



Geographical Information Systems (GIS) success factors amongst UK food retailers: Comparisons between market leaders and followers

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Abstract

Geographical Information Systems (GIS) are becoming more prevalent for retailers in their use for both day-to-day and strategic decision-making. Given the array of internal and external databases they use, as well as the amount of organisational development, system implementation is a most apposite description of how a GIS supports retailing decision-making.

System implementation has been one of the most active research topics in the GIS field (e.g., Kraemer and King, 1979; Pinto and Onsrud, 1991; Campbell, 1992; Huxhold and Levinsohn, 1995). However, the results of these studies are mixed and inconclusive. There is also very little published work on GIS implementation in retailing. Practitioners in retailing, responsible for the implementation of a GIS cannot assume that the determinants of successful GIS implementation can be readily generalised from studies based on other environments such as local government authorities.

This article presents the results of cross case studies, reflecting upon the GIS implementation experiences of key UK food retailers. Two retailers were studied that have different positions in the marketplace and have utilised their GIS to varying degrees. The theory developed shows the factors that are significant in the implementation of a GIS in retailing organisations. It reflects upon the experiences of market leaders and the retailers that struggle to keep up with them.

Keywords and phrases: GIS implementation factors, implementation, GIS in retailing, case study research, grounded theory.

1.0 Introduction

In the UK over the last 15 years, GIS have developed as a Decision Support System (DSS) employed by retailers. The systems were initially employed to support site selection decisions but have developed to support an array of marketing mix decisions. Such systems are established as giving competitive advantage, establishing direct electronic links with customers, enhancing organisational planning and decision-making in a wide array of functions and reducing the cost of operations.

Despite the widespread use of GIS technology particularly in the retailing, it appears that the primary focus has been on applications, with limited emphasis upon the issues around implementation of the system (Beaumont and Inglis, 1989; Johnson, 1989; Tonks, 1990; Goodchild, 1991; Mitchell, 1991; Kolli, *et al*, 1993; Bryan, 1994; Buttery and Volk, 1994; Botts, *et al*, 1994; Clarke and Rowley, 1995; O'Malley, *et al*, 1995; Tayman and Pol, 1995). Practitioners responsible for the implementation of the system cannot assume that the key themes with other areas of GIS are equally significant for GIS implementation in retailing. Even if one believes that to be so, this assumption must be confirmed empirically. Reviews of GIS implementation factor research have revealed that collectively, implementation studies have yielded



conflicting and somewhat confusing findings. The extent to which the existing body of research reflects a cumulative development of knowledge is not entirely clear. Thus, the knowledge of which GIS implementation factors are the most significant, to achieve the purported benefits. In line with this reason, there are also other reasons why studies dealing specifically with GIS implementation are significant and must be undertaken. Many DSS¹ have never accomplished the claimed benefits made when the system was acquired (Alter, 1978: Ginzberg, 1981: 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. Retailers must understand and manage these key implementation factors in order to maximise the benefits from their GIS investments. For retailers, GIS implementation becomes an issue that requires careful planning based on a full understanding of what must be done to achieve success and avoid failure. Examination of the implementation factors in leading UK retailers will hopefully provide these lessons.

2.0 Research Methodology

A review of GIS implementation studies was undertaken in areas more developed in GIS implementation, e.g., local authorities. Based on this review, it was noted that there is an enormous array of implementation factors described in the literature. Given these array of factors and the fact that there are few key retailers that could be studied, both case study research and a grounded theory approach were devised and employed as a combined methodology to allow the encapsulation of the phenomena. Grounded theory allows an “understanding” rather than “measurement” of the retailers’ GIS implementation experiences, leading to the generation of the grounded theories. A broad framework of GIS implementation was developed based on the System Development

Life Cycle (SDLC). This framework was used to set boundaries to events of enquiry (prior, during and after GIS implementation). Four retail organisations were approached for the purpose of the primary data collection, though in this paper two retailers are examined that represent a high performing market leader and ‘follower’ of moderate performance. All interviews were tape-recorded and the relevant portions of the tape were transcribed in full². Direct observations were used to supplement the in-depth interviews, not only to examine the same phenomena but also to enrich understanding. The data obtained from the in-depth interviews were then compiled and presented in the form of cross case analyses. Cross case analyses allow a structuring and contrast in the data collected. The basis employed in selecting the organisations and the informants for this study was based on Glaser and Strauss’s concept of theoretical sampling (Glaser and Strauss, 1967) instead of using the quantitative sampling approach³. The sample is chosen based on the conceptual requirements of the study. The unit of analysis for this study is a series of organisational activities taking place over time, that is the entire GIS implementation process. The conceptual framework for the study follows the SDLC in which project managers sequentially go through the following stages in developing and implementing GIS.




