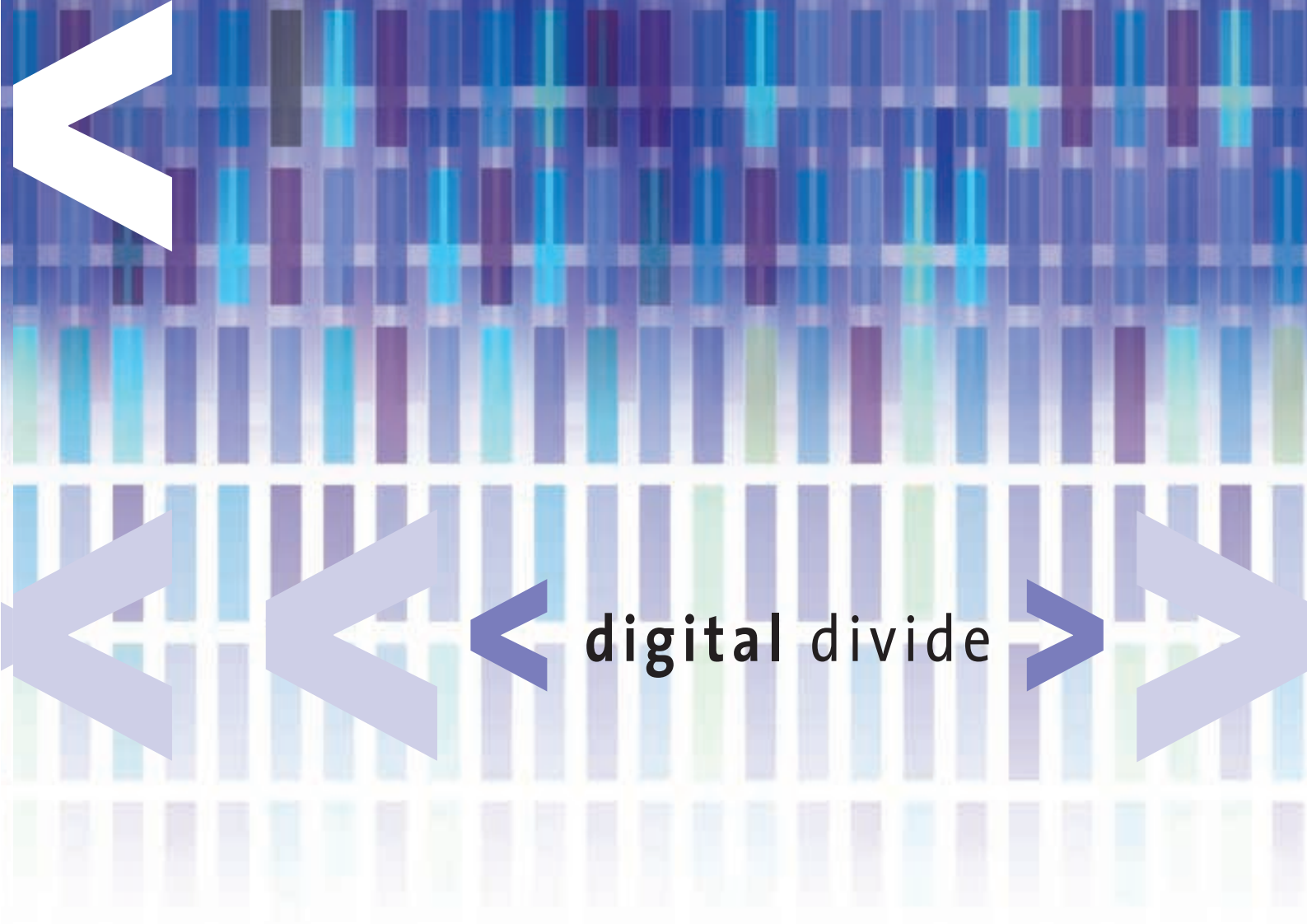# BECTa

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< digital divide >

BECTa TOSHIBA

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Foreword and Introduction

Niel McLean

Director, Evidence and Practice, Becta

When Becta set up the ICT Research Network, we aimed to enable greater communication and collaboration between researchers, practitioners, the industry and policy-makers, and to identify areas of convergence and commonality around various aspects of ICT in education. The initial partnership between Becta and Toshiba, which enabled a seminar and this publication, arose out of that network. Toshiba played an active role in the partnership and as a result, a model has been developed for future collaborations with others in the industry. We hope this publication represents the first of many fruitful outcomes.

