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Webmapping: delivering local area statistics

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Abstract

The year 2000 saw the implementation of a pilot project in Scotland to assess the applicability of using Internet GIS to inform the Scottish Executive's Social Justice agenda. The pilot is now complete and a report submitted to the Scottish Executive. This paper describes the achievements of the Pilot, the lessons learned and the implications for local area information provision in Scotland – through applications such as Neighbourhood Statistics.

The Taskforce co-ordinating the Webmapping Pilot – representatives were drawn from both central and local government – were keen to investigate the applicability of Internet GIS to integrate data from numerous sources and make analysis tools and information products available to non-GIS users. Using data provided from Local Authorities, central government and the private sector, the Pilot has identified various issues – including data protection, organisational, technological and training issues – which will have to be addressed by any large scale, Internet based information provision service.

Since the project's inception, the PAT18 report has significantly influenced the availability of statistical information. In Scotland there is agreement to collect a wide array of public information at unit postcode level. These data will be made available through Neighbourhood Statistics in Scotland: GIS will be used to aggregate point data to higher geographies. The lessons learned from Webmapping are therefore relevant to the delivery of Scottish Neighbourhood Statistics and other Internet based GIS projects.

Introduction

Central and local government provide a complex range of services, all of which influence local communities and have a direct impact on socio-economic issues. The public sector needs to be able to understand when neighbourhoods are declining or improving in relation to both national social justice milestones and local priorities. However, tackling social inclusion is not the responsibility of any single organisation. Partner organisations need to provide complimentary (and perhaps collaborative) services. Best practice would dictate that these organisations should access common data upon which decisions can be made. In early 2000 this "common data, common sense" approach became the principle driver for the Scottish Executive to request Communities Scotland (then Scottish Homes) to co-ordinate a Webmapping Pilot.

The Webmapping Pilot's primary aims were to:

- develop a web-based application to provide access to data from numerous organisations; and,
- identify and review the key issues pertinent to sharing information across the public sector; and
- assess the applicability of Internet Geographic Information Systems (GIS) to inform cross divisional and organisational decisions.

While the project was termed a 'Webmapping' Pilot, it had a clear remit to examine the issues around the sharing of information across organisations, not simply the development of an Internet GIS application. In many ways, the GIS acted solely as a gateway to gain access to geographic information for display, analysis

and data sharing purposes. Accessing information in this way highlighted various issues which are of use for any Internet based information tool – not necessarily one utilising Internet GIS.

Organisation

Communities Scotland established a Taskforce in February 2000 to progress the Webmapping Pilot (see table 1 for membership). With representation from Communities Scotland, the Scottish Executive, Scottish Enterprise and the Convention of Scottish Local Authorities (CoSLA), the Taskforce was designed to represent a range of public sector bodies in Scotland. In addition, Ordnance Survey, the General Register Office for Scotland – GRO(S) – and CACI were involved as information contributors.

Contact	Organisation
Gillian Young	Communities Scotland
Neil Mackinnon	Communities Scotland
Abigail Nolan / John Rowland	Scottish Enterprise
Gavin Keith	COSLA (Forth Valley GIS)
John Esslemont	COSLA (Ayrshire Joint Structure Plan Team)
Gillian Lancaster	COSLA (South Ayrshire Council)
Alistair McNeill	COSLA (North Lanarkshire Council)
Cameron Easton	Scottish Executive (GIS Unit)
Marlene Walker / Vicky Carlin	Scottish Executive (Area Regeneration)

Table 1: Webmapping Pilot Taskforce membership

The Taskforce met on a quarterly basis over the two-year duration of the pilot project. Communities Scotland were given the responsibility to oversee both the strategic and technical activities of the project, chair the meetings, and report back to the Scottish Executive on the findings of the pilot. Internal staff were used for the majority of the system design and data acquisition activities with a budget of £40K allocated specifically for third-party application development, data cleansing and research studies.

