderate some of the difficulties that are experienced.

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APPENDICES

Appendix 1: The Meaning of DSS Implementation

Appendix 2: Example of the Various Data Sets[4] for Building MOSAIC

Appendix 3.1: Building the Case Studies (sources of evidence)

Appendix 3.2: Informants Contact Addresses and Telephone Numbers

[4] Source: CCN Marketing Head Office, Nottingham, UK.

Appendix 1: The Meaning of DSS Implementation

Senior management may want to explore new ways to make decisions or may want a better approach for handling implementation process. While the implementation issue has been addressed by scholars, there have been different interpretations of what implementation actually is. Traditionally, according to Schultz and Slevin (1975), implementation has been viewed as beginning after the system and design effort and ending as soon as the system becomes operational and the outputs are produced. In the same year, Churchman defined implementation by stating that,

> *"The implementation process, if it occurs at all, take place when the managers of the organisation are truly influenced by the experts recommendations and put these recommendations into action. The implementation process undoubtedly also includes an evaluation of the actions once they have taken place."*

Picket (1978) defined implementation as,

> *"Implementation success is attained when sufficient effort is made within the organisation and the model is actually integrated into the organisation's decision system. It must be recognised, however, that how efficiently the results provided by a model are used is a function of the user's own decision making ability. With respect to implementation, it is the use of the model to influence the decision making process that constitutes success."*

Moreover, a more recent analysis of implementation by Lucas (1974) states,

> *"Implementation of a computer-based information system is an on-going process which includes the entire development of the system of the system through the feasibility study, system analysis and design, programming, training, conversion and installation of the system."*

In addition, according to Multinovich and Vlahovich (1984), implementation is referred as,

> *"Management Information System/Decision Support System (MIS/DSS) implementation entails bringing a system or subsystem into operational use and turning it over to the end users. It is the culmination of the design process."*

Davies and Olson (1985) state implementation as,

> *"Implementation is a process of preparing the organisation for the new system and introducing this new system in such a way to assure its successful use."*

From a technological diffusion perspective, implementation is defined as an organisational effort directed toward diffusing appropriate Information Technology (IT) within user community (Kwon and Zmud, 1987). They propose a stage model of IT implementation activities based on Lewin's (1952) change model, which incorporates six major stages (initiation, adoption, adaptation, acceptance routinisation and infusion).

The definitions are by no means unique to the field of MIS/DSS. In every different area, including those where the body of knowledge is far less developed, there is a significant recognition that there is a common concept in DSS activity. For this study, implementation refers to the on-going process that include the entire development of the system, from pre-implementation stage (e.g., planning) to post implementation stage (e.g, audit). This broad definition of implementation will allow me to discover as much as possible the factors leading to GIS implementation success.

Appendix 2: Example of the Various Data Sets[5] for Building MOSAIC

Country: Greece

1) Which variables exist in the Greek Census (please see attached an example of the typical variables. We really need a full list of variables available in Greece)?

2) At what level of geography does the data exist?

3) Are there any other sources of data available (e.g., electoral roll, market research, national car file, etc.)

4) If there are other sources, at what level of geography is the data available?

5) What cartographical data is available?

6) At what scale has the data been digitised?

7) Is there a link between the census geography and consumer addresses?

8) How much do the following cost

    a) *Census data*
    b) *Any other data*
    c) *Cartographic data*
    d) *Address (geocoded) file/software*

9) Who owns the data in point 8 above?

10) Is it possible for us to set up reseller (or joint venture) agreements for the data? Do standard agreements/royalties already exist?

11) How often is the data updated?

12) Are there any suppliers of consumer survey data? If so, what are the sample sizes (this data can be cross-referenced with MOSAIC to create product consumption/media profiles)?

13) Who are the competitors in terms of market analysis/GIS companies?

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[5] Source: CCN Marketing Head Office, Nottingham, UK.