2.1 Method of analyses

Content analysis was employed in analysing the data. The data was categorised into concepts and sub-concepts (open coding) and 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 core and sub-categories that linked with a number of related concepts (axial coding). The Tesco (first retailer examined) data were re-analysed and re-coded using the proposed method with the aim being to determine a set of core and sub-categories that covered as much

¹ GIS is considered as part of DSS due to its nature in supporting decision making.

² Note taking was found to be necessary in serving as a back up in the case of tape-recording failure. It will also act as a preliminary index to the tape-recording itself (Brown, 1990).

³ Choices of the informants and interactions were driven by the intention to expose any of the similarities and dissimilarities, providing the opportunity for comparing and understanding key relationships in the setting.



of the data as possible. An iterative re-analysis yielded a set of broad core and sub-categories that described the notable conditions, events, consequences and experiences associated with GIS implementation. Following the “constant comparative analysis method” as proposed by Glaser and Strauss (1967), Somerfield (second retailer examined) data 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. The same process was employed for analysing Somerfield data (the data was first sorted into the initial 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 site (Somerfield). Accommodating Somerfield 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. The iteration between data and concepts ended when sufficient categories and sub-categories had been defined to explain what had been observed at both sites and when no additional data were being collected or found to add to the existing set of categories and sub-categories. A situation Glaser and Strauss (1967) described as “theoretical saturation”. 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 informants and with triangulation of methods.

3.0 Findings

Based on the SDLC that guided data collection and analyses, a list of successful factors is presented that can be employed by retailers. The results from the analyses allowed the formulation of a grounded theory of the GIS implementation factors.

3.1 GIS Implementation Factors

3.1.1 Internal and external forces to GIS implementation

The analysis started with the internal factors that acted as “forces” towards GIS implementation. The internal factors leading to the implementation of a network-based GIS were inherited as a result of using a “traditional” 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 statistical presentations).
- Prolonged frustration faced in using the old approach, i.e., “traditional” or PC-based stand-alone GIS, for example, was unable to provide customised internal site research models (it cannot be customised and was designed to meet the universal need of the retailers).
- Continuous internal pressures to lead or maintain present organisational position in the market by senior management and investors.

All these factors indicated that there was a “struggle” by senior management in improving the productivity of the site research decisions. In addition, there were also some external forces towards the GIS implementation, which were closely connected to the continuous internal forces. The four key external forces were:

- The intensification of competition faced within the industry.
- Increasing competitors investments in GIS.
- Worldwide retailer’s attention towards GIS particularly in Europe and USA.
- The mushrooming of GIS data and vendors that facilitated the evolvement of the technology.



3.1.2 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 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's Site Research Department (SRD) senior managers had conducted discussions with GIS specialists from non-competing organisations. In contrast, Somerfield proceeded its implementation without having any plan developed in hand ("trial and error" approach). It was revealed in the analysis that the basic implementation objective was to solve the problems that lay in using the traditional GIS. The new network-based 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.

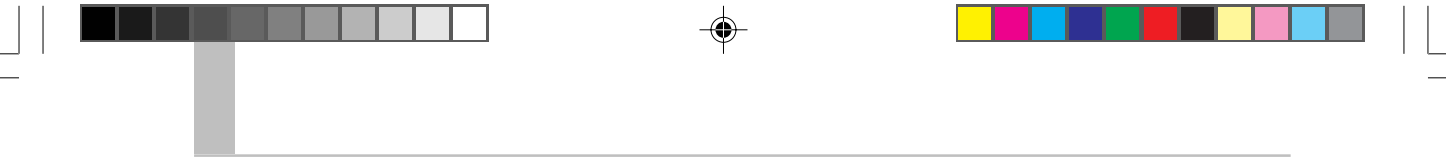
3.1.3 Senior management awareness and support

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. At Tesco, the ability and benefits of GIS were realised by a large number of senior managers prior to the implementation and thus the idea of GIS implementation was well received. Senior management commitment and support were critical and essential for successful GIS implementation. 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. Senior management commitment and support were present throughout the implementation period, i.e., SRD had continuously employed GIS in developing the site research models 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 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. However, at Somerfield, the level of support provided by senior managers was somewhat marginal except in the provision of funds. It was believed to be 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 commitment and support.