Outputs

Outputs from the Webmapping Pilot are threefold. Two written reports have been written. These are:

- the Webmapping final report **Sharing and Analysing Neighbourhood Level Information**
- and a summary report **Lessons Learned and Strategic Recommendations**

Both of these are available through the project’s third key deliverable: the Webmapping site itself (www.web-mapping.scot-homes.gov.uk). In addition, Communities Scotland commissioned two small studies to inform the Taskforce’s thinking. These were:

- cost recovery options for managing a multi-agency data sharing website; and
- an investigation of user feedback.

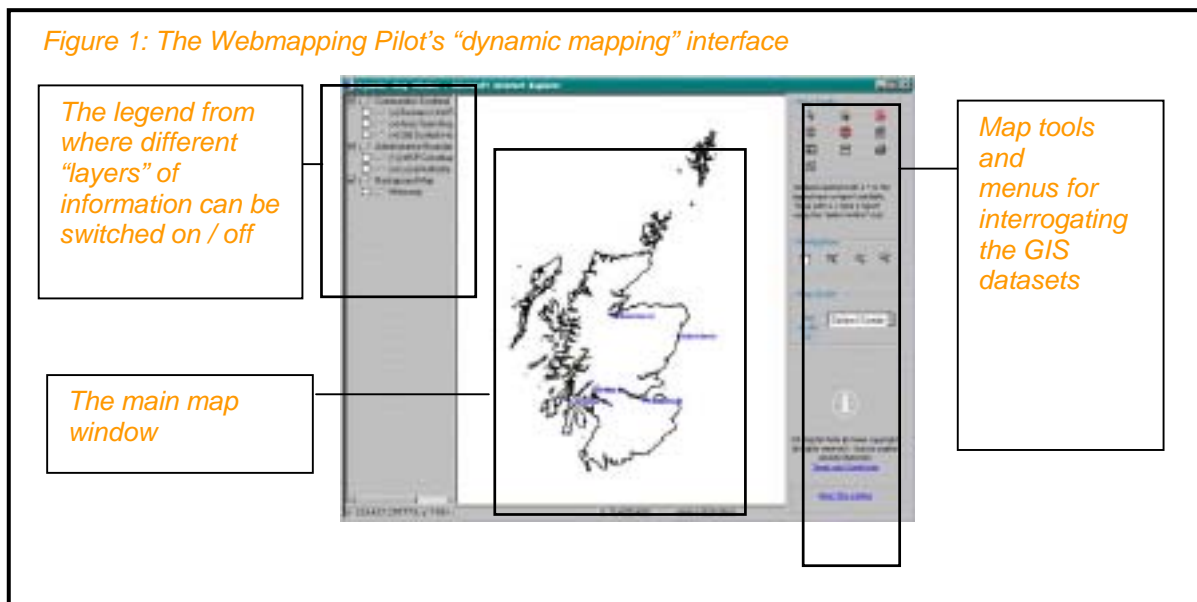
The Webmapping Pilot Internet GIS Application

Development of the Webmapping Pilot’s Internet GIS application was initiated early in the project. The majority of the development activity was conducted in-house by the Communities Scotland GIS team. Application development was designed to support users with different needs and experiences and, as such, contained three discrete areas for access to geographic information. These are:

1. an area to download geographic datasets including SIP boundaries and Communities Scotland administrative boundaries such as Business Units and Area Teams;
2. a section for pre-created, or “ready made” maps on all Social Inclusion Partnership areas and other key datasets; and
3. a “dynamic mapping” web-based GIS application with a wide range of functionality.

The majority of the application development was apportioned to the latter part of the application, the “dynamic mapping”. This system, based upon Autodesk MapGuide, offers the user tools to perform basic query and analysis, create demographic profile reports by a given geographic area, and perform buffer / proximity analyses. Figure 1 below illustrates the user interface employed by the “dynamic mapping” section while table 2 lists the reports available through the system. Table 3 provides a full list of datasets included to the “dynamic mapping” application (it is important to note that there is national coverage for only those datasets supplied by central government organisations – there are variances in data supplied by each local authority).

