

The Use and Social Impact of Computer Networks for Community and Business Development

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Abstract

This study provides new data on the attitudes of residents of the Western Isles of Scotland to the use of the Internet as the region moves towards ubiquitous broadband connections. The evidence shows that, whatever their current Internet skills, there is a high level of expectation that broadband will provide new and better services, new business opportunities and enhanced social interaction. Using short case studies from other regions with a longer history of broadband experience, we document the innovative ways in which broadband can add value to local development in rural areas. We focus particularly on four emergent properties of broadband, namely that it allows faster data transfer, more complex data, greater inter-activity, and is always on.

Introduction

This study was conducted in order to provide a community perspective on anticipated developments in Information and Communications Technology (ICT) in the Western Isles of Scotland. We combined primary data gathering with field studies of broadband implementations in other parts of the world, particularly southern England and Ontario, Canada.

The purpose of this project was to provide a clear understanding of the aspirations and potential demand for broadband connectivity among Western Isles communities and businesses. The project used three main methods of data collection: -

- 1) A Web-based questionnaire survey of all sectors of the community
- 2) Individual telephone interviews
- 3) Case study formulation

The triangulation between these research methods enhanced the depth and reliability of the evidence presented in the analysis and the recommendations.

Survey questionnaire results

Background

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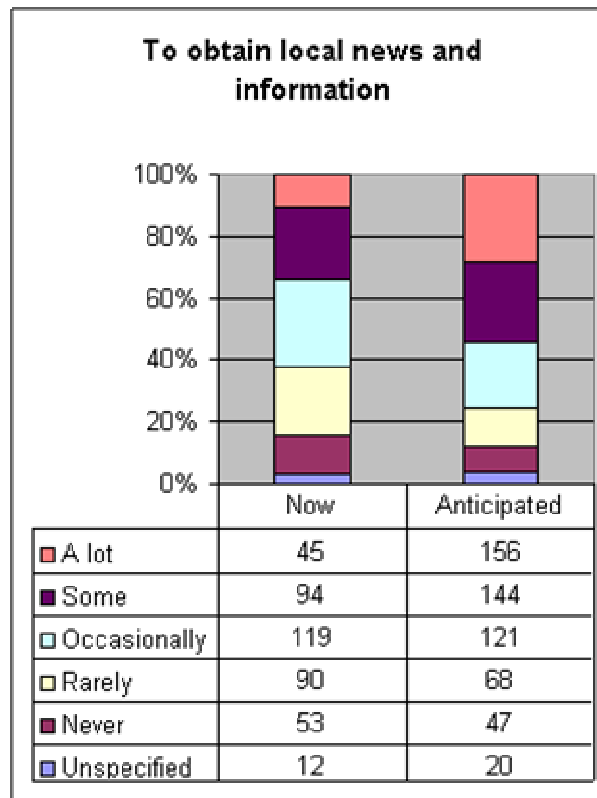
We prepared a questionnaire, which was amended and agreed on by the funders and then posted on a Web site hosted by Lews Castle College, UHI. Public meetings were held by the project team in order to raise awareness of the study. Local facilitators were also employed to work with the members of key organisations in the study areas. The survey attempted to assess the current level of familiarity with computer-based networking, establish the current perceptions of prospective use/demand for community networks, and predict the possible development opportunities for the local business and community (social) interests.

Of the 556 respondents to the on-line questionnaire, the majority, as might be expected, identified themselves as living in the Stornoway area, (the only sizable town in the Western Isles), with decreasing but still significant numbers of respondents living in the areas of Point, Ness and West-side Lewis. A smaller number of respondents were living in east Lewis and north Harris, with a scattering of people in other locations.

The vast majority of respondents (492, or 89%) indicated that they have a personal computer in the home, with only 59 (11%) respondents indicating that they did not. Following this, 91% indicated that they have access to the Internet (8% do not). A more detailed analysis showed that 461 respondents (83 %) have access at home and 178 (32%) have access at work, while 324 (58%) have no Internet access at work and only 16% do not have Internet access at home.