3.1.4 The role of GIS champions

A GIS champion is someone who is entirely committed to the idea of implementing the system within the organisation. They tirelessly pursue the goal of GIS implementation by selling the idea to senior managers, 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 managers, users, and system developers) by working together as a team. They also tirelessly sold the idea to other potential users about the system and kept it alive by confronting the counter implementation threats. Once GIS started to develop, they continued to actively persuade other senior managers and users in the organisation to commit to the idea of implementing the system in the entire organisation. 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.

3.1.5 Need analysis

User needs analysis served to educate 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 could they realistically expect of the system. 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 of the system (as the implementation process proceeded). 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. Continuous formal and informal support and training were ascertained by the departmental head and discussions were held with users in their attempt to improve the system. As GIS started to develop, senior managers and system developers held further discussions 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.

3.1.6 Applications and system development

Applications and system development issues are technical issues of GIS implementation. Detailed application design should be focused on the design of the 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 develop-

ment effort in GIS implementation was a post-implementation evaluation (as users become more sophisticated, they frequently demanded more from the 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 the SRD's accumulated experience and knowledge. A joint team of senior managers, users and system developers were set-up to deal with these problems. On the other hand, at Somerfield, implementing GIS applications generated specific and general specifications for the applications. Although GIS had been recognised as a tool to strengthen sales forecasting and site research models, system's hardware was not upgraded according to user expectations and requirements.

3.1.7 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, an incomplete system was purchased, allowing them to set-up their own in-house application designs for maximum customisation flexibility. Prior experience gained whilst engaging the PC-based stand-alone GIS was employed as a guideline for the procurement tasks. On the other hand, at Somerfield, procurement tasks (e.g., evaluating the vendors) were performed solely by the site research senior manager.

3.1.8 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, users and system developers in managing the databases, e.g., conversion and maintenance processes. At Tesco, careful attention was given prior to managing the data sets. Its design tasks were based on senior managers' and users' feedback. The data was digitised immediately once the system was installed. On the other hand, at Somerfield, most of the data set were in various data formats that caused severe data set management problems. Multiple sources of data



were one of the key factors that resulted in limited applications of the system in the organisation.

3.1.9 User awareness and involvement

The changing nature of the organisational context suggests a need for appropriate approaches to facilitate better communication between senior managers, users and system developers. Although formal communication and documentation can be valuable, it was revealed 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 revealed that the senior manager-user involvement is not practically feasible due to the effects of organisational norms. One way to overcome these effects could be to support the mechanisms to improve communications with intermediaries such as GIS champions. It was evident from Tesco that 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 rested on their ability to communicate in a meaningful way (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 and various attempts had been made to facilitate users' involvement (e.g., regular meetings). On the other hand, at Somerfield, although users were familiar with the system, users' involvement was self-initiated. The benefits of the system were realised only by a small number of users.

3.1.10 Resistance to change

Understanding resistance to change is significant to successfully implementing GIS. At Tesco and Somerfield, resistance to change was strong during the initial stage of the implementation. It was due to the unfamiliarity faced by senior managers and users in operating the system. GIS implementation difficul-

ties 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 SDLC. An extreme level of enthusiasm displayed by the champion, helped to reduce the strong level of resistance amongst other users. Some of the resistance to the use of GIS was reduced by providing an opportunity for users to experiment with the system, for example, developing the application prototypes. It is contended that this approach made GIS accessible to a wider audience of users.

3.1.11 Training

At Tesco, 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 managers, 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 and monthly training was also conducted on a regular basis. Proper compilation of training materials was developed for future training references. 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.

3.1.12 Vendor support

At Tesco, collaboration was set out with key vendors in developing several of their applications during the introductory stage of the implementation. These applications were set up by their key vendors. As the implementation proceeded, they provided a continu-

ous 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.