The 'digital divide' was chosen as a focus for this first seminar for a number of reasons. It is a key theme running throughout Becta's work. Quality and equality issues are mutually reinforcing. Both need addressing if ICT is to be used effectively throughout society. The digital divide cannot be viewed in isolation from inequalities in access, support, literacies and so forth. Historically, all new technologies introduce the possibility of increasing inequalities. However, the extent to which they become entrenched and structured depends on both our understanding of the issues and, more importantly, the actions we take as a result.

The term 'the digital divide' itself, is unusual, fascinating and complex. It needs careful consideration and debate at all levels. It is as much about people as 'producers', actively engaging with the on-line world, as it is about individuals as consumers of on-line content. Those on the wrong side of the digital divide are not one homogeneous group. They vary in terms of their socio-demographic make-up and the reasons why they are excluded. There are qualitative differences between:

❙ the 'have and have nots', who lack access

❙ the 'can and cannots', who lack the necessary skills and perceptions

❙ and the 'do and do nots', where the focus is more on structural issues and the relevance of ICT and content to various excluded individuals.

We need to question how much the digital divide matters in relation to other inequalities such as health, housing, income, education and so on. However, perhaps it is the expected future impact of ICT in 'knowledge economies' or 'information societies', that makes the digital divide such an important issue. As more services, participatory mechanisms and information become available on line, what further disadvantages may those on the wrong side of the digital divide face in the future and to what extent might this affect those wider inequalities mentioned above? This suggests that we need to take a more holistic view of the digital divide. But what exactly needs to be done?

Attendees at the seminar highlighted a range of possible future developments from a number of perspectives. So far, we tend to have ideas about why the disparities exist, but less of a clear, concrete picture about how to improve things. Perhaps this is the next stage, and if it is, it is more likely to occur as a result of cross-organisational collaboration, information sharing and partnerships, as exemplified in the seminar.

Partnerships for the future

Trevor Evans
Corporate Sector Manager, Toshiba

We are delighted to be working in partnership with Becta to stimulate debate and dialogue, consider practical ways of tackling the digital divide, and to inform and support future thinking and research about an issue referred to as the 'most pressing civil rights issue of the millennium'.

We have already been working closely with a variety of agencies and other commercial providers on our research education programme. Through it, we gather evidence about how portable technology is affecting teaching and learning processes and helps to raise standards, reduce exclusion and remove bureaucracy. We are also following closely the progress of the NGfL, the ImpaCT studies and the Pathfinder projects. We are encouraged by the establishment of Becta's ICT Research Network, in which we intend to play a full and active role, and we are excited by the DfES vision of the 'school of the future' and their views reflected in Transforming the Way we Learn.

We were pleased to see the preliminary reports published by Becta on the relationships between ICT and school standards and we hope to publish further examples of best practice as a result of our partnerships with Leeds Metropolitan and Wolverhampton universities and Microsoft.

Commitment to People

The Toshiba Group companies, based on our total commitment to people and to the future, are determined to help create a high quality of life for all people, and to do our part to help ensure that progress continues within the world community. We endeavour to serve the needs of all people, especially our customers, shareholders and employees, by implementing forward-looking corporate strategies while carrying out responsible and responsive business activities. As good corporate citizens, we actively contribute to further the goals of society.

Commitment to the Future

By continually developing innovative technologies centring on the fields of electronics and energy, we strive to create products and services that enhance human life, and which lead to a thriving, healthy society. We constantly seek new approaches that help realise the goals of the world community, including ways to improve the global environment. Hopefully, these commitments make it visible that we accept our corporate social responsibilities. Our participation and support for a range of Best Practice projects in a variety of settings demonstrates the rhetoric of these statements converting into the reality of people's lives. We can see no reason why there cannot be synchronicity between our social responsibility in addressing the digital divide and general business sense. We consistently invest significant amounts on research and development and we intend to ensure that the outcomes of these events and every subsequent research finding are factored into our research and development cycle.