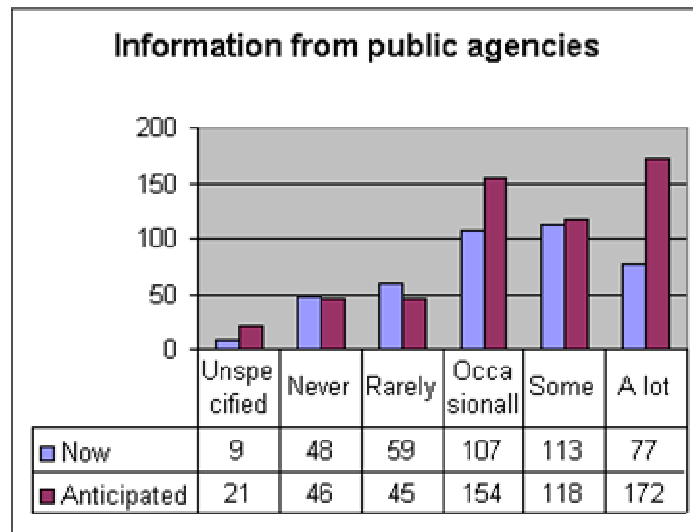
The bulk of the middle section of our questionnaire attempted to compare what the respondents currently use the Internet for, and what they anticipate they might use it for if/when they have broadband access. To do this we asked a range of questions on the broad range of current Internet activity that we are aware of from previous background work. For each category we asked the participants to indicate to what extent they used the Internet for that purpose by giving a (subjective) assessment on whether they use it “A lot/Some/Occasionally/Rarely/Never” for that purpose. This set of questions was directed only to those participants who indicated earlier in the questionnaire that they had access to the Internet. We have graphed the results of all of these questions, but for the purposes of this report we consider it to be more interesting and relevant to combine the data with a second set of questions directed towards participants’ perceptions of their future use of broadband Internet access.

Figure 1: To obtain local news and information



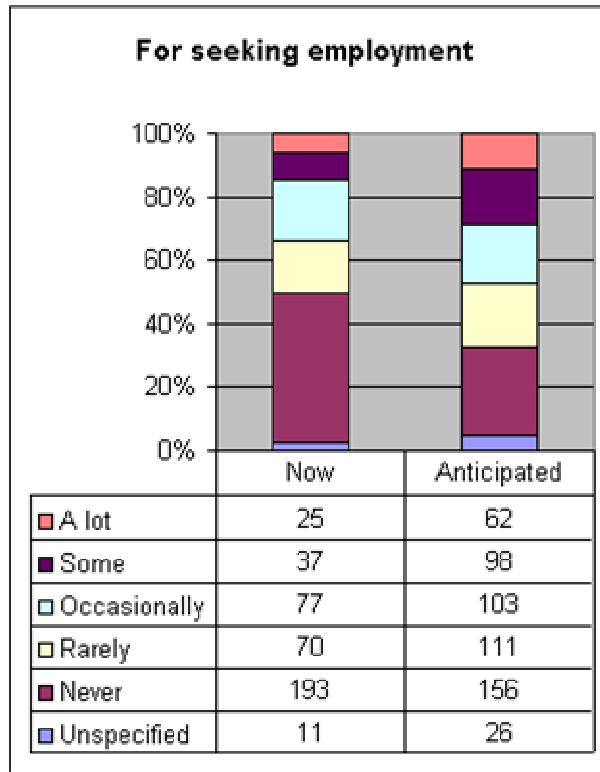
There is a big increase from around 30% to over 50% of participants who consider they would use broadband “a lot or some” to access local news and information. The proportion that were unspecified or remained convinced that they would “never” use it for this purpose was approximately the same in both cases, at between 10 and 15%.

Figure 2: To obtain information from public agencies.



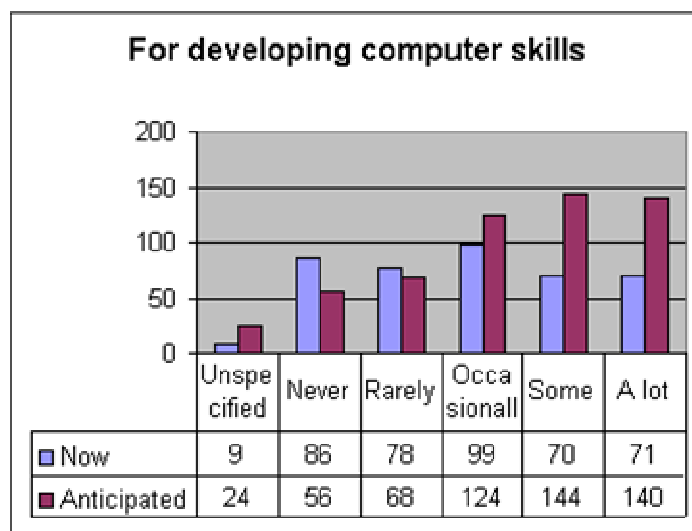
This basic pattern is repeated in considering the availability of information from public agencies over the Internet. There is a substantial increase in participants who claim that they would use it a lot or occasionally, with a consistently small (less than 10%) tail end of participants who would never use it for this purpose or remain uncertain. Together, the increased proportion of participants who would use broadband for accessing local information, news and information from public agencies (local or not) constitutes a significant potential growth area and supports the case for the enthusiastic development of local community portals and locally-based Internet network services.