One of the key success factors of the pilot has been the willingness of numerous organisations to contribute geographic information. Participating agencies included five central government agencies, eight local authorities and one private sector organisation (see Appendix A for full list).



Information	Available at
1991 Census information (population, household, employment and housing information)	Census Output Area boundaries (and aggregations of)
Secondary school information (budgets, examination results and student destinations)	Individual school level (available from a "select within" at any geographic boundary containing a high school)
MSP information (including links to relevant Scottish Parliament Internet pages)	MSP Constituency level (and aggregations of)
CACI modelled income information	Any geographic boundary (including a "buffer" created from proximity analysis using "select within")
Sasine (house sale information)	Any geographic boundary (not including a "buffer")
VAT registered businesses	1991 Council Ward boundary (and aggregations of)

Table 2: Reports available through the Webmapping Pilot's "dynamic mapping" application

Core Boundary Datasets	Core Demographics	Background Map Datasets
1991 Census Output Areas 1991 Wards Local Authorities MSP Constituencies Postcode geographies	1991 census data CACI modelled income	1:50k raster Landranger data Meridian
Access to Services	Economic Deprivation	Education
Bus Routes Play Areas Public Parks Childcare facilities/Nurseries Council Offices Housing Offices Social Work Facilities	Objective 2 Boundaries Objective 5b Boundaries SIP boundaries VAT registered businesses	Prm. school catchment areas Sec. school catchment areas Primary Schools Sec. school attainment levels
Housing	Physical Environment	
Housing Land Supply Housing Market Areas Council House Sales Housing Stock Sasine (House Sales)	Industrial Sites Nature Reserves	

Table 3: Webmapping "dynamic mapping" list of Geographic Datasets by domain

While the creation of information reports was completed for a number of datasets (Table 2), these were mainly accessed through standard MapGuide functionality. This meant that a degree of user familiarity was required for users to know how to fully exploit the reporting functions offered by MapGuide. The one exception to this was the Sasine report. From the outset this was designed as a "wizard" type process whereby the user would be led through the process of creating a report (figure 2).

