

The Last 10% - Using GIS to Address Broadband Market Failure in Scotland

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The 'e' prefix is now all pervasive, 'e-business', 'e-commerce', 'e-care', 'e-learning', 'e-government', 'e-gif', 'e-ticket', 'e-mail' and so and so on. Many of these have now become a subject and institution in their own right. However, in each and every case there are fundamental prerequisites in the form of content, organisational framework and communications infrastructure. The term 'broadband' has evolved out of the telecommunication industry's vocabulary into everyday language to imply a communications medium that is capable of shifting 'bits' of data at speeds significantly faster than that which is commonly achieved through the traditional dial up modem. A precise definition of broadband varies from organisation to organisation – to some its just over twice the speed of a traditional dial up modem, to others it is more like ten times that speed, while ultimately it is likely to become the 'megabit' speeds that users of internal local area networks are accustomed to.

The UK government seeks to have the most competitive broadband market of any OECD Group of Seven nation by the year 2005. The Government's Department of Trade and Industry uses various indices to draw comparison with other G7 nations at six monthly intervals. The Government's communications watchdog, Ofcom, reports that as of the end of 2003, the UK ranked: third equal with the USA in terms of *extensiveness*, a measure which combines coverage and addressable market; third overall in terms of *competitiveness*; and joint sixth with Italy in terms of *take-up* [1].

However, within the UK there have been significant local variations between two key measures: that of *coverage* - in terms of percentage of population able to obtain access to some form of broadband service; and that of *take-up* - in terms of the percentage of the population with access to broadband who actually subscribe to a broadband connection. With respect to coverage, some urban areas are now enjoying close to 100% coverage, while more sparsely populated areas such as the Highlands and Islands of Scotland are significantly lower (51% at the time of writing).

Few if any citizens can have escaped evidence of the 'e-era' in which we currently live, whether it be in the form of mobile phone or broadband advertising, on line booking of holidays, financial transactions, emails to loved ones in far away lands or downloading of the latest chart hits. The current and potential impact of the 'e' prefix is significant in economic, political and geographical terms. The recent merging of the former telecommunications regulator 'Ofjel' with the Broadcasting Standards Commission and other regulatory bodies to form Ofcom, presages the fusion of the 'e' capability into a digital environment in which contemporary radio, television, video and internet are just alternative forms of media interwoven into a digital world underpinned by broadband.

In economic terms, 'e-technology' is already making a significant impact upon a number of industries such as that serving the needs of the travelling public. However as society moves forward: this impact is destined to become more profound, in perhaps less obvious ways; influencing where businesses and their employees choose to locate and live; where we chose to holiday; determining how goods are traded between producer and customer; creating opportunities for global delivery of education; and potentially going some way to providing solutions to some of today's conflicts of interest, such as that between the environment and increasing demands for transportation.

Geography and geographical information has a potentially significant role to play in supporting the prioritisation, facilitation and assessment of initiatives to support the 'e-agenda'.

Scottish Enterprise and K-map

Scottish Enterprise and its counterpart, Highlands and Islands Enterprise are the government agencies responsible for delivering the economic development policies of the devolved Scottish Executive government to lowland and highland Scotland respectively. Both

agencies enjoy a wide remit encompassing amongst other things: training, inward investment, regeneration, enterprise, careers guidance and e-business.

In the year 2000, Scottish Enterprise initiated a project branded 'K-map' to establish a geographic information service to serve the needs of itself and its immediate partners. The initial project concentrated on establishing an infrastructure to manage, analyse and disseminate geographic knowledge relating to its many and varied activities. The initiative was in part successful in establishing a cell of geographic information expertise and a number of basic tools with which to articulate understanding of geographical issues. In competition with other knowledge initiatives at the time, it however failed to establish the fundamental restructuring of underlying data that was really needed to permeate a strong geographical dimension across the organisation's day to day operations.

Its capability was demonstrated by some of the business applications that made use of an online map viewing tool implemented using Autodesk's MapGuide product. These included: an application to determine eligibility for geographically defined funding schemes; a viewing tool to assess the availability of skills and learning; a study relating to the potential impact that future timber extraction from Scotland's forests would have upon the public road network; and a localised study of demand for broadband services in the Scottish Borders area.

Scotland's Broadband Access Programme

At the beginning of 2003 the Scottish Executive initiated its Broadband Access Programme with a funding allocation of £24 million to address the potentially significant level of market failure that Scotland's geography posed with respect to broadband deployment and take up. Although a considerable extent of Scotland's main cities were able to access broadband, either via ADSL technology (41% of population) or cable (46% of the population), there appeared to be little likelihood of broadband reaching the bulk of Scotland's less populated land mass. Responsibility for programme delivery was entrusted upon the two economic development agencies. Intervention measures were identified as being either to boost customer demand in order to make the market more attractive – 'demand side' intervention; or to establish telecommunications infrastructure in areas that were clearly unviable on a commercial basis – direct 'supply side' intervention.