We are particularly sensitive to the complexities of the issues surrounding the digital divide and its many dimensions, which have implications for us all, particularly in the education sector. Events like today can only help in raising awareness, influencing policy and identifying areas for future partnership efforts and the most effective use of scarce resources. We look forward to working closely with Becta and the academic and practitioner communities in the future, and ensuring there is a synergy between your efforts and insights, and our practical and commercial expertise.

Digital Divide and Problems with Definition

Tim Rudd

Education Officer, Evidence Team, Becta

When I first began researching ICT and issues of inequality in the mid-late 1990s, it was apparent that most research around the use and perceptions of ICT was largely devoid of any real socio-cultural context. As a result, it may be argued, claims about the overall utility of ICT remained over-optimistic in the short term, or what Beynon and Mackay (1996) termed 'technoromantic'. The potential reproduction, or exacerbation of inequalities due to the proliferation and integration of new technologies into social structures, tended to be largely overlooked. Over the last decade, we have begun to see research that has identified how economic, social and cultural factors have an impact on equal access and use of ICT and also how ICT can play a role in generating inequalities. For example, in some cases, inequalities have been shown to arise as a result of the structuring effects of classroom practices; unequal access, ownership and support in the use of ICT at home, in schools and the wider community; stereotypical representations by the media and their effects on perceptions; and also because of existing differential ownership of economic, educational, social and cultural capitals.

We are beginning to obtain a better picture about the interrelationships with wider social factors. This collection of papers highlights how far the debates have come, further reiterating the extent, characteristics, complexity and dimensions of the digital divide(s).

However, beyond those researching or specifically interested in the field, how many others have the same levels of awareness? Do the majority of individuals still tend to accept the quick and often crude statistical representations of the digital divide? If there is one thing readers of this publication can do, it is to pass on the knowledge to others, so that there is greater and more informed debate around the issues and less likelihood of narrow or unsustainable solutions. We need to highlight the multi-dimensional nature of the divide(s). There are quantitative divides in terms of ownership and access, but also qualitative divides in terms of length and kinds of use, type, quality and functionality of technologies, and levels of support mechanisms, as Keri Facer, Graham Murdock and Samantha Hellawell's papers identify.

Very broadly, divides have been identified along dimensions of gender, socio-economic status, employment, geographical location and ethnicity, as well as in relation to disability and other groups who suffer from exclusion, such as prisoners and refugees. However, we also need to consider other equally important factors that create barriers to effective engagement with new technologies. These include issues of illiteracy in all its forms (see Fred Garnett's paper), the relevance and bias in content (as identified by Samantha Hellawell's paper) and to understand what counts as meaningful and accessible content, through consultation with under-served groups (see the papers from Sal McKeown and Kevin Carey).

People will argue over why, and to what extent, the digital divide matters, ranging from those who believe it is one of the biggest civil rights issues of the millennium, to those who believe the divide to be more of a matter of choice in contemporary society. However, to make an informed decision people need to be better informed about the subtleties and intricacies of the arguments, including the impact inequalities may have in terms of engagement, citizenship, self-esteem and access to participatory mechanisms.

People first: meeting the ICT needs of socially excluded customers

Samantha Hellawell
Director, IS Communications
http://www.iscommunications.co.uk

Samantha is the author of the recent Fabian Society Report, Beyond Access: ICT and Social Inclusion. Her interest in the role of ICT in promoting social inclusion began when she joined IBM in 1994 as Community Programmes Manager. Prior to that she had worked for seven years in the voluntary sector as Head of Communications at the National Council for Voluntary Organisations (NCVO) and prior to that, as Communications Manager at Barnardo's.

At IBM she developed a model of promoting employee volunteering through the use of technology to match employees' interests with local volunteering opportunities. She then became a member of the INSINC Working Party set up by IBM and the Community Development Foundation (CDF), the first national working party to look at the impact of the emerging information society and its potential for creating a more inclusive society. She has since taken responsibility for delivering a number of projects that used technology to combat exclusion, including the production of a CD-ROM that won the first BAFTA for interactive digital educational material in 1998. During her final year at IBM, Samantha was seconded part time to Communities Online to help set up the organisation.

Samantha was a guest lecturer at City University on ICT and social inclusion and a member of the PAT 15 team until she left IBM to set up IS Communications, and now works on a variety of projects, which focus on how to use ICT with hard to reach groups.

