
PRACTICE FORUM

Computer Applications in Planning: Twenty Years' Experience of Cheshire County Council

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Introduction

The availability of geographic information systems (GIS) has aroused much interest in the planning profession and has become one of the most popular techniques used by local planning authorities in Britain to handle information and to guide decision making in recent years. With rapid improvements in the capacity of both computer hard and software, GIS now have unprecedented capabilities to handle a wide range of physical and socioeconomic data. The linkage of all data in GIS by location—the central role of maps—is the particular value of GIS for a wide variety of planning issues and applications. However, the potential of GIS has not necessarily been fully realised and the experience of using GIS is not always a straightforward and easy one. This paper aims to provide a brief overview of the latest development of GIS usage in British planning authorities. It then examines the hurdles faced by planning authorities and their organisations in the development of a fully integrated and embedded GIS system, and the type of applications GIS have contributed to the day-to-day management of planning and the policy-making process. These key issues are further explored by a case study of Cheshire County Council (CCC) which has 20 years of practical ex-

perience with digital mapping and GIS. The lessons drawn from the experience of Cheshire will no doubt shed light on future GIS development and use in the planning arena.

The Road to GIS: From the Chorley Report to the Service Level Agreement

The 1995 Royal Town Planning Institute (RTPI) survey on the adoption of GIS shows that about two-thirds of planning authorities have either GIS or automated mapping systems. Although this is not a shining record in comparison with our international counterparts (Worrall, 1990), it is, however, an apparent acceleration in the take-up rate in British terms. For British planning authorities the road to GIS is a long and twining one. The watershed which increased awareness of GIS got off with the publication of the Chorley Report in 1987 (Lord Chorley, 1987). Its recommendations on the rapid digitisation of the Ordnance Survey (OS) basic scales map series, the use of post-codes as standard data holding units, the use of the national grid referencing systems for data linkage and the setting up of a Centre for Geographical Information, have provided im-

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portant pointers to the fundamental directions of change in GIS development in Britain.

However, the real breakthrough in achieving large-scale digital mapping coverage came with the signing of the Service Level Agreement (SLA) between the OS and local authorities in April 1993 (the second agreement was renewed for the period 1996–1999). According to the 1995 RTPI survey, 62% of local authorities have approved the SLA. With a one-off contribution towards the global SLA fee each local authority is entitled to the use of a range of digital data products such as the Land-Line data, 1:10 000 raster data and the Central Alignment of Roads database. Before the introduction of SLA, digital map data was charged for each independent use which made it very unaffordable to many local authorities and only a few of them had complete coverage. This, however, has changed considerably since the start of the SLA in that 85% of authorities are now using digital data for a range of tasks from simple map production to more sophisticated applications such as geographic information integration and processing (Burleton, 1996).

Planners have played a very important role in the development and management of GIS. This is evident from the fact that 42% of all GIS/automated mapping systems were hosted in planning departments (Rodriguez-Bachiller & Smith, 1996). Nevertheless, the progress and adoption of GIS varies widely from authority to authority. In a recent survey carried out at Manchester University, Bamford (1995) found that the usage of GIS by smaller district councils was very limited (only 7% possessed GIS). This is reinforced by the RTPI survey findings that only one-fifth of planning authorities had a fully operational system despite the steep increase of take-up rate by 137% between 1993 and 1995. Since the large majority of the adopted GIS are not fully up and running, it is not surprising to find that most applications made so far tend to be lower-order functions. The findings of the RTPI survey show that 43% of all systems were dominated by cartographical uses, and this is especially so among the smaller authorities. Only 9% of authorities applied GIS for higher-order activities such as the evaluation of planning constraints and socio-

economic analysis and 6% of authorities mentioned uses such as planning application processing, development plans work and listed buildings (Rodriguez-Bachiller & Smith, 1996).

It is now 10 years since the publication of the Chorley Report; the lack of higher-order applications of GIS makes it important to find out what are the obstacles and challenges which prevent the large majority of planning authorities from integrating GIS as part of their management and decision-making system. One of the most frequently mentioned issues of GIS development is the data compilation and management problem (see e.g. Worrall, 1990; Wong, 1993). Although GIS is a very powerful tool for handling a vast quantity of information, the data needed to serve specific policy objectives or decision-making processes are often not collected at all, or if they are collected, they are not necessarily in a machine-readable format. This creates significant problems over data linkages to realise the full potential of GIS.