Figure 3: For seeking employment



There was a large rise (from around 50% to 70%) in the proportion of participants who considered that they might use broadband for seeking employment in the future, but still a considerable percentage (around 30%) that do not see themselves using the Internet for this activity in the foreseeable future. Again it depends on the nature of the job service offered and the level of accessibility locally. It is easy to foresee the incorporation of an on-line service from the local job centre, together with the establishment of a recognised local public information area for advertising local employment opportunities working together to raise the profile of such a service, both for local job-seekers and for people seeking to move/return to the islands.

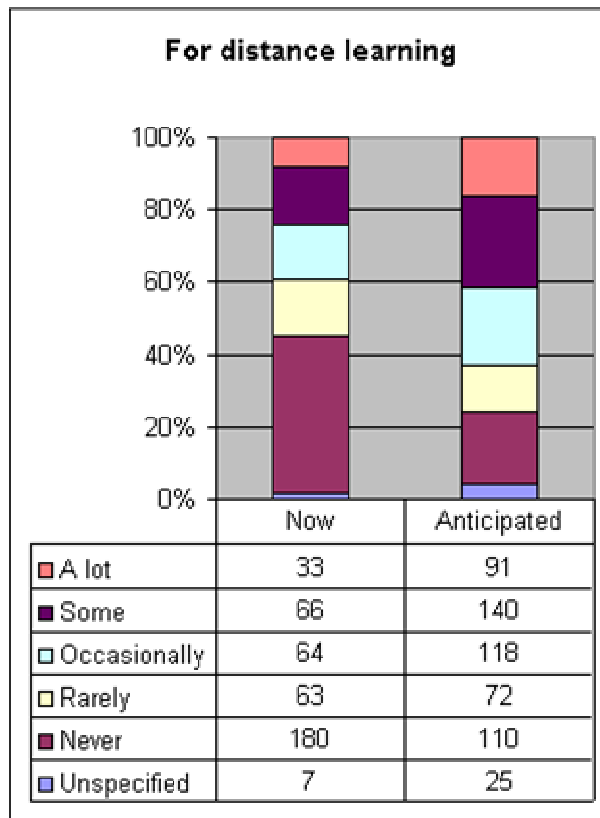
Figure 4: For developing computer skills



Although we did not specify or ask in the questionnaire which type/level of computer skills the participants would be seeking, there was a very significant rise (200%) in the perceived demand for this category of broadband use in the ‘some’ and ‘a lot’ classes. Overall there was a strong indication that this is an important area of potential new use, which suggests that there is an under-developed market for local training courses in computer skills.

The area of broadband use for distance learning (Figure 5) indicates a potential growth in the number of participants who anticipate using the web for educational purposes. There is a significant (72%) increase in the level of participants who anticipate using broadband to obtain educational materials. This, of course, does not specify the level of materials they may wish to obtain, i.e. primary, secondary, or tertiary education, nor does it indicate if the materials are for themselves or for another person. In common with the results from many other areas of the world where broadband has been introduced, there is a general trend towards increased use of the resource for educational purposes, in terms of both the number of participants and the frequency of use.

Figure 5: Current and anticipated use of the Internet for distance learning



Individual interviews with local businesses

It was felt that telephone interviews would be the most suitable mechanism to gain an understanding of the expectations of a range of Western Isles businesses regarding the opportunities likely to be brought about by the introduction of broadband. A list of 27 businesses with an interest in broadband was obtained and a selection made to cover a range of locations within the Western Isles and a range of sizes and types of business operation. Between mid-January and mid-February 2004, telephone interviews were arranged and undertaken following a structured interview plan which also allowed for free-ranging discussion. Interviews with twenty-three businesses provided a range in scale from individuals working part-time from home to companies with over 20 PC users. Ten of the businesses are based in Stornoway, four in rural Lewis, two in Harris, five in the Uists and two in Barra. Two currently use satellite broadband systems and nine have ISDN connections.

Overview of current Internet use

The first part of the interview aimed to gain a picture of current usage of the Internet and any problems encountered. As interviews were being undertaken with named contact individuals for businesses that had registered an interest in broadband, these interviewees were generally the most frequent and experienced users of the Internet and often the most enthusiastic about broadband within their companies. As even the larger companies are relatively small, they were well informed about the current usage and problems and were able to comment on use made by other members of staff.

Comments even by those reasonably new to use of e-mail all reflected a feeling that it was an essential method of communication, that it was growing in its use, and that these people felt comfortable and competent about their ability to use it. Internet access to information was also felt to be increasing, but several people felt less confident that they were able to search and use web sites as fully or as efficiently as they might do. How often the Internet is used to source information on a daily basis is difficult for people to judge, but a third of the interviewees felt that it is used up to two or three times a day, slightly more interviewees responded that it is used more frequently than that, and five responded that it is always on or in almost constant use. Everyone interviewed used the Internet for personal use and, interestingly, several people commented on the extent to which they or their partners and friends now bought and sold on e-bay or similar auctions.