During the course of my research for the Fabian Society I interviewed a German professor of psychiatry who was involved in setting up a web site based learning organisation for professionals and users of mental health services. Towards the end of the interview we discussed the poor state of the NHS and he told me that if his children needed medical treatment, he took them back to Germany. Interested in a European's perspective on how we can improve our public services, I asked him what needed to change in the UK health service.

By way of an example, the professor stated that the previous week he had been to Moorfields Eye Hospital for an examination. When he arrived he was given an eyewash, at the same time as everyone else with an appointment for that afternoon's clinic. This prevented him and everyone else from being able to read while they waited for up to two hours to be seen. The point of the wash was that it enabled the doctor to examine the eye better. There was no reason to give it until just before those waiting were due to see the doctor, but it suited the clinic to give it to everyone at once. A very small example, but no doubt it is this sort of scenario Alan Milburn has in mind when he exhorts the health service to become more customer focused. While the main difference between UK and German health provision is the level of funding, it is the transformation to a customer-led service that will determine whether we ever have a world-class service.

The concept of a socially excluded person being a customer is even further from informing the delivery of projects designed to impact upon regeneration and social exclusion. There are two reasons for this: firstly, those who design and implement projects are end users themselves of complex, incoherent and demanding funding systems that result in focusing on the funder as customer, not the service user. Secondly, many professionals involved in the business of overcoming social exclusion have had a different life experience from their customers. This means that they often do not understand what motivates a socially excluded person to use a service and how he or she might want to access it. Too often, projects are designed from the perspective of what would work for the provider, not the customer.

The existence of a digital divide has been well documented and government funds have been allocated to bridge it, principally through UK Online Centres, learndirect and the Wired up Communities programme, which is piloting home access. The purpose of this paper is to look at what we need to do to ensure that funding makes a real difference to help deprived communities cross over to the right side of the digital divide: the one awash with opportunity for economic gain and improved life chances. It draws on our experience as a company working with regeneration partnerships who are looking at ways to address the digital divide. It further develops ideas that came out of research for the Fabian Society[1] , which specifically focused on the experience and views of the most socially excluded people and asked the following questions: How do young people leaving care or leaving prison think that ICT can help? What motivates Muslim women to use ICT and how do they want to access it? What information do people living on deprived estates want available on line?

In order to meet the ICT needs of these and other excluded people, we must start from the proposition that socially excluded customers are our most valued customers. In short, we have to see the world through the eyes of our socially excluded customers. Projects that aspire to provide ICT learning opportunities to their target group of customers must meet their real needs, as opposed to professionals' perception of their needs, in terms of access, content and support. We need to take a marketing approach: find out what people want, how they want it delivered and what price they are prepared to pay. Of course tackling social exclusion is more complicated than launching even the most sophisticated service in the private sector. Success is about decreasing, rather than increasing, your customer base. The customers themselves are often very fragile and have complex problems. Revenue comes not from keeping customers happy (few can afford to pay anything for the service) but from managing relationships with funding bodies whose hard output-driven culture does not adequately measure or reflect the qualitative, subtle changes in a person's perception of themselves and their place in the world. As one tutor at an ICT centre on a deprived estate in the North East said:

"We know that self-worth is more valuable than anything, but you don't get a certificate for that. I cannot give them a piece of paper at the end that says, 'My

God, Tracey, you've really enriched your life in the past year and I can see a huge difference in you'. How can you quantify that, unless you listen to people like me?"[2]

People first – the barriers

Let us take a closer look at the barriers that get in the way of putting the needs of socially excluded customers at the forefront of ICT service delivery. There are four main barriers: those relating to the structures people work in; those relating to issues of access and content and those relating to the mindsets which professionals bring to their work.

We have touched on some of the structural issues that mitigate against people being able to bring about customer-led services, principally that it is the funder that is perceived to be the customer. Therefore the wider framework in which both funders and projects operate needs a radical overhaul to support a customer-led approach.

A report commissioned by the Digital Divide Group at the DfES[3], highlights issues we have found working with clients:

▌ There is often no clear strategy and leadership at regional level
▌ There are poor linkages between strategy and delivery
▌ There is little knowledge of what already exists and a mess of unrelated projects at local level
▌ There is confusion about the different digital divide 'brands'.