3.2 The Emerging Theory of GIS Implementation

The likelihood of a GIS succeeding and having the desired organisational impact depends strongly upon the understanding on how to manage GIS implementation over time. A generalised approach to the GIS implementation is proposed, based on the SDLC. The methodology differs from the traditional SDLC in several essential ways, i.e., the process itself is iterative and 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 the user may not fully understand or be able to articulate needs early in the SDLC. A framework of GIS implementation process is presented in Figure 1 based on the cross-case analyses (a sequence of tasks can be arranged that approximately follow the implementation process). It incorporates the emerging framework of GIS implementation that is developed based on the seven key concepts that emerged from 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.

It is clear to see that effective GIS implementation processes depends very much on the behaviour of senior managers and users and that success increases with their willingness and motivation. 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 and 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 be better able to analyse their own department/organisation in managing the implementation tasks (avoiding spontaneous processes) 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

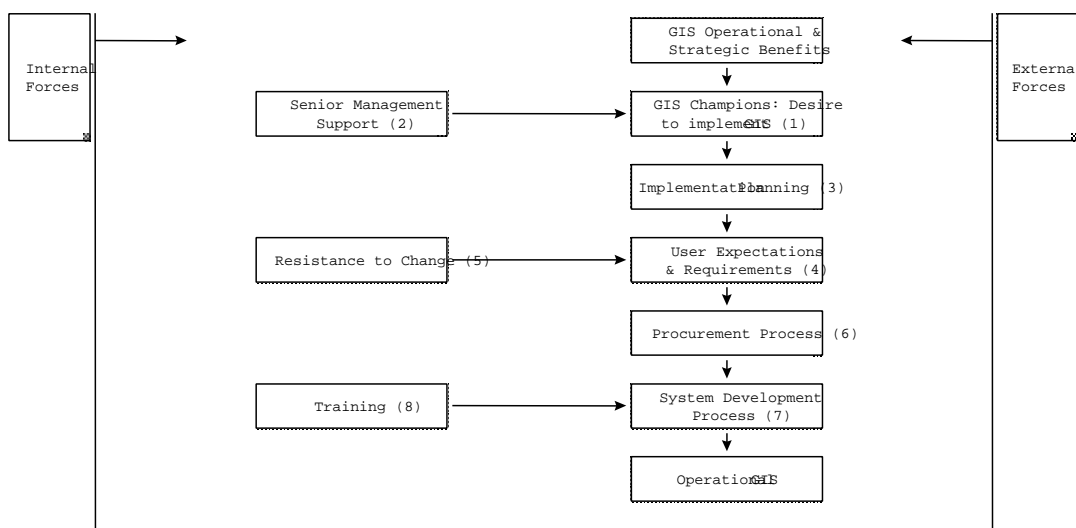


Figure 1: The Emerging Framework of the GIS Implementation

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 champions 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, 1992). 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 and users. 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 can be done. As implementation planning proceeds in parallel with implementation tasks, departmental heads (e.g., site research) can start to plan for the entire organisation, by sharing some of the applications with other interested departments. Stage (4) involves the analysis of user expectations and requirements. It should be a process that establishes dialogue between senior managers, users and system developers. 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 limitations 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 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’ resist-

ance, 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 and 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. Users are supposed to be holding the primary responsibility in developing the applications and in administering the databases. 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 design stage. This procurement process is