Eighteen interviewees indicated that they currently have their own business website (or sites) and four are considering or intending to develop one shortly. Only one company has websites enabled to take credit card payments; for the others, websites mainly fulfil promotional and contact functions, with some extending this to ordering and booking, but business is then conducted by e-mail, phone or post with any payment using traditional methods. Those websites that have display functions are considered to be increasingly important by some businesses and essential to their remaining commercially competitive. For example, the use of websites to radically expand the potential market for local property is considered to be a major element in the recent upturn in demand and prices. There was a feeling from several of the service businesses that having a website was something which they 'should' do, rather than because it was of real importance to their business. Only three businesses make use of the Internet to store information for their own use or to give remote access to accommodate working away from base or on a client's premises.

Connectivity and problems

Half of all those interviewed, when asked if they experienced any problems with their connection, identified slow line speed and difficulties with the transfer of larger files as their major concerns. Due to the slow speeds that most people work with, the transfer of large files was a slow process and became unworkable above a certain size, as connections were often dropped before transfer was complete. This causes particular problems for those businesses where their regular work includes graphics, photos,

software updates and other large data files. It also causes problems for those working with Branch offices or a Head Office located elsewhere, in that the office base in the Western Isles is potentially isolated from the rest, who could all share information easily and quickly. For some this was felt to threaten the continued existence of a Western Isles base.

The time that files take to transfer is not only a cost in connection charges but also ties up PCs, as their use for other tasks simultaneously was inclined to further exacerbate the file transfer problems. Where work was undertaken through accessing PCs in other offices, it sometimes had to be scheduled out of normal office hours due to the time for which it tied up the PCs in the remote office. As well as making use of zip files to speed up the transfer of information, different individuals have come up with creative ways of 'managing' this problem by working in the evenings or over weekends. Others 'save up' all their Internet work to do at quiet times so as to maximise the generally slow upload/download speed. In evening and weekend hours this also has the benefit for some users of cheaper connection rates.

For focussed promotional activity for retailers, service or tourism businesses, the current connection systems place a constraint on the size of mailing lists that are viable. Even sending a small amount of information to large numbers of people took a lot of time. Tourism operators found the use of e-mail particularly important in communicating with international clients.

Six people using ISDN lines found that they encountered problems with slow speeds or interrupted connections and felt that in practice ISDN was not giving as good a connection speed, as they had anticipated. Those businesses with a requirement to upload as well as download large amounts of data were also unable to solve their problems through satellite broadband, so were particularly keen to see the introduction of broader bandwidth systems as soon as possible.

The frustrations caused by the slow and sometimes unreliable systems were felt by almost all the businesses to different extents, but the differential that these connectivity problems created between Western Isles businesses and those based elsewhere caused serious concern to several who felt they were unable to remain competitive.

Expectations of broadband

Every business contacted had high expectations of broadband and was keen to use it, with only one business uncertain as to whether they would do so as soon as it was available. The expectations ranged from being based on a very detailed knowledge and understanding of the difference it would make to their operation, to businesses with no real concept of broadband but a belief that it was worth using.

Increased speed was the most universally mentioned benefit of broadband (21 responses), followed by the benefit of being 'always on' (15 responses). As well as making all use of the Internet more efficient, greater speed was of particular importance to those who worked frequently with large files. The increased ability to work remotely was seen as important by three companies and two had expectations of greater reliability. Other users looked forward to the increased bandwidth removing contention and solving problems of delay and latency in communications.

The universal expectation was that broadband would make e-communication more efficient and so improve quality and provide cost savings. In many cases the actual use of the Internet through a broadband connection to undertake new tasks or to work differently was seen as something to develop in the future. Those businesses who currently worked, or struggled to work, with larger files (13) or were heavily Internet dependent had more specific expectations as to how they might use broadband.

Businesses such as graphic designers, media companies, web designers and photographers saw it as enabling them to transfer work to and from clients, to work more collaboratively, to assist reviewing, to send copy directly to printers, to use video on websites and to maintain more interactive sites. Several also mentioned the size of software updates and hoped to do this on-line rather than by CD. One also intended to use storage for images that was offered on remote servers but was not viable with current file transfer times.

Businesses in other fields were keen to improve their ability to work on-line with organisations and agencies such as EU Directorates, Companies House and the Land Registry through easy transfer of large documents. For some uses broadband would increase the current speed of file transfer, while for others such as complex land registry work, broadband was essential. In situations where they also wanted to work collaboratively or take advice on these documents, they anticipated the value of being able to transfer them several times. Companies considered that the ability to consult with experts elsewhere was now considered to be standard practice and any technical inability or difficulty with this effectively made them uncompetitive.