Demand side intervention focussed on the registration process that had been established by the wholesale arm of the national telecoms provider BT. A process that required a certain proportion of subscribers in an exchange area to register their interest in broadband before BT would undertake to enable their exchange. Demand side intervention simply used targeted marketing to accelerate this process. It was recognised from the outset that this course of action would be both simpler and very much less expensive than that of pursuing supply side initiatives. What was not clear however was the extent to which demand side activities would be effective on their own. Initial predictions based on geographical analysis suggested that demand side intervention alone would be instrumental in bringing broadband services to approximately 90% of Scotland's population leaving a gap of 10% that would need to be addressed through recourse to a supply side strategy.

Building on the back of the previous demand modelling work in the Scottish Borders undertaken by telecoms consultant Obligato, it was decided that a similar exercise should be undertaken for the entire Scottish Enterprise area in order to both size and understand the overall broadband market. This task was awarded by competitive tender in April 2003 to Marconi Integrated Systems with the intention that it would form the basis of a K-map Broadband Application.

Following receipt of Marconi's predicted demand data in June 2003 it became obvious that the initiatives that were being planned for the Broadband Access Programme needed to be supported by more than just demand intelligence. Further information was required to: ascertain the location and extent of all operational broadband services; the availability of telecommunications infrastructure; produce mailing lists for marketing purposes; and to be aware of business trading locations. Accordingly budget and approval were gained to implement an information support function based on the 'platform' that had been already established by Scottish Enterprise's K-map project. An information support function that

would not only support the activities of the two enterprise agencies but also allow gleaned market intelligence to be shared with broadband suppliers and other parts of government.

The K-map Information Support Function

Implementation of the information support function had to be pursued in parallel with information processing services to support intervention activities that were already underway. Implementation pursued four tracks of activity: deployment of database and server infrastructure; collation and preparation of data content; development of map viewer and database reporting interfaces; and finally testing and user initiation. It was recognised from outset that the collation and preparation of data content track would be dependent upon establishment of a data sharing framework to ensure that there was clear understanding and trust between all providers and users of data.

The data content that has been collated to date (see Appendix 1) is a mix of:

- readily available commercial data products acquired under license from Bartholomews, Equifax, Landmark and Ordnance Survey;
- bespoke data processed on behalf of Scottish Enterprise by Marconi Integrated Systems and Forth Valley GIS and others;
- data acquired from other parts of the Scottish public sector, principally the General Registers Office of Scotland and the Scottish Executive Geographic Information Service; and
- data that has been voluntarily contributed and actively maintained by suppliers of broadband services.

The data sharing framework recognises that some data needs to be treated in commercial confidence, so not all data is necessarily published. In addition to enabling all broadband suppliers to be aware of current broadband deployment, the assembled content has been used to support a number of business priorities, significantly:

- To direct demand side intervention activities by identifying areas where marketing activities would be most effective.
- To then determine and monitor broadband deployment in terms of the percentage of the population that is able to connect to a fixed broadband service.
- To ensure that citizens and businesses were able to obtain a neutral view of broadband availability for their postcode through the web site – www.broadbandforscotland.co.uk.
- To promote and police an incentive scheme to encourage small businesses to connect to broadband with a grant which varied according to whether they were able to connect to terrestrial provision or needed a more expensive satellite link.
- To identify and quantify the full extent of market failure that would need to be remedied through direct supply side intervention.
- To monitor and track broadband take up in terms of number of connections in proportion to number of potential subscribers within a footprint area.

Two sources of data in particular have been key to satisfying each of the above priorities: Ordnance Survey Address Point; and the General Registers of Scotland's (GROS) Postcode Index file and associated polygons. In combination with polygons representing the extent of BT coverage, the AddressPoint data has been used as an effective proxy for population when determining % population coverage and in turn take up. Point in polygon data processing is used to tag each AddressPoint with the identity of the PSTN exchange area in which it is located, and from thereon both coverage and take up determinations are relatively straightforward.

The GROS postcode polygons provide a relatively convenient means of creating first cut broadband footprints for broadband suppliers who are only able to define their footprints in terms of postcodes to which they provide a service. The GROS postcode index file cross references every Scottish postcode with higher order administrative areas in which they are located. This has provided a convenient and effective means of reporting coverage and take up for virtually any arbitrary unit of geography. This capability proved to be particularly useful for responding to enquiries made by the elected members of the Scottish Parliament.