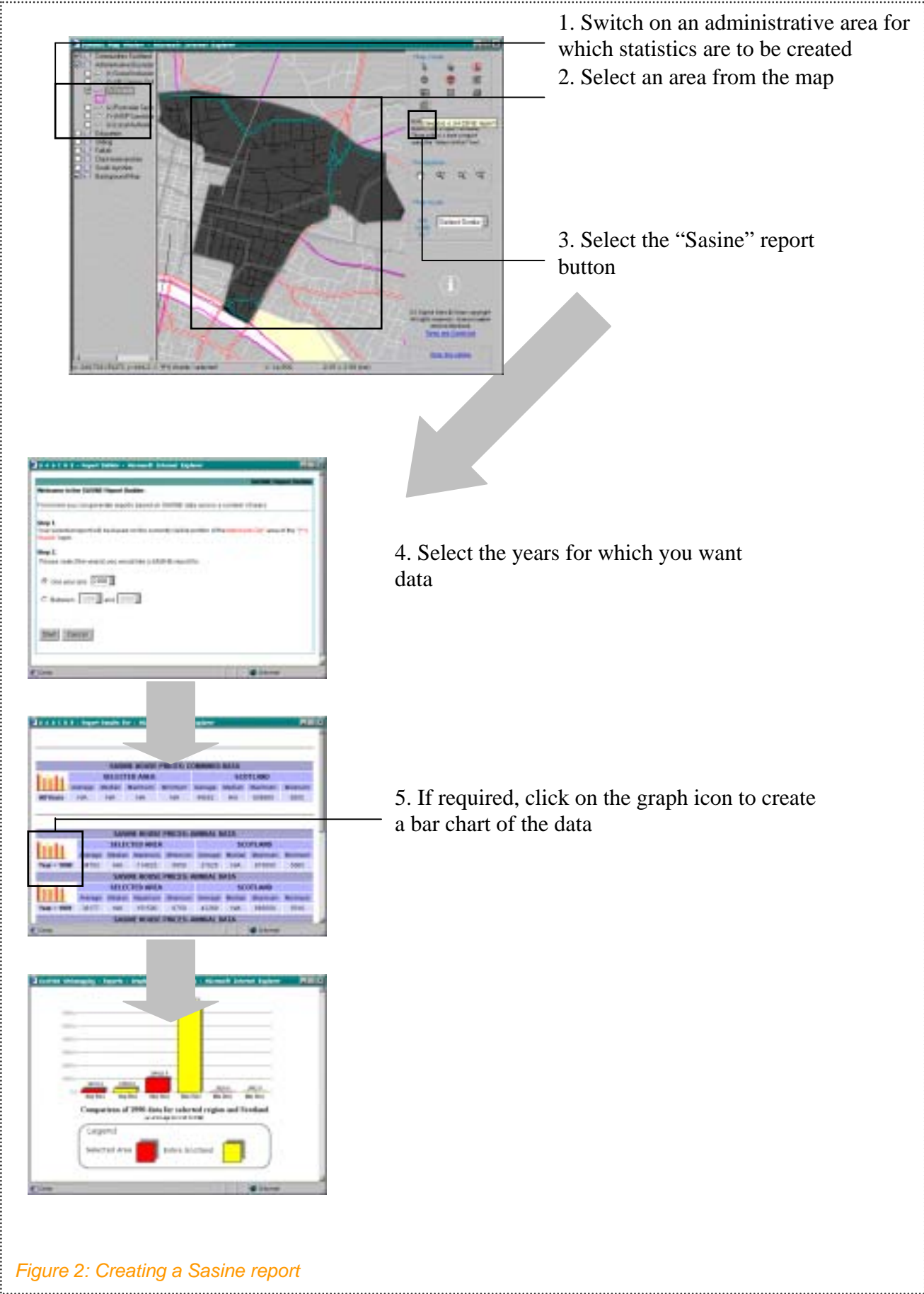


Figure 2: Creating a Sasine report

The reason for implementing “dynamic” reporting in such a way was to ascertain the level of user confidence in interacting with MapGuide software. While MapGuide Internet GIS is more intuitive than

desktop GIS applications it remains significantly different from other office applications. A significant difference is the requirement for users to pan, zoom and select objects prior to requesting the information they need. The Webmapping Taskforce was interested in ascertaining the comfort level of Pilot users in completing these tasks.

Feedback from users

Towards the end of the Pilot, Communities Scotland commissioned a consultation exercise with users of the pilot to seek their input into their information requirements should the Webmapping system become operational. Those interviewed represented a cross-section of organisations including councils, SIPs, central government, consultants as well as one RSL and one Community Project.

The results from this investigation found that basic demographic, housing and economic information formed the core of user information requirements. However, there was a further requirement for more detailed domain-based datasets to address specific issues such as the SIP Monitoring Framework or Local Housing Strategies. Furthermore, the lack of income-based information was a complaint amongst users. Given that no income question was included in the 2001 Census, alternatives for meeting the demand for this information will have to be considered, particularly from commercial sources of information.

The most frequent use of the Webmapping pilot was to assist in ‘planning’ activities. Other uses included the extraction of data for monitoring and evaluation purposes and the link of data held to other GIS systems. The most used information was the 1991 census data even though it was ten years out-of-date. There was consensus amongst users that an operational system must include 2001 Census information integrated with more specific domain-based information sets such as the Sasines house sale information and income data provided by CACI. In sum, for Webmapping to become a useful operational system to support the Social Justice Agenda, it must have access to a wealth of base socio-economic datasets as well as a number of key domain-based datasets targeted to specific issues. It is also fundamental that the information is reliable to minimise any suspicion on the quality of data presented.