The ability to maintain websites, including such elements as a large on-line updateable brochure for customer download, regularly updated property schedules, streamed video promoting products or an on-line booking facility operating directly between customer and supplier, were all given as examples of how people hoped to be working with broadband.

Several businesses with good existing systems saw the main impact on them as coming through customers in the Western Isles having access to broadband, both in terms of benefits for existing customers and to increase their customer base. This could open up opportunities to use VC with clients or to undertake more collaborative working with other local businesses. Knowing that their customers had broadband would mean that businesses could be confident that they would be able to access streamed video or large

brochures etc. if they put them on their websites. The expansion of broadband locally would also enable companies involved in technical and software development to work more closely with local organisations and public bodies, as they used broadband. For example, health care is an area that is anticipated to make increasing use of broadband in many ways, with many benefits to patients and health management. This will mean that software development companies will be able to work closely with the local health care market once there is a broadband infrastructure in place.

On-line learning

A variety of views were expressed on the limitations or perceived limitations of on-line courses. The subject matter was mentioned by several people. All but one of those with experience of on-line courses felt that they suffered from limitations relating to:

- quality of provider
- access problems
- slow downloads
- lack of face-to-face / lack of personal touch
- time pressure and distractions

On the whole their experiences had not been good in terms of either technical performance or the quality of on-line courses. Many of the problems had been connected with slow downloads and poor connectivity, and the coming of broadband was expected to solve these concerns. Most people felt that the subject matter would dictate how effective a course would be and that on-line courses would be of limited value for most practical subjects.

Whilst being aware of the pros and cons for both on-line and traditional methods, only two people felt that on-line was more effective. This was due to its flexibility and ability to fit training in with a varied work schedule. Several others felt on-line could be effective particularly if it provided training locally rather than on the mainland, but only if the courses were of high quality in terms of content and support. The clear indication here was that they would have to be substantially better than previous courses undertaken, and even then people had a strong preference for the traditional learning situation. The vast majority felt that these more personal and collaborative learning situations enhanced the value of the content of the course and provided deadlines and peer support, and two people felt they created a welcome break from the screen for people who worked long hours at a PC.

The training providers were keen to expand into the provision of more on-line courses and offer more services. One provider had offered on-line courses in the past but found little demand and felt that this indicated a lack of confidence to undertake training on-line.

Overall the interviewees came across as very enthusiastic about broadband and the benefits it would bring, although for some this belief was not based on any clear concept of how it would change the operation of their Internet connections or the ways in which it could change their working methods. There was a general desire for more information about broadband. For some it was the need to be kept regularly updated on the connection dates in order to plan some of the quite major changes that they envisaged taking place. For others with less technical understanding there was a need for them to feel that they knew far more about the operation and opportunities of broadband in order to be able to consider how it might change their business. A lot of companies saw any increase in communication speed and consequent ease of data transfer as a benefit worth getting, but had little understanding of any other ways in which broadband could change the way they organised their business. Some very practical information was felt to be needed – geared to those with no understanding of broadband. This was now an urgent need, as the time for introduction came closer.

4 Case studies

Background

Experience of new technology deployment over many years makes it clear that it is the social structures and human processes that need to be re-engineered before the transformative potential of a new technology can be realised. As it is much more difficult to alter human processes and evolving social structures than to install technology, new initiatives can grind to a halt after the easy part has been accomplished. However, it is too simplistic to blame ‘technology push’ as the cause of the many failures in the take-up of technology-based innovations. This is very clear in the case of broadband, where the classic dilemma pertains. The technology needs to be in place before people see how they might use it and before services are created to attract users, yet making the technology available in the first place is inevitably a technology-led operation.

One way around this dilemma is to provide potential users of the technology with models of how it is being used elsewhere, of how people like themselves talk about the benefits they have found, and how businesses like theirs have expanded, have become more efficient, or have diversified. The following case studies are intended to fill exactly this need. They have been chosen specifically because they are from rural or remote areas like the Outer Hebrides, from small businesses not dissimilar to those found in Lewis, and from social or economic conditions familiar to local people.

Broadband characteristics

There are four properties specific to broadband access that emerge as critical from current applications:

1. It is many times faster

2. It allows the transfer of more complex data
3. It enables much greater interactivity between users (hyper-interactivity)
4. It is always on (avoiding dial-up connections and line sharing).