Another key concern are the organisational and managerial aspects of GIS. Since the cost and resources involved in setting up and running a GIS system are huge, it is important to choose the right system to match with the identified needs of the organisation. On the whole, there is a consensus that a far-sighted strategy focusing on application needs together with a strong organisational and staff commitment are the crux to success (Gault & Peutherer, 1990; Campbell & Masser, 1994). However, it is not always easy to achieve these qualities and most GIS strategies of British local government are perceived as either technology-led or too narrowly centred on a specific process or task (Gault & Peutherer, 1990; Worrall, 1991). Moreover, a lot of discussion has focused on the pros and cons of adopting a corporate or department approach to the implementation of GIS. Whilst authors such as Gault & Peutherer (1990) advocate the benefits of synergy brought by a corporate approach, Campbell & Masser (1995) argue that the general acceptance of the corporate approach as the most appropriate basis for implementation can only confuse the issue.

These long-term obstacles to GIS development were further compounded by the new political challenges faced by local authorities.

During the late 1980s and early 1990s, there has been considerable legislation resulting in the changing roles for education and social services and new responsibilities in environmental services. With the neo-liberal ideology of central government, *Compulsory Competitive Tendering* was introduced in certain services of local government. Local authorities have also been facing increasing pressure on resources, demanding greater efficiency in their service delivery and how they tackle problems. The auditing culture of central government means all public organisations are under pressure to provide quality services. More importantly, this quality should be expressed in measurable terms and translated into performance indicators. All these changes demand better information access and management.

On the planning front, a new consensus has emerged within the profession which pays more attention to conservation and environmental protection in the 1990s. This is strongly driven by the White Paper *This Common Inheritance* (HM Government, 1990) and the subsequent UK Strategy for Sustainable Development. The environmental legislation of the European Union and the Agenda 21 movement following the Rio Earth Summit, have led to a growing application of the idea of sustainability and the environmental appraisal of plans and other policy areas. This has led to the growth in environmental organisations, all demanding greater involvement in decision-making and access to information about the state of the environment and internal environmental audits.

Increasing uncertainty about roles of local authorities has been intensified by the review of local government. There has been some recent concern over the potential losses of data following the latest round of local government reorganisation which started in April 1996 (Davies, 1996). The experience of the abolition of the metropolitan counties in 1986 was something of a nightmare in this respect; a lot of valuable information, computer systems and data sets were lost in the turmoil. This was partly compounded by the problems that the key personnel who were involved in the day-to-day management and operation of these systems and information either left for other jobs or took early retirement.

It is these long term obstacles as well as the turbulent political environment which create uncertainty (as well as possible opportunities) for the development of GIS in British local government. The next section of the paper aims to use the practical experience of CCC, which has a strong national reputation of being at the forefront of pioneering GIS activity, to examine the key issues surrounding the managerial and organisational context of the adoption of GIS.

Cheshire's 20 Years' Experience in GIS

The Embryonic Stage

Digital mapping started in Cheshire in 1976 to speed up the manually operated cartographic service by digitising the land parcel boundaries and reproducing them as map overlays on a graph plotter. Although the original overlays were visually unattractive, it was possible to make automatic calculation of the area of each land parcel. Questions such as "how much land is available for housing development in Chester?" could then be answered by using point-in-polygon searching techniques to interrogate digitised 'Areas of Interest' and the land parcel files. The approach adopted was problem-solving rather than research-based. The aesthetic appearance of the products and the timescale of response were the crucial elements in maintaining the enthusiasm of politicians and managers for GIS development. After 10 years of pragmatic work in a somewhat sceptical environment, digital mapping in Cheshire had reached a plateau in 1986. The prime task was then to move from a development project to a full production mode, to enhance the system by going fully interactive, improving the speed of data capture and informing other colleagues of the potential of the database. Although CCC had most of the favourable factors in place for GIS development, there were still issues concerning their corporate approach, about leadership and enthusiasm from the top and about the finance for more experimental work and the demonstrator project.

Meeting New Challenges

There were considerable changes in the context

within which local government operated during the late 1980s and early 1990s. These changes and external pressure have affected CCC's corporate development of GIS. *Compulsory Competitive Tendering* was introduced in certain services of the Council. 'Arms length' companies such as the Waste Disposal operation have been created together with direct labour/service organisations in Engineering, and in one case a service has been completely privatised—the former Architect's Department. This fragmentation of the Council's functions may in market terms lead to greater efficiency but has meant a rethinking of their GIS strategy. The strengths of a GIS are that it brings data together and gives it a spatial dimension. Fragmentation of activities and functions renders the corporate objective more difficult to define and hence the design of a GIS correspondingly more difficult. Indeed the privatised elements may have no interest in a corporate vision unless it increases their profits.

In order to cope with the ever stringent financial regime of the public sector, an *internal market* has been established whereby front-line services can buy services from support services. This necessitates devolving of budgets which, in the longer term, will allow front-line services to shop around to obtain the best buy. In order to link databases, contractors will need to adhere to Council standards, in both technical terms and for data documentation and exchange. Of course, convincing front-line services that adherence to these standards will be for the greater good may be difficult and not achievable across the board.