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[1] *Beyond Access: ICT and social inclusion*, Samantha Hellawell, Fabian Society, 2001
[2] *Beyond Access*, p. 57
[3] The Group's remit was to assess and advise on significant gaps in the Government's digital divide strategy and look at the impact current initiatives set up to address the divide were having. The aim of the research was to carry out an audit of ICT access and learning for adults; to look at the coherence of that provision and barriers to take-up. A series of nine audits were carried out in different areas.

As the report by Hall and Aitken[4] says:

There is no consistent delivery or co-ordination of strategy for tackling the digital divide at a regional level. This is partly because the digital divide overlaps between the learning and skills agenda, the more broad ICT access agenda and the over-arching regeneration agenda. Lack of strategic consistency is also weakened by the plethora of organisation and partnerships, which seek to influence ICT and learning strategy.

In other words, no body is accountable but everyone wants a place at the table, certainly a scenario not unique to delivery of digital divide strategies. The authors also comment:

The poor linkages between the strategic partnerships and local delivery partnerships would appear to be one of the fundamental issues emerging from the regional audits. The range of funding sources can often lead to new, localised delivery partnerships which do not link to any over-arching strategy.

Clearly the Regional Development Agencies (RDA) must take responsibility for developing an ICT strategy for the region that underpins its economic aspirations and which addresses the exact nature of the digital divide in that region. Local audits should be carried out to map existing and planned ICT provision to the opinions and needs of excluded people, particularly those not using any existing services. Paper exercises are not enough. There may be ICT access on or near a deprived estate but it may not be meeting the needs of some of the most excluded people on that estate, for example those who are unable to get out of the house because of mental or physical disability. Seeking out people who aren't using a local ICT centre and asking them why not, can be an extremely valuable exercise.

Once a clear map exists and barriers facing existing and potential customers are documented, hard decisions can be made about how to rationalise provision, since there will almost certainly be overlap and gaps. The local driver partnership, most probably the local strategic partnership,

should be responsible for local delivery. For this reason, it is important that members of the Local Strategic Partnership (LSP) understand the potential of ICT to contribute to improving their neighbourhood. Time should be set aside to help educate them about how technology is helping residents in other areas to better communicate, develop skills, improve health, engage disaffected youth and so on. LSP members could start by setting up their own electronic network to e-mail and discuss issues with each other. The Neighbourhood Renewal Unit should encourage ICT know-how in LSPs by making ICT a key strand in its skills and knowledge programme and showcasing best practice.

Formal vs. informal: getting the right mix

Barriers relating to access have been well documented by think tanks, academics and by the government's own research and policy initiatives. Key recommendations include providing comfortable, non-threatening environments, starting with people's own interests and relevant content. Child care provision is crucial to engage many women. However, as Liff and Steward note[5] in their analysis of advice given about providing ICT learning opportunities:

In the light of prevalence of such well grounded advice it is surprising that the main activity of e-gateways with respect to new users is provision of relatively formal learning opportunities.

4 *Mapping the Digital Divide*, Hall and Aitken, DfES, 2001
5 'Communities and Community – egateways: Networking for Social Inclusion', in Keeble, L. and Loader, B. (eds), *Community Informatics: Community Development through the use of Information and Communication Technologies*, Routledge, 2001

This conclusion is supported by the DfES' own research[6]:

In some areas it is clear that there needs to be more emphasis on basic access without any explicit learning component. Funding regimes need to be geared towards this form of provision as well as more formal learning provision.

Unfortunately it is still the case that most public access is delivered by educational bodies that are more familiar with formal, classroom-based, qualification-led, learning. People who have had a bad experience of school are often not motivated to take up formal courses. They can perceive learning delivered at the local college, for example, as simply 'not for people like us'. Indeed among socially excluded customers there is often a profound and hostile reaction against, 'some guy in a suit standing at the front telling us what to do'.[7] One way of confronting this persistent negative self-image is to introduce peer-led training. I once asked someone why it was important to him that the learning assistant in his local ICT centre was someone who lived on his estate. He replied: "Cos I thought if that thick beggar can do it, then so can I".

The University of Teesside is recruiting learning ambassadors from within its communities to promote and deliver ICT learning at community-based centres. Deputy vice-chancellor Helen Pickering says that the university has had to abandon the traditional 'campus' model of marketing and delivering courses, based on prospectuses and formal teaching, to reach out to people living