In our search for applications of broadband appropriate to the Western Isles, we identified a number of benefits that we considered would be most appealing to a cross-section of potential users. The following case studies include examples of individuals creating new businesses, SMEs diversifying and finding new markets, local government and educational initiatives:

Cambridge Ring

The Cambridge Ring North East project (Carnet) was started by local residents in 1998 when they realized there was no prospect of either BT or cable companies providing broadband in the foreseeable future. The ring of villages around Cambridge has a high concentration of computer-literate residents, many with connections to Cambridge University and others who work from home in related industries such as IT and graphic design. A few early adopters championed the cause as they were sure that there would be sufficient take-up of broadband in the local villages to defray the start-up costs. The supplier, Invisible Networks, is working with Carnet, a not-for-profit organization, and is bearing the capital cost of renting a leased line from Cambridge to the Bottisham telephone exchange and providing wireless antennae and receivers to connect local homes and businesses (Carnet, 2003).

Community uses of broadband are developing as the number of subscribers grows. One example of a much-valued service is a webcam on the main commuter route into Cambridge, so that residents can plan their journeys to work.

The major take-up is by individuals who are self-employed or work from home and need to send and receive large files, images and diagrams. The increased speed now available through broadband has had a significant effect on the working practices of these people:

- Before broadband, information had to be sent on CDs through the post, or be broken up into smaller files to be sent individually.
- Working practices used to revolve around setting things running for several hours while other tasks were done.
- Access to clients' products used to be through printed brochures received by post. Now these products can be accessed on-line more readily and in a more up-to-date version.

- Before broadband, employees had to drive in to the head office to pick up training material and large data files. These journeys are no longer necessary.

The conceptual barrier to working from home has really disappeared for these people. They produce work more quickly than before and can pace their work more appropriately.

Revolution Records

Simon Gordon owns and runs Revolution Records. Broadband has helped him transform his business in line with the changes in the record industry. With the decline in 'vinyl', he has moved away from selling records in a shop to selling them on-line. Revolution Records is an on-line record store supplying specialised dance music over the Internet. In addition, he manages his own record label and now sends upwards of 100 emails a day, some with huge attachments. Artwork and sound files can be sent directly to the printer, disc jockey or cutting rooms rather than by post. In his recording studio he can master a track and email the file to several disc jockeys, who can give it an immediate airing. He has gained a real reputation for mixing music with vocals and regularly exchanges large files with clients around the world. Before broadband, this process would have taken seven days, but now it takes less than an hour.

One aspect of this diversification is the way in which the business has become international. The 15 artists he manages are from as far afield as Serbia, Australia and South Africa, all this from a small first floor office in remotest Cornwall. With broadband, his location outside the London metropolis is no longer a disadvantage.

Camilla House Hotel

Camilla House is a small bed and breakfast hotel in Penzance owned and run by a young couple who live on the premises and manage the business entirely themselves. They bought the property a year ago and installing broadband was part of their business plan from the beginning. Because of the competition amongst hoteliers, they saw broadband as underpinning their strategy of providing value-added to the standard bed and breakfast offering. For example, guests have access to a broadband-connected PC for email and web browsing. Guests are given a detailed weather forecast at breakfast which the proprietors download each morning. An extensive and regularly updated 'what to do locally' website is provided for guests, most of whom are tourists on short breaks.

The most valuable competitive advantage that broadband offers the owners, however, is the 'always on' feature. Many prospective guests email a range of local hotels. By setting an audible email alert, the proprietors can respond almost immediately, sending details of rooms and availability. This gives a definite competitive advantage – in fact, the hotel is

the only one in the whole row of half a dozen others that remains open all year, and has an enviable occupancy rate.

The proprietors have more ambitious plans for using broadband: they plan to introduce walk-through video clips of the hotel facilities, and put a webcam on the roof so that prospective visitors can see the view. In order to compete favourably with comparable hotels in the area, the owners pay careful attention to the ranking of the hotel in the search engines.

Calico Consultants

Calico UK (2003) is an Internet service provider (ISP) and consultancy company that operates from a small fishing village on the north-east coast of Scotland. The company was established in the early 1990s with the specific intention of bringing fast access Internet services to a wider range of small businesses and individual households in the Highlands and Islands of Scotland. To this end, Calico UK was an early adopter of a dedicated fibre optic connection, and though they work with large-scale corporate players, the majority of their clientele are small and micro businesses across the UK and specifically in this region. This has given them unrivalled access to customer and business intelligence on the requirements of installation and use of telecommunications applications. After 7 years of broadband use, they are established regionally, nationally and internationally as a small and flexible group combining the ISP with communications consultancy and training.