Feedback from the users indicated that access to both mapped and tabular data was useful, particularly access to data from different sources. GIS query functionality (i.e. selection of a given geography by a pre-defined area) was a valuable tool for users as it allowed them to define subsets of tabular data for a given area such as a Ward or SIP boundary (figure 3). There was consensus that report output facilities were of a high standard, particularly for a pilot application. However, most users also stated that, if the pilot was to evolve into an operational system, it must be more intuitive and ‘user friendly’. This is particularly relevant with the more advanced functions such as ‘select within’ or ‘create buffer’ tools. Surprisingly, there were only a few examples of users downloading tabular or mapped information from the Webmapping pilot.

These findings corroborate the perceptions held by the Taskforce that the majority of users are unfamiliar with the need to draw geometric shapes with the mouse in order to select map objects prior to receiving information. As such, any operational system would require to deliver “Fischer Price” simplicity to successfully deliver information to the majority of the user base (figure 4).

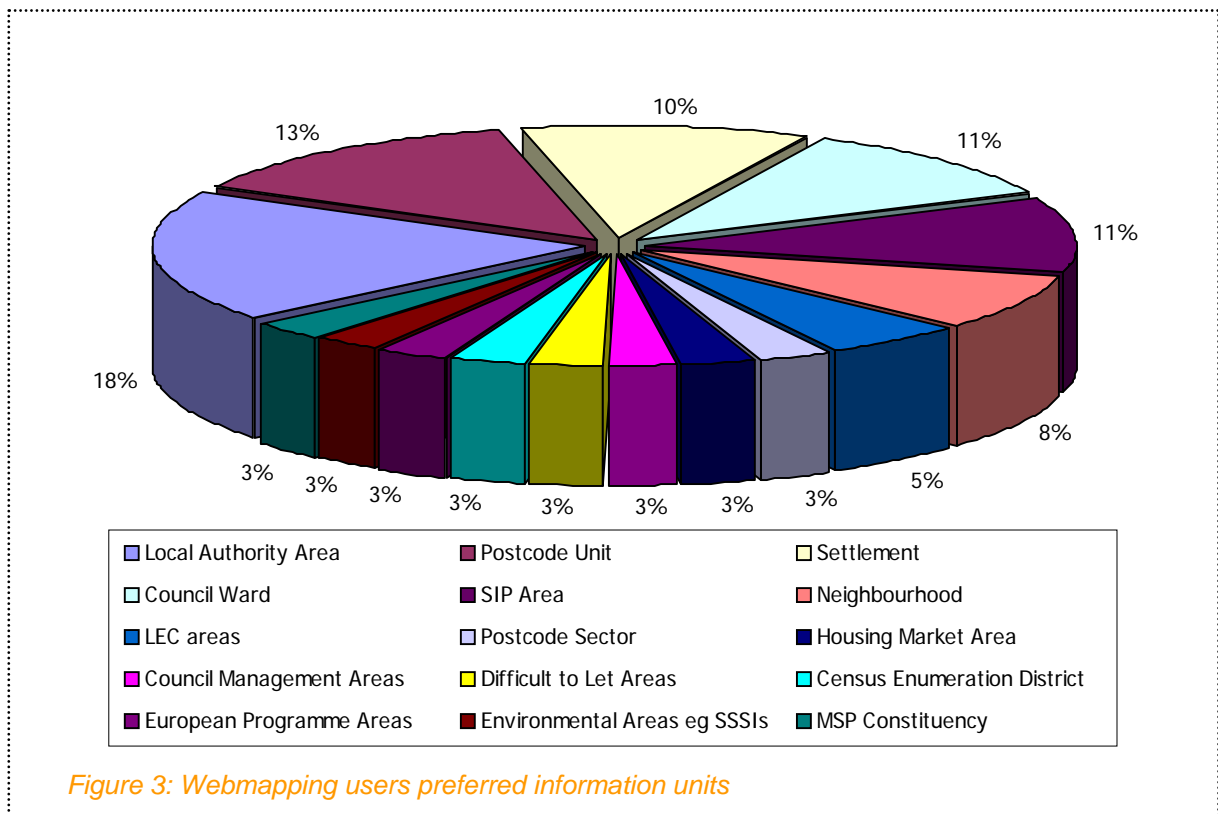


Figure 3: Webmapping users preferred information units

