

**SYMPOSIUM ON GEOGRAPHIC INFORMATION SYSTEMS:
THE NORTHERN IRELAND GEOGRAPHIC INFORMATION SYSTEM**

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1. INTRODUCTION

It was with great pleasure that I accepted the invitation to speak at tonight's symposium on Geographic Information Systems. The Society has had a long relationship with the Ordnance Survey and it is fitting that it should have provided this forum for the discussion of issues which are changing many of the methods of socio-economic research.

The aim of this short paper is to give an introduction to and an overview of the current state of GIS in Northern Ireland. The paper starts with an attempt to give a definition of GIS; this is followed by an overview of both public sector and academic developments in GIS. The paper then concentrates on NIGIS (the Northern Ireland GIS) which is being developed as a single, distributed but fully integrated GIS for Northern Ireland. It is providing the means, on a country-wide scale, by which the varied spatially referenced data holdings of Government Departments and public utilities can be linked and fully exploited for the benefit of the entire Northern Ireland community.

2. GEOGRAPHIC INFORMATION SYSTEMS

With increasingly powerful computer systems becoming more readily available, the ability to handle large-scale sets of data is developing rapidly. One of these developments is in the analysis of data which are spatially referenced. The systems which have been developed to handle such data are

known as Geographic Information Systems. The definition of a GIS given in the report of the Department of the Environment's Chorley Committee, *Handling Geographic Information*, reads:

"A system for capturing, storing, checking, integrating, manipulating, analysing and displaying data which are spatially referenced" (HMSO 1987, p.132)

The spatial referencing of data can take many forms. The reference may locate a single data-point at an exact location on the Earth's surface, e.g. the position of a fire hydrant; it can be a set of references which locate a more complex entity in space, e.g. the route of a road; or it can be a reference to an area, e.g. an electoral district.

To capture spatially-referenced data effectively a GIS should be able to provide alternative methods of data entry. These would normally include digitising, both manual and automatic; satellite imagery; scanning and keyboard entry. For storage, checking, integrating, and manipulation of data a GIS should provide the facilities made available by a standard Database Management System (DBMS), as well as spatially specific tasks, and be capable of handling both attribute and topographic data. For data analysis the GIS should have access to all the standard statistical facilities of a package such as SPSS or SAS, and to routines which have been designed to handle the special problems created by the spatial characteristics of the data. Finally, the GIS should be able to display the data: spatially referenced data should be capable of being displayed in map format.

Too often GIS is equated with the generation of computerised maps. GIS has in principle much more to offer than simple mapping. Northern Ireland is taking a lead in highlighting the true functionality of GIS mainly through the work of the Ordnance Survey for Northern Ireland (OSNI), but also lately through the Economic and Social Research Council sponsored Regional Research Laboratory.

3. OVERVIEW OF GIS IN NORTHERN IRELAND

In late 1981 the OSNI, the government body responsible for the creation and maintenance of the topographic archive of northern Ireland, carried

out a feasibility study to establish the benefits of replacing conventional map production with a computerised system. The plan involved the digital conversion of the archive over a 10 year period to provide not only a complete topographic database for Northern Ireland, but more importantly, the basis for the development of a distributed but fully integrated GIS (NIGIS) through which all the major government and public utility functions would be linked. The goal from the start was ultimately to produce a true GIS and to this end Liaison Committees encompassing public services in Northern Ireland government departments and other major public sector organisations, were created to advise on the structure of the topographic database, the programmed population of it, the requirements of data exchange and the progress of computerisation within each organisation.

Establishing user needs has been fundamental to the approach and with the state of computerisation in most of the organisations concerned being limited to financial and administrative duties, there were few previous system decisions present to constrain a GIS route. Much of the partner bodies' information is held on maps and the use of GIS technology will enable them not only to quickly and flexibly store, retrieve and manipulate their own information, but also to interact with the datasets of other partners through the GIS linkages, be they on-line or otherwise.

It was determined that those using the topographical information should not encounter the incompatibility problems that were being experienced elsewhere and this aspect has been at the forefront in all considerations. Political support was received at the outset for this integrated approach, thus ensuring that information will be collected and converted to digital form only once, by the appropriate authority, and to a standard that will ensure usability by all. Financial benefits are in the main long term but the fact that more and more organisations have justified the need to computerise their own geographical records to integrate them with other elements of their information (statistical, customer records etc.) which in turn, requires structured topographical data, indicates that these benefits are real. In Northern Ireland the financial justification is soundly based on non-duplication of data conversion and the fact that additional benefits accrue when the information systems of the entire public-sector are linked to allow the exchange of relevant information.