All these turbulent political changes have created obstacles to GIS development in Cheshire. Nevertheless, the effort of creating a GIS has proved to be extremely valuable in the drive to achieve greater efficiency and productivity without significantly increasing costs. The audit culture and the rise of environmentalism have exerted tremendous pressure on the Council to supplying information to the public. GIS have contributed to the major area of activity in the measurement of the quality of public services and the management of environmental information. Indeed contracting out services has made tremendous demands on digital

map data to produce plans and area measurements for tender documents (e.g. grounds maintenance contracts). However, GIS development in the Council may face another big challenge due to the recent review of local government structures in the English shires. The outcomes of this review are that Halton and Warrington will separate from the county and become unitary authorities in April 1998. This will no doubt bear resource implications for the service provision of CCC and may lead to a reorganisation of the County Council's structure.

Developing a Corporate Approach

A Geographic Information Unit (GIU) was established in 1989 to focus on the research and development of GIS in CCC. The Unit was formed by transferring personnel from the Planning Department which had taken the lead in GIS activities. The Unit was to acquire the spatial corporate databases such as OS digital data and the Royal Mail's Post Office Address File for the county and make them available to front-line services, provide a good-quality cartographic service and spatial analytical techniques, and give GIS advice to other council services. The county-wide communications network CHESHIRElink is also used to network GIU's services to over 1000 terminals so that schools, public libraries, police stations and other offices can access the databases. The overwhelming client demand of GIU mainly comes from customised cartographic products. Some notable examples are the mapping for the Old Bailey trial of the Warrington IRA terrorists, the submissions to the Local Government Commission and the re-plotting of the County Public Rights of Way definitive maps. The Unit also uses GIS to carry out research analysis: for instance Tydac's Spatial Analysis System (SPANS) was used to analyse the pattern of multiple deprivation at the local level by integrating the Census data and other information.

Despite all the development and experience in CCC, it has failed to produce a corporate GIS (Gilfoyle & Challen, 1995). Although there is a corporate approach in Cheshire for the management of data sets, it is still very much a departmental approach in terms of GIS

development. Other than the work of GIU, other departments in the Council also carry out their own activities and they use a wide range of equipment and software. For example, police control using DATATREK disaster monitoring using IMPLEX, and more corporately based systems such as ARC/Info for the Highways and Planning Services. All the GIS are narrowly based with limited cross-service access to other databases. This may be due to the lack of a formally agreed clear vision of what a corporate GIS is. To resolve this problem a Steering Group of Chief Officers has been set up to identify areas of weakness and establish mechanisms to overcome the hurdles. The hindrance to the road of a corporate GIS is less financial or technical but more the ability of middle to senior management to understand the potential and requirements of GIS. CCC is going to review its information technology strategy and GIS will be part of it.

Data Availability and User Training

As the pioneer and key diffuser of GIS technology the Planning Department of CCC has been writing a lot of software and digitising a huge database of planning constraints and boundaries of statutory or policy significance since the 1970s. It is therefore interesting to take note of the progress and obstacles faced by the Department during the last decade of the 20th century. GIS development in the Planning Department is mainly supported by the technical team which currently has three staff (the other four were transferred to the GIU in 1989). ARC/Info has been chosen to replace the 'old mapping' software which was written in-house in 1976. The old in-house software was actually written in a very flexible way but was not really user friendly because it was run from the mainframe and there was no visual output of the image from the computer screen. The data files in the old system are based on 1:10 000 scale which is also very crude when doing data overlays. The choice of ARC/Info was partly due to its successful implementation in the Highway Department, from which expertise and experience could therefore be drawn.

The environmental database in the Planning Department built up over the previous decade

has been expanded. Currently, one of the major tasks for the technical team is to establish the data infrastructure for the new system. Although the Department has developed a considerable amount of data sets in the past, the move to the new system implies a major job of data transfer. Due to the flexibility of the old system in handling the polygons, the transfer to ARC/Info is slightly more complicated as it is more restrictive on data format. The data formatting problem is also found in linking the Census data. One major challenge is to look forward to ways of updating and maintaining the data sets in the system. Although data sets have been input to the new system, it is not always easy to get those who hold the information to update the information, especially in a computer-readable format.

There are now over 70 data sets in the new system, such as agricultural land, green belt, conservation areas, derelict land, employment land, nature reserves, woodland and areas of archaeological potential. A pilot scheme has been carried out since March 1996 which allows only a small number of staff to access to data files and make alterations via ARC/Info. General access to a restricted number of data sets is made available via Arc/View on a view-only basis. So far, 12 staff have been sent to Liverpool University to receive training on Arc/View and in-house training has been provided for those who use ARC/Info. The new system, which has a pull-down menu written in-house, is more user friendly and it is hoped to encourage wide usage by staff. With the improvement of software and appropriate training, the ultimate aim is to provide easy access to geographical information for all staff via the PC network.