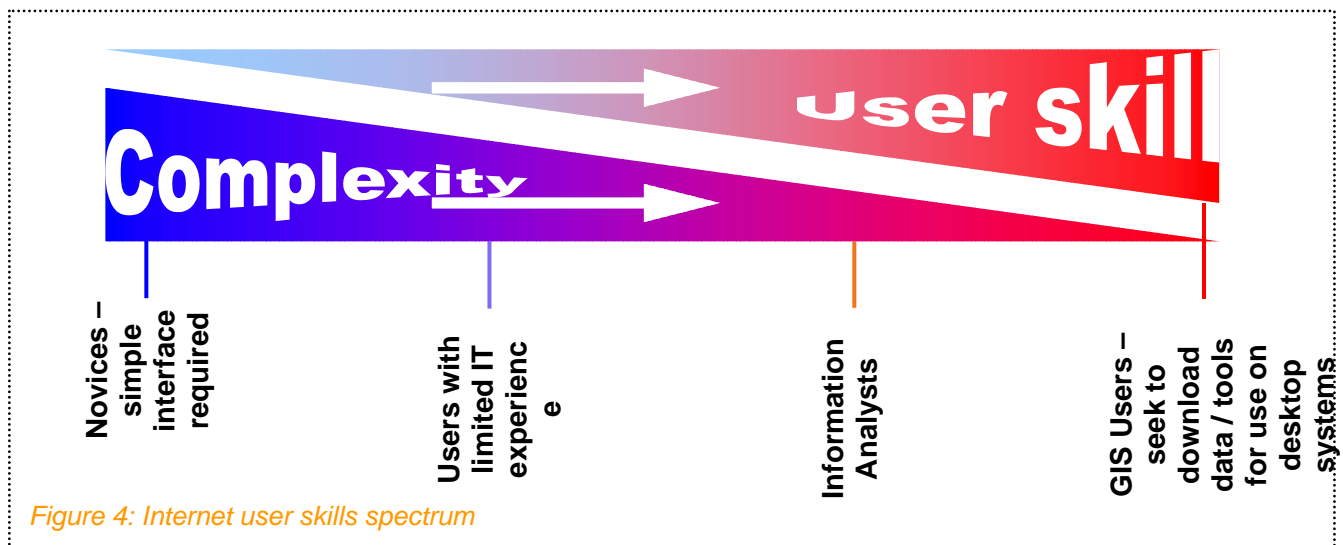


Figure 4: Internet user skills spectrum

Other issues

The pilot also highlighted various issues that are common to all projects where geographic analysis of statistical information is necessary. Namely, geographic boundaries are the framework for virtually all socio-economic data, providing the structure for collecting, processing, storing and aggregating statistics. However, the boundaries of the different geographic unit types such as postcode unit, census output area and electoral ward are not aligned and this issue is further propagated as boundaries change over time. The result is a major problem when trying to produce and compare meaningful statistics with this inconsistent geography when using information from different sources.

Feedback from the users indicated that statistics available at small area levels were most relevant when using this information for social inclusion and area regeneration issues. However, information available for larger areas such as ward, postcode sector, and local authority is valuable when analysing information at a

national level. There was general consensus that, regardless of the geographic unit, information must be available in an uncomplicated format with accompanying metadata to ensure fitness-for-purpose.