Appendix 3.1: Building the Case Studies (sources of evidence)

Organisations	Nature of Business	Contacts/ Posts	Purpose/ Status	Data Collection Methodology			
				In-depth Interviews	Observations	Archives	Other Sources
Tesco Stores Limited	Food retailing	Nigel Dodd (Statistics Controller) Sarah Drury (Site Research Analyst)	Primary case study Primary case study/ Verification of the findings	Tape recording and note taking Tape recording and note taking	GIS application demonstrations	• Internally-generated data, e.g., annual reports/ brochures/ newsletters • Abstracts and articles from refereed journals and magazines • Conference proceedings and chapters in books	• World Wide Web, e.g., company homepage, and independent market news/reports • Independent databases, e.g., NISS, BIDS and Mintel
Somerfield Stores Limited	Food retailing	Graham Feeboul (Business Development Manager)	Primary case study	Tape recording and note taking	GIS application demonstrations	• Internally-generated report on evaluating GIS • Conference report by KPMG Peat Marwick	• World Wide Web, e.g., company homepage (annual reports) and independent market news/reports • Independent databases, e.g., NISS, BIDS and Mintel
Safeway PLC	Food retailing	Chris Wilkinson (Director of Stores Information) with two site research analysts	Primary case study	Note taking (group interview)	GIS application demonstrations, GIS application outputs (maps) and departmental "organisational chart"	• Internally-generated data, e.g., brochures/ newsletters • Abstracts and articles from refereed journals and magazines • Conference proceedings and chapters in books	• World Wide Web, e.g., company homepage (annual reports) and independent market news/reports • Independent databases, e.g., NISS, BIDS and Mintel

Organisations	Nature of Business	Contacts/ Posts	Purpose/ Status	Data Collection Methodology			
				In-depth Interviews	Observations	Archives	Other Sources
Boots The Chemists	Food retailing	Tim Goodwin (Location and Development Research Manager)	Primary case study	Tape recording and note taking	GIS application demonstrations	• Internally-generated data like annual reports/ brochures/ newsletters • Abstracts and articles from refereed journals and magazines • Conference proceedings and chapters in books	• World Wide Web, e.g., company homepage (annual reports) and independent market news/reports • Independent databases, e.g., NISS, BIDS and Mintel
North Tyneside Council	Local government	Paula Henderson (GIS Officer)	Pilot case study	Tape recording and note taking	GIS application demonstrations	-	World Wide Web, e.g., company homepage and independent news/reports
Gloucester County Council	Local government	John England (Information Systems Manager)	Pilot case study	Tape recording and note taking	GIS application demonstrations	Two articles published by the interviewee on his organisation's GIS development	World Wide Web, e.g., company homepage and independent news/reports
CCN Marketing (UK)	GIS consultants, system and data vendor	Peter Cummings (Account Manager) Marc W. Farr (Business Development Manager) Nigel Wilson (Senior Consultant)	Pre-liminary discussions on gaining "access" International data issues in developing GIS International data issues in developing GIS	Note taking Note taking Tape recording and note taking	• GIS application demonstrations • School of Management, University of Bath does have a Mosaic Micromarketer PC-based version in-house • A half-day course on GIS (Mosaic Micromarketer) conducted by CCN Marketing at the University of Bath premise • The "Greece" Data Requirements List for developing GIS	Company and Mosaic Micromarketer Brochures	World Wide Web, e.g., company homepage and independent market news/reports

Organisations	Nature of Business	Contacts/ Posts	Purpose/ Status	Data Collection Methodology			
				In-depth Interviews	Observations	Archives	Other Sources
ESRI (UK) Ltd	GIS consultants, system and data vendor	Andrew Coote (Consultancy Services Director)	Pre-liminary discussions on gaining "access"	Telephone Interview	GIS application demonstrations	• Company brochures • Company "White Papers"	World Wide Web, e.g., company homepage and independent market news/reports
ESRI South East Asia (Malaysia)	GIS consultants, system and data vendor	Brett Bundock (Country Manager)	Discussions on Malaysian GIS development issues	Note taking	GIS application demonstrations	-	-
Jaya Jusco Stores Sdn Bhd	Supermarket	Liow Yoon Mun (Business Development Officer)	Exploratory fieldwork on site selection decisions/ Verification of the findings (via CCN Marketing Demo CD ROM)	Tape recording and note taking	-	-	Local magazines and newspapers
Mobil Oil Malaysia Sdn Bhd	Petrol stations	Abdul Halim Mohd Tahir (Real Estate Manager)	Exploratory fieldwork on site selection decisions/ Verification of The findings	Tape recording and note taking	-	Confidential site selection decision criterions manual	Local magazines and newspapers

Appendix 3.2: Informants Contact Addresses and Telephone Numbers

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