To date, the focus has been predominantly on supporting demand side intervention activities. Measures to boost consumer and business demand have proven to be particularly effective with between 95% and 97% of Scotland's population now on schedule to be in a position to access a broadband service by August 2005. The originally envisaged 10% gap could now be as small as only 3%.

Looking Forward

Data assembled by the information support function was able to provide a recently convened parliamentary sub committee with a high level view of the overall broadband position in Scotland. The sub committee concluded that in moving forward priority should now be devoted to: consolidating coverage via a supply side intervention initiative; boosting subscriber take up figures; and investigating next generation broadband technology options.

The now established K-map information support function will continue to support these priorities under a new operating contract with a remit to: provide ongoing support and enhancement of an online MapGuide implemented interactive map viewer; assemble data and intelligence to support supply side intervention activities; and a range of activities to support and encourage take up.

The MapGuide implemented map viewer has received positive and commendable feedback from those who have used it to date albeit with recognition that some consolidation of the initial version is required.

The focus for data collation and analysis will now shift from attainment of coverage to that of boosting broadband use and take up by businesses. Using data collected from an annual survey of 12,500 businesses, the established K-map information support function will play a pivotal role through both: identifying the geographical areas and business sectors that will be targeted by a variety of promotion and marketing activities; and then monitoring the impact of these activities. The results of this exercise will be used to assess Scotland's position with respect to both the rest of UK and other parts of the world.

From a technical stand point it is planned to make more effective use of business listing data sourced from Equifax and to develop a grid cell database to enable more effective resolution of data pertaining to large rural postcodes.

Lessons Learned

The information support function has proven successful in a number of ways: not only has it provided the enterprise agencies with an effective decision support tool but in so doing has provided clear demonstration of the benefits that can be derived from using geographic information in a key information support capacity. This was largely achieved by virtue of two factors: firstly by ensuring that the geographic element was brought into consideration at an early stage of business strategy formulation; and secondly by co-opting a geographic information resource to act as a member of the business team that was responsible for taking forward the overall Broadband Access Programme.

Although much of the data was very specific to the topic of broadband, it is envisaged that there will be considerable opportunity to re-use the collated data and developed functionality to support other agendas of an 'e' persuasion.

References

[1] – www.ofcom.org.uk

Acknowledgment

Rod Mitchell, Industry Liaison - Scottish Enterprise E-Business Group who provided comment and input.