They identify two strong elements in their successful adoption of extensive bandwidth in their business, the always-on property, and the fostering of trust between users of their on-line community. This includes a range of links and support for customers without broadband but who wish to adopt communications technology for their own purposes. Calico UK's use of a broader bandwidth has resulted in changes to working practices that include a blurring of job demarcation in the company and use of the always-on property to share business information and workloads. Enquiries by email to the ISP helpline are posted to an internal staff conference where a number of staff are able to comment and respond with solutions. Other staff conferences are used to deal with work scheduling and specific tasks, as well as overtime and management records. Being pioneers in their area, they were largely unable to utilize conventional training methods for staff, and have relied upon informal web-learning and a high degree of knowledge-sharing, both between staff and within a network of other companies. On-line business contacts have frequently developed into reciprocal business relationships, for the mutual benefit of the partners. The combination of ISP, training and consultancy roles places Calico UK in a uniquely informed position to respond to a very varied network of customers and users, and to incorporate their use of broadband into their business practice as a fixed asset rather than simply a utility. They characterize the strengths of broadband in their business as "being able to find a good idea and share it with your colleagues" and "not just being what you bring to your on-line work, but also the added values to on-line and off-line relationships".

Quintdown Press

Quintdown Press is a printing company with several outlets in Cornwall: Truro, Camborne and Newquay. Since installing broadband in 2002, the business has seen immediate benefits in the form of greater productivity and staff efficiency. The faster transfer of files from one outlet to another has enabled a quicker turn-around of work. Furthermore, there have been cost savings on couriers and the lower production costs mean better value for money for customers. Previously data files were hand delivered by van; now turn-around time has increased immeasurably, making the business more competitive.

Quintdown Press plan to make still greater savings by using video conferencing for production meetings, which is now possible using webcams with the broadband connection.

The business has grown significantly since the installation of broadband, as clients are no longer just local. Broadband has enabled the business to offer an efficient service on a national scale.

Upper Karelia, Finland

Upper Karelia is a remote rural area located in the eastern forest periphery of Finland that comprises three neighbouring municipalities with a population of 20,000 inhabitants. The area has suffered the typical troubles of remote rural areas: a persistent high rate of unemployment, declining incomes of households from agriculture and forestry, out-migration of young people, and cuts in public spending on rural services and infrastructure. Using some Finnish research and development finance, plus a contribution from the North Karelia Regional Council, a project was set up to create a local community network to achieve social objectives, support social innovations and improve services. Called Learning Upper Karelia, it was funded for two years beginning in 1998, and an evaluation was carried out by Oksa and Turunen (2000).

In the first stage, 21 local unemployed persons were selected for a special six-month training course financed jointly by the project and the district employment office. During this course they were trained to become the trainers and support persons of the community network. Thirty computer kiosks allowing free access for the general public were installed, and the newly trained staff provided free support to groups and to individuals in their homes. At first the kiosks were mostly used for surfing the Internet, and participation in the community net started slowly. Public sector actors (municipalities, employment office, civic organisations) started producing information in the community net. Special attention was paid to young people as users. During the second year, use of the community network increased steadily, a register of local enterprises was constructed and agendas and minutes of all council meetings were made available.

At the core of the success was a connection between locality and the general development trends in society. Locality was understood not as isolation but rather as an arena for working together to meet the challenges of the larger society. The local resources for the task were recognized and mobilized. The key implementor was local, the project leaders were local and the lay trainers had themselves been local unemployed persons, so that they were highly sensitive to the starting level and needs of the local people. Training and support were free and easily accessible, and access to the Internet through the kiosks was free and available in public spaces such as libraries, youth centres, local banks and shops.

Simcoe County

Simcoe County is one of the largest fibre optic broadband community networks in Canada. The public institutions in virtually every community throughout this largely rural county are connected to each other and to the Internet. A total of 680 kilometres of fibre optic cable connects municipal government, health care providers, schools and college campuses, libraries and hospitals. The aim is to create jobs and business opportunities, as well as to give residents electronic access to a wide range of services. Some of the key applications are: a Virtual Town Hall for e-democracy, Surgical Pre-Admission Clinic and Telemedicine applications for patient assessment, consultations, education and meetings, and connectivity for schools and libraries.

Key factors in the success of this broadband implementation are:

- A high degree of stakeholder engagement within and from interested communities and a well-established stakeholder team
- The needs, applications and benefits that are clearly defined and linked to a vision of community sustainability
- Extensive experience of project leaders with ICT or community economic development activities
- Broadband viewed as a strategic asset and enabler, not just a service.

We asked whether there were any surprising outcomes of the project: voice-over IP was the immediate response. As a very large county stretching from northern Ontario to the edges of Toronto, Simcoe County were able to reduce their phone bills of its public institutions substantially as many employees needed to ring Toronto numbers, which were now 'free'. What the champions of the project are most pleased to point out is that the amount of money invested in installing the fibre optic cables etc. has been matched by savings from no longer needing to service networks amongst schools and other institutions.