Lessons learned

As Webmapping was always intended to be a pilot, its real benefit to Communities Scotland, Scottish Executive and other participating agencies is to examine and identify the obstacles and barriers that require resolution. It is through this approach that the Webmapping Pilot has clearly met its initial objectives and listed below is a synopsis of key issues and lessons learned that must be addressed by any organisation / partnership seeking to implement an operational system.

A collaborative approach to addressing information requirements is essential.

The Webmapping pilot was successful in bringing together different agencies from both central and local government to integrate and share geographic information on a collective basis. This type of engagement underpins Modernising Government philosophies and is fundamental in resolving information issues that transcend across political and organisational boundaries. However, most of the collaboration was with the 'technical advisors' of the participating agencies with little interaction at a senior or policy level. This engagement simply did not occur in the Webmapping pilot. It is clear that for any data sharing application to become operational, it will only succeed if it contributes to a policy agenda and will therefore require input from senior management and the policy experts of the participating organisations.

There is a direct correlation between the quality of information presented through a web-based application and back-office business processes.

On-line solutions (GIS or otherwise) are not sustainable without efficient business processes, quality information, and maintainable information architectures, particularly with information of a high degree of dynamism. This is magnified more so with numerous organisations providing information. Those organisations that provided information of a high standard to the Webmapping Pilot were those that had effective business processes and data management regimes in place.

There is a wide variety of data quality and completeness across organisations

This issue is particularly apparent across local authorities, all of which are at varying degrees of advancement in the use of geographic information. It is not simply a process of integrating 32 pieces of an information puzzle together as the local authorities all use different approaches to the management of geographic information. This becomes more of an issue with the provision of statistical or attribute data such as council tax registers or housing stock condition information.

There remains much confusion over the Data Protection Act and data protection is often used as an excuse to avoid sharing data

Public services have the twin objectives of preserving the confidentiality of individuals and making better use of personal information to deliver smarter public services. This is particularly vital on join-up government initiatives such as the Webmapping Pilot. The Cabinet Office's Performance and Innovation Unit recently published a report entitled "*Privacy and Data-Sharing: The way forward for public services.*" that is currently out for consultation and should be of assistance in providing guidelines in this area.

There is no established model in practice for financing joined-up initiatives such as Webmapping

Communities Scotland explored a number of options to finance a joined-up 'service' should Webmapping evolve into an operational solution. It quickly became self-evident that further discussions with the Scottish Executive are necessary. It appears that funding joined-up services can be difficult between different departmental and organisational budgets.

Any Webmapping Application must be intuitive with easy access to the data and analysis tools that are available

In addition to meeting business needs, a Webmapping application must adhere to the "fisher-price" philosophy of intuitiveness and ease of use. This message was reinforced in the feedback from users of the application.

Software and performance issues should be resolved at the outset of the project

The Webmapping Pilot experienced a number of problems relating to the requirement for software ‘plugins’ for Autodesk MapGuide as well as performance problems given that geographic information is often voluminous and requires a high bandwidth specification in order to operate effectively. Given the improvements in software technologies and that all public sector organisations are improving their network infrastructures, these issues should be overcome provided that there is consultation at the outset of the project.

Internet applications for disseminating data and providing analysis tools

There is considerable interest in the future of Internet GIS technologies based upon feedback from the Scottish Executive, participating agencies in the Webmapping Taskforce and user consultations. It must be recognised however that there is a need for applications to provide a wide range of high quality information. Importantly, these are all issues that can be resolved provided that the right framework is in place. In particular, projects like Webmapping offer:

- easier access to information from a single, verifiable source;
- a common base of information to support a multi-agency approach to service delivery on such policy issues as social inclusion, area regeneration and housing;
- minimised duplication in data capture and information management as numerous organisations exploit a common base of information;
- access to geographic analysis, display and reporting tools for a wide range of organisations; and
- a joined-up approach which fulfils Modernising Government objectives in providing smarter services to the citizen.