The new system is not yet ready to produce maps, although it has been used as a tool to handle some environmental analysis by staff in the nature conservation team. The system is still in its early stage for handling the entire system of development control applications; so far only minerals applications are handled by ARC/Info. There is, however, a vision that the system will be used for statutory consultation purposes. Due to the tremendous pressure on data capture as different divisions in the Department would like to see their data being

input, a GIS Working Group was set up to assess their priorities. The criterion is to serve those demands that have a wider user group before other specialist data. Due to the lack of in-house resources they may have to look for opportunities from other organisations and commercial sources to increase and speed-up the data capture process. The Working Group has recently prepared a GIS Strategy which provides a detailed assessment of their current state of play as well as their strategies on county GIS integration, user requirements, data capture and staff arrangements, data maintenance, data standards, training and finance. On the whole, data capture and maintenance are the crux to getting the new ARC/Info system up and running; analysis and applications will then follow. However, the progress is determined by the availability of staff resources.

Conclusion

This paper has provided a brief review of the picture of GIS adoption and usage in British planning authorities. Progress has been made since the publication of the Chorley Report and the rapid take-up of the technology was boosted by the SLA between local government and the OS in 1993. However, the large majority of GIS applications remain lower order activities of cartographic outputs; the potential of GIS for analysis and the decision-making front has not been realised and is very much in its infancy. Although there is an awareness of the importance of the organisational and management dimension of GIS development, there is still much discussion about the pros and cons of having a corporate or departmental approach in implementing GIS. The 20 years of GIS experience in CCC have demonstrated that the setting up of a successful GIS, at either the corporate or the departmental level, is a very complex task, especially in the light of the highly politicised environment. Four key issues can be drawn from the above discussion to shed light on future development of GIS in British planning authorities.

First, the rapid development of GIS in Britain also coincides with a very unsettled period. Due to the recession at the end of the 1980s, together with the neo-liberal ideology of

central government to deregulate the supply-side factors, the finance and roles of local government have undergone a very turbulent time. Financial constraints and the latest local government review are the two factors frequently cited as the reason for not adopting a GIS in the RTPI survey. Indeed, this unstable political environment and competitive culture have also affected the progress of those who have GIS already. However, organisations should be encouraged to take a more positive view towards GIS and consider its potential as part of the strategy to cope with change. The experience of Cheshire has proved that GIS has actually contributed to improve efficiency in certain services (for example the provision of digital maps and measurement for tender documents) in a very competitive time.

Second, despite the strong criticisms made by academics on the low level of applications made by practitioners in GIS applications, one has to be sympathetic to the circumstances faced by a lot of authorities in that they simply do not have the staff resources to cope with the basic data infrastructure of GIS, let alone doing higher level analysis. In some cases, there has been the creation of devolving budgets within an organisation, which means that applications are driven by client demands. Unfortunately, as proved by the case of Cheshire, these demands tend to be for cartographic products. In a way, this is a necessary part of the diffusion process since until users can appreciate the cartographic functions of GIS, they will not be committed to or involved in the development of a GIS. Having said that, it is correct for academics to keep reminding about and encouraging the use of GIS for policy analysis in order to reach the full potential and advantage that these systems can offer.

The third issue that comes out from this paper is the obstacle of data capture in developing a GIS. Data linkage and maintenance are the key issues faced by those who are involved in the running of GIS. Even a fully operational GIS cannot be sustained without the commitment and the correct attitude of everyone in the organisation to comply to data compilation standards and to update information frequently in the appropriate format. The apathetic attitude towards data collection is partly related to the

lack of commitment of some planners to monitor their policies because it is not mandatory (Bamford, 1995), and partly related to the fact that the planning profession's interest in techniques and analysis has been stifled since the demise of the rational planning approach in the late 1970s (Wong, 1998).

Finally, the idea of using GIS as a corporate tool to link up different data sets is very good, but practice always falls short of the ideal. Despite being a pioneer in GIS development, the technical and data experience of Cheshire does not seem to guarantee a successful corporate GIS. It is also the leadership, commitment, attitude and understanding of key personnel in the organisations that matters. After all, it is also attitude problems which create obstacles to data linkage and to some extent the types of applications GIS are used for. This is why Gilfoyle & Challen conclude that "The next generation of managers will be less awestruck by the technology and more able to take advantage of it. We believe that the heights will have been reached when the corporate facility abandons the 'G' in GIS and becomes a fully integrated management information system" (1995, p. 6.3.4).

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