An Leabhar Mor

The example of *An Leabhar Mor* (The Great Book of Gaelic) illustrates some of the advantages of broadband for the transfer and access of complex digital data. This is a large, complex and innovative cultural project that includes poetry, new artwork, a travelling art exhibition, a new glossy book (MacLean and Dorgan, 2002), a web site, an educational pack for children and a documentary film. Each aspect of the project has innovative and entrepreneurial elements, but for our current purposes, we focus on activities related to the web site, though it is necessary first to describe the central concepts of the project.

The idea was conceived as an exploration of the cultural links between the Gaelic-speaking areas of Scotland and Ireland. A steering group and selection panel invited 15 Scottish and 15 Irish poets to nominate one of their own poems, plus two others of their choice, with a further 10 poems nominated by a panel, to give 100 poems in all, spanning writers from the 6th to the 21st century. One hundred visual artists were selected by nomination and open submission and then paired with a poem for which they then produced a creative response. Finally a team of calligraphers was selected to provide an additional response to the individual poems.

The interactive web site (PNE, 2003) contains the text of the entire book with hypertext links, plus thumbnail illustrations of all of the original works of visual art. Broader bandwidth is undoubtedly advantageous to view these complex illustrations speedily, but the real benefit of broadband access is realized by the next stage of project development. In this phase, audio clips of each of the pieces of poetry are being added as hypertext links, combining digital sound with the literary and visual experience. Further plans for web site development include invitations for new contemporary Gaelic poets to write their own interpretations of the visual art, and for new artists to respond in different ways to the poetry hosted on the site. In this way, the site will become both an archive of 'classical' culture, an organically growing vehicle for the contemporary expression of Scottish and Irish cultural links, and also a powerful teaching and learning resource.

Welsh Internet Radio

The example of Radio Acen (Radio Acen, 2003) demonstrates one of the advantages of the 'always on' property of broadband by utilizing 802.11b technology (digital wireless) to operate a learning community, entertainment and merchandising operation through the medium of Internet radio. In 2002 the Welsh National Assembly backed a community-based initiative called e-fro (e-fro, 2003) to demonstrate the value of 802.11b wireless technology, to stimulate the demand for broadband and to create on-line communities for innovative trial projects in Wales (Welsh Assembly Government, 2003). After background research in the Ogwen Valley, west of Cardiff, into potential links between broadband access and economic and cultural development, a number of pilot initiatives were tested, including wireless demonstrations at the Royal Welsh Show and the National Eisteddford and a community link between Bangor and Bethesda.

From these initial trials grew a number of cultural and broadcasting initiatives, including the idea of a Welsh language Internet radio service, based upon a schedule of Welsh music with occasional topical pre-recorded programmes in Welsh. In effect, the radio service was offered as a soft 'front' for both informal and structured opportunities to learn the Welsh language. A number of on-line courses in basic Welsh are available from the radio station home page, along with a selection of programmes that can play on request. Listener feedback provides evidence of an international audience, with asynchronous access, largely among the diaspora of Welsh expatriates and their descendants. On-line learning courses in this initial phase are being offered free, with the costs being recovered through on-line merchandising associated with the music and other cultural activities. The radio service was established as an entrepreneurial, private sector initiative, pooling the resources of a Welsh language development agency, TV broadcasting experts and a music recording company. The success of the venture lies not only in capturing the interest of an international expatriate market, but in the ability to provide high quality digital sound reproduction on request, across time zones and at times of day convenient to the users.

Summary

In summary, it is clear that in some of these case studies, broadband has had a simple cost saving or time saving effect. In others it has allowed businesses to internationalise, diversify or expand. In many cases the introduction of broadband has been a catalyst for a range of changes that have improved service immeasurably. Finally, broadband has enabled new forms of activity that simply were not possible before. New businesses have been created and existing businesses have found new markets. Some applications are obvious – distributed businesses, teleworking and access to multimedia resources. Others are more unexpected. For example, a hair and beauty salon in Cornwall uses broadband to upload photographs of clients to the computer so that they can see themselves on screen with a range of different hairstyles and hair colours. In addition, they can browse the latest hair designs from internationally renowned stylists on the web.

For some of the applications it is the ability to send and receive large files with complex data or multimedia material. For others it is the always-on capability of broadband that creates a business advantage. We have chosen examples from individual, SME, government and education implementations in order to demonstrate the range of applications and to spark ideas about how these could be applied in the Outer Hebrides.

What many of our interviewees said was that they could never go back to working without broadband. There is clearly a psychological element to the implementation of broadband: the knowledge that connectivity is 24/7 has a powerful effect, though it cannot be directly measured.

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