It is this last benefit that has already been recognised as an important outcome of the pilot as the Communities Scotland have identified Webmapping in the Scottish Executive electronic service delivery (ESD) progress report as one vehicle in meeting future Modernising Government ESD targets. The following section on Strategic Recommendations provide a proposed way forward in transforming the Webmapping pilot to an operational system to meet these targets.

Conclusions

Webmapping is fast becoming one of the best ways of accessing and analysing information in support of social and economic change. Importantly, the Webmapping Pilot demonstrated the ease to which information from different sources can be combined and disseminated in a more co-ordinated manner than previously possible. Through Webmapping and other similar initiatives, it is now technically possible to integrate information from a single point of access with local information providers still retaining the authority to manage their own information. The issues in ensuring a sustainable solution are therefore not related to the technology but to the quality of information and the business processes behind the Internet façade.

Even now, there are few examples of collaborative partnerships within Scotland and the UK that provide solutions to on-line sharing of information to improve decision-making. If nothing else, the Webmapping pilot has concluded the obstacles to overcome in transforming Joined-Up Government rhetoric to reality are not based on technology. Rather, the issues to overcome are related to organisational structures and the quality and compatibility of information that is derived from numerous sources. Webmapping has succeeded in meeting its original objectives and has been recognised as an example of best practice in terms of partnership working, data sharing, and delivering an innovative web-based GIS application.

The lessons learned from the Webmapping Pilot are therefore pertinent to the development of any Internet application seeking to deliver information tools and services to a wide audience. In Scotland, the findings will benefit the development of Scottish Neighbourhood Statistics as well as operational systems within Communities Scotland and other organisations represented by the Taskforce.

Appendix A – Catalogue of Webmapping Datasets

	Dataset Name	Supplier / Owner	Coverage	Data Type
Core Boundary Datasets	1991 Census Output Areas	GRO	Scotland	Boundary
	1991 Wards	GRO	Scotland	Boundary
	Local Authorities	GRO	Scotland	Boundary
	MSP Constituencies	GRO	Scotland	Boundary
	Postcode geographies	GRO	Scotland	Boundary
Core Stats	1991 Census Data	GRO	Scotland	Statistics
	CACI Modelled Income	CACI	Scotland	Statistics
Access to Services	Bus Routes	Stirling Council	Local	Line / Network
	Play Areas	Falkirk Council	Local	Boundary
	Public Parks	Falkirk, S. Ayrshire	Local	Boundary
	Childcare facilities/Nurseries	Clack, Falkirk, Stirling	Local	Point
	Council Offices	S, Ayrshire	Local	Point
	Housing Offices	Stirling	Local	Point
	Social Work Facilities	Falkirk, Stirling	Local	Point
Economic Deprivation	Objective 2 Boundaries	Stirling	Local	Boundary
	Objective 5b Boundaries	Stirling	Local	Boundary
	SIP boundaries	Communities Scotland	Scotland	Boundary
	VAT registered businesses	GRO	Scotland	Boundary
Education	Prm. school catchment areas	Numerous Local Auths	Local	Boundary
	Sec. school catchment areas	Numerous Local Auths	Local	Boundary
	Primary Schools	Numerous Local Auths	Local	Point
	Sec. school attainment levels	Scottish Executive	Scotland	Statistics
Housing	Housing Land Supply	Clack, Falkirk, Stirling	Local	Boundary
	Housing Market Areas	South Ayrshire	Local	Boundary
	Council House Sales	Clackmannanshire	Local	Point
	Housing Stock	Clackmannanshire	Local	Point
	Sasine (House Sales)	Communities Scotland	Scotland	Statistics
Phys. Env.	Industrial Sites	Clack, Falkirk, Stirling	Local	Boundary
	Nature Reserves	Clackmannanshire	Local	Boundary
O.S. Data	1:50k raster Landranger data	Ordnance Survey	Scotland	Digital Maps
	Meridian	Ordnance Survey	Scotland	Digital Maps