On the academic side the catalyst for the development of GIS has been the

establishment of the Economic and Social Research Council's Northern Ireland Regional Research Laboratory (NIRRL). This is one of eight 'centres of excellence' established to develop the quantitative analysis of large scale socio-economic data sets. The Government's response (HMSO, 1988) to the publication of the Chorley Report (HMSO, 1987) encouraged them to develop their role in the area of GIS (HMSO, 1988, para 64). The NIRRL is a consortium of Queen's University Belfast, the University of Ulster and the Northern Ireland Economic Research Centre. They are closely linked to NIGIS through their advisory committee which consists of many members of NIGIS. They have developed a number of demonstrators which highlight some of the applications of GIS in Northern Ireland. Two of these demonstrators will be discussed tonight: one on Local Labour Market information Systems and the other on Environmental Analysis. Apart from these demonstrators they have been involved in more fundamental research in areas such as database design, human computer interaction, methods of spatial analysis and problems of topographic data transfer.

4. NIGIS

Following acceptance of the feasibility study and necessary potential systems evaluation and benchmarking, a SysScan system operating within a Digital Equipment Co. Vax environment was installed in OSNI in 1985. Work commenced on the creation of the OSNI topographic database COMTOD (Computer mapping and topographic database), the Greater Belfast Area being scheduled first, with the remainder of Northern Ireland for completion by the mid-1990s.

The graphic database structure contains some 190 separate levels and has a link and nodes nature capable of handling points, line strings and polygons, with all map sheets edge-matched and merged to eventually provide homogeneous cover for the whole of Northern Ireland. The system also enables the inclusion of associated textual information linked to relevant geometry, the link being achieved through a unique, system generated Irish Grid 12 figure reference representing the x and y co-ordinates of any relevant geometric element. Hence the topographic data user is provided with not only with the ability to access either all, or only selected elements of the graphic, but also, by virtue of the fact that OSNI is inputting the full postal addresses of relevant properties, to establish a link to the graphic for data held by address, through the unique reference.

Digital conversion for COMTOD is well in hand with Greater Belfast and the surrounding area now complete based on the large scale 1:1250 and 1:2500 surveys, and work continuing on the remainder of the Province. A second element of COMTOD, a small scale database created from 1:50000 mapping is also proceeding in tandem with the large scale work. In addition to initial conversion from the up to date archive, the database information immediately comes under a digital maintenance system, based on the latest field surveys, with a historical record, inclusive of its attribute information, being retained as a layer within the database as archived information.

There is an enormous amount of work to fulfil before the objectives of NIGIS are achieved. Considerable progress has already been made. National Transfer Format (NTF) or a further development of this is seen as the neutral format for data transfer and COMTOD data can already be supplied in NTF up to level 3. The NIGIS Liaison Committees fulfil an essential role in co-ordination of member developments and in ensuring the incompatibilities are not created through lack of information between partner organisations. Their membership has expanded as GIS awareness has increased and typical bodies represented are the DOE(NI) Divisions, the Department of Agriculture, the Department of Health and Social Services, the Northern Ireland Electricity Service, the Northern Ireland housing Executive and British Telecom (NI).

A programme of a series of six months studies is in hand hosted by OSNI, to provide a cost-effective means of enabling NIGIS partners to evaluate GIS techniques for their own applications, and to assess the benefits which will accrue from access to and interaction with other partners' data. Studies have been completed with Land Registry, Water Service, Roads Service and Planning Service. All have used the same geographic area, enabling successive studies to access data generated by those completed previously, thus progressively enhancing their usefulness by improved simulation of the final GIS position. Further in-house projects with the Department of Agriculture Drainage Division and the Northern Ireland Housing Executive are planned. All studies to date have reported favourably and findings are at various stages of evaluation within the Divisions concerned. Most advanced is Roads Service where an operational requirement for GIS implementation within their Belfast division is being readied for issue.

The area of data communication will be an additional feature of the NIGIS environment and to this end the current pilot project to investigate GIS potential within a wide range of Department of Agriculture application areas will be hosted off-site with a telecommunication link to COMTOD at OSNI HQ. This will allow the assessment of procedures necessary to transfer large data sets. Completion of the British Telecom STAR programme providing high capacity, optical fibre links to most urban centres by 1992 will provide a sound basis upon which the Government Telecommunication Service (GTS) X25 network can be employed to distribute NIGIS data.

The role of the NIGIS Liaison Committees is now being supplemented by the creation of a dedicated NIGIS Unit, located within OSNI, and with OSNI providing the core staff, to act as a focal point for ongoing development and implementation.

5. CONCLUSIONS

While GIS principles and technologies have been with us for some time, NIGIS is unique within the UK in approaching their use in a fully coordinated way, which in turn will result in financial and social benefits to all in Northern Ireland. Digital conversion is expensive but the investment in the data and the additional power and value which the topographical element allows will amply repay the effort. The commitment and support is there to bring NIGIS to fruition for the benefit of the whole community and point the way forward for the rest of the UK.

I think I am safe in predicting that GIS will come to play an ever increasing role in the proceedings of this Society and I believe that NIGIS provides researchers in Northern Ireland with unique opportunities for high quality work. I look forward to the future.

References

HMSO, 1987. Handling Geographic Information, *Report to the Secretary of State for the Environment of the Committee of Enquiry into Handling Geographic Information (Chairman Lord Chorley)*, London, HMSO.

HMSO, 1988. *Government Response to the Committee of Enquiry into Handling Geographic Information*, London, HMSO.