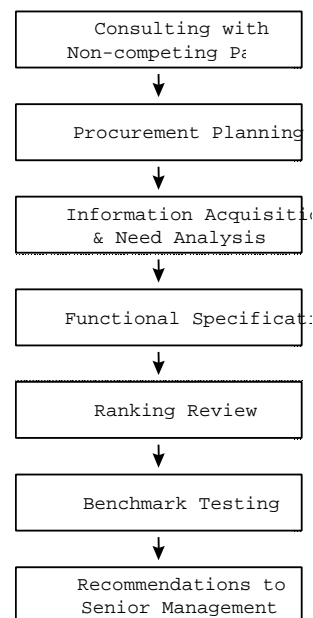


Figure 2: The GIS Procurement Process

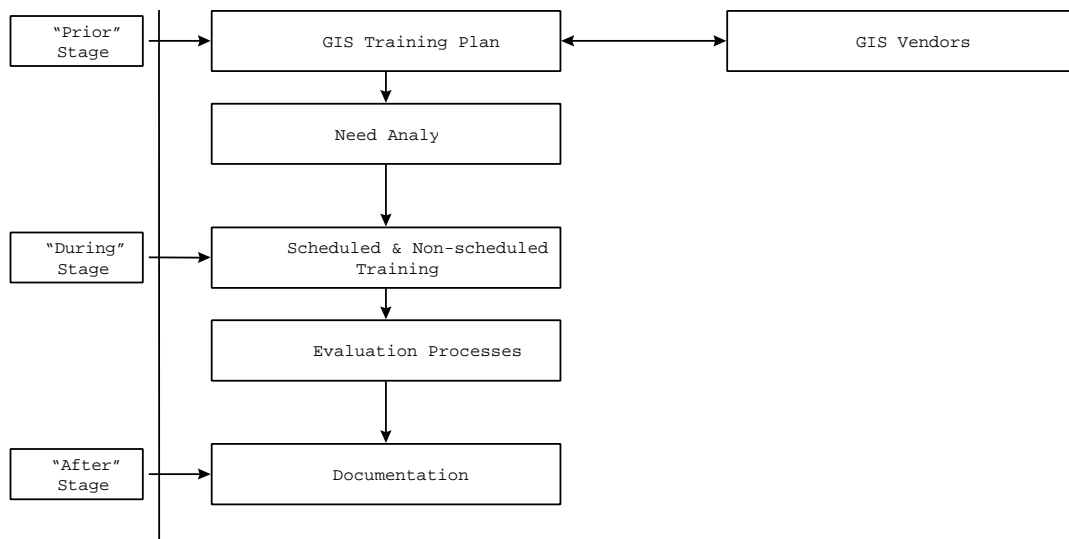


Figure 3: The Training Process

dependent on the policies and practices of the organisation. However, the process may be outlined in a general manner. Figure 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. Senior managers, users and system developers 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 the senior management.

For the system development process (7), implementation tasks can be more manageable with the aid of 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 system is enriched, adding more knowledge of the underlying processes. A high degree of senior manager, user and system developer participation are needed and the design should be presented for feedback. As revealed by Tesco, who were market leaders in their own sector, the development and implementation process should be initiated with thorough planning. System development tasks can be categorised into three key categories: 1) Application development, 2) DBMS (database management system) 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. Finally, all the methods and procedures for designing and developing the application as well as the system should be documented for easy future reference.

A key part of the system development process is training (8). There is a need for senior managers to cultivate an on ongoing 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 3 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 the system (give inputs into the system). Users' 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.

4.0 Conclusions

System implementation has been one of the most active research topics in the GIS field (e.g., Kraemer and King, 1979; Pinto and Onsrud, 1991; Campbell, 1992; Huxhold and Levinsohn, 1995). However, the results of these studies are mixed and inconclusive. There is also very little published work on GIS implementation in retailing. Practitioners in retailing, responsible for the development and implementation

of a GIS cannot assume that the determinants of successful GIS implementation can be readily generalised from studies based on environments such as local authorities. The GIS implementation covers the tasks and forces that lie within the process. By recognising the nature of these influences, senior managers and system developers might be better able to understand, commit and support the implementation process.

The theory developed shows the factors that are significant in the development and implementation of a GIS in retailing organisations. It reflects the experiences of a market leaders and a retailer that struggles to keep up with them. It suggests that before the implementation of a technology such as GIS, key players (e.g., senior managers) in the department/organisation should articulate their intentions with respect to the context of GIS implementation process. Having articulated these key issues, senior managers can more effectively plan the implementation process and facilitate the action to enact the implementation.

The methodology employed offered excellent conditions for the understanding of subjective elements in GIS implementation process, i.e., in understanding user awareness and involvement along with organisational and technical issues. It can be of value to other researchers in DSS/GIS development and implementation in general, as a basis for further investigation. Both researchers and practitioners alike should find the framework useful as they examine the implementation and use of this significant but still poorly understood technology (the framework can assess and manage what is typically poorly understood). It is also significant to recognise that these case studies involved British retail organisations. Therefore, replications within other sectors or countries are desirable.

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