ILLUSTRATIONS

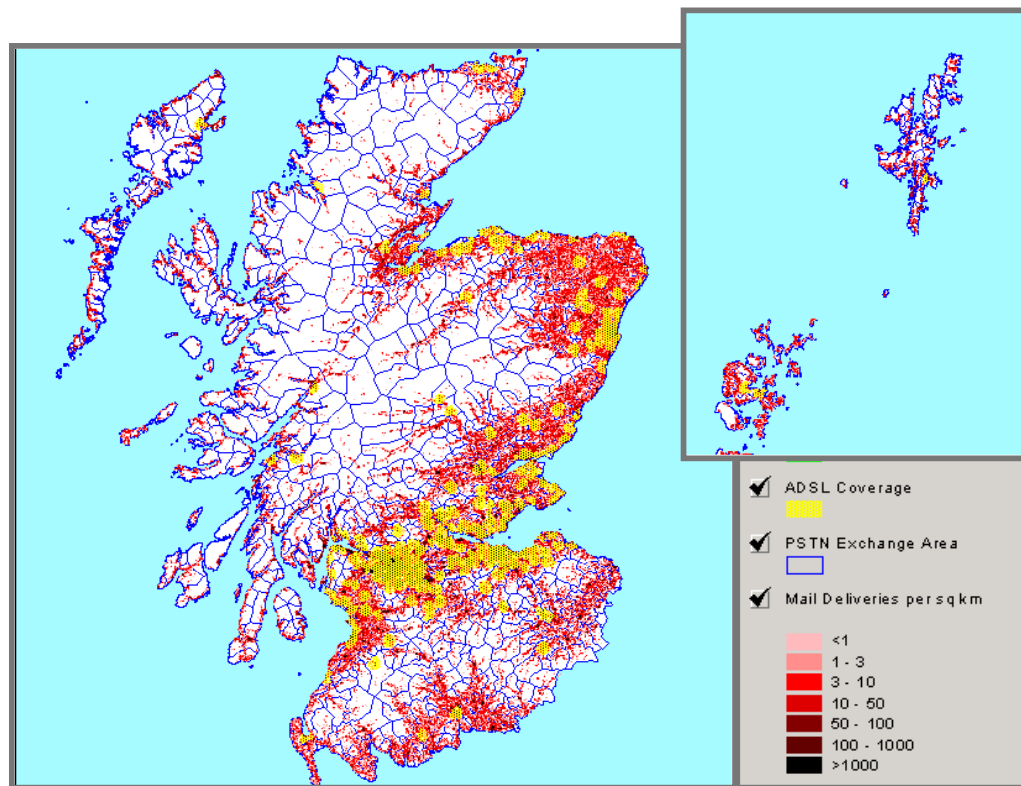


Figure 1 – DSL Coverage as of 2nd July 04 - © Copyright Marconi Communications

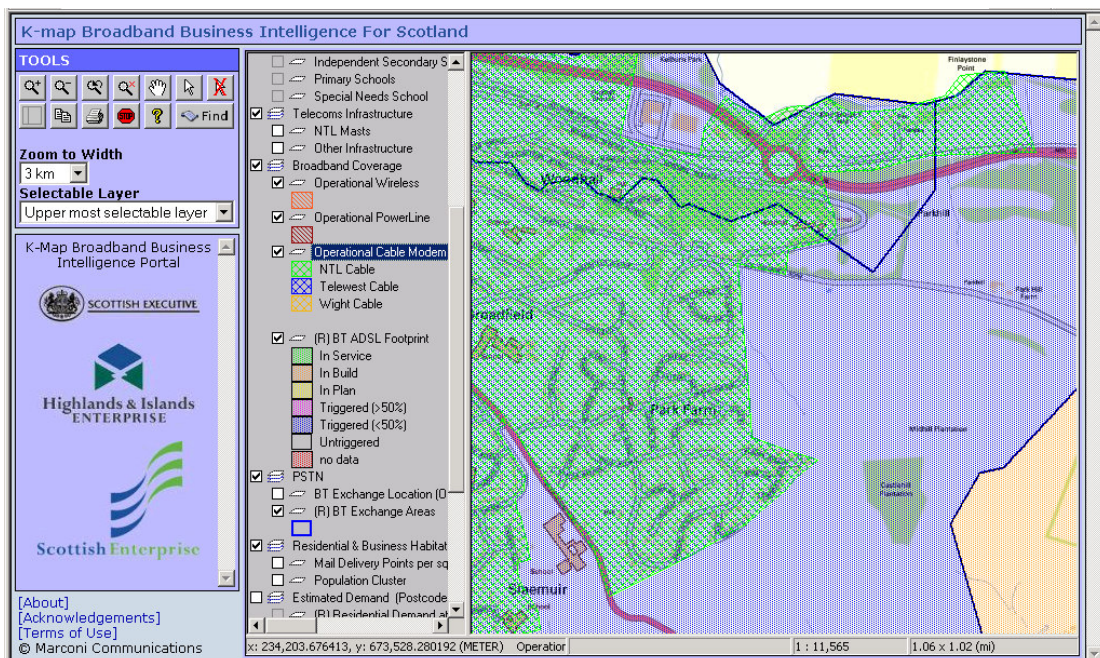


Figure 2 – Online K-map viewer implemented using Autodesk MapGuide
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Broadband Reporting: Estimated Demand Breakdown (by Market Sector)

[Report Selector](#)

Cost Scenario: July 03 cost
For 41 Selected Postcode Units.

Cost Scenario:

Market Sector	Total Market Size	< 512 kbps subscribers	512kbps - 2mbps subscribers	> 2mbps subscribers	Net Demand
Household Subscriber	333	318	15	0	5%
Large Corporate Subscriber	0	0	0	0	0%
Public Sector Subscriber	1	0	1	0	100%
SME Subscriber	20	17	2	1	15%
Total	354	335	18	1	5%

Select Graph:

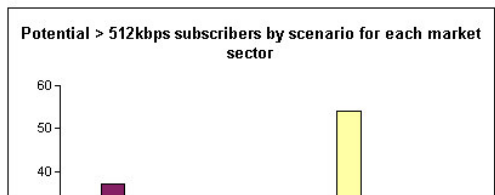


Figure 3 - Reporting of Marconi's estimated demand prediction for a potential broadband 'footprint'.

APPENDIX 1 - Data Content as of June 04

Boundaries

- Postcode unit
- Postcode sector
- Council Ward
- Council Area
- Local Enterprise Company
- Parliamentary Constituency
- Social Inclusion Partnership
- European Regional Development Fund eligibility
- Regional Selective Assistance eligibility

Broadband Specific

- ADSL footprint
- Cable modem footprint
- Fixed wireless footprint
- Power line footprint
- PSTN exchanges and exchange areas
- Telecommunication mast locations

Market Size / Demand Indication

- Household and business mailing address density
- Predicted household and business penetration
- Trade directory and Companies House derived business listing

Background Mapping

- Ordnance Survey and Bartholomews (various scales)

Educational Establishments

- Tertiary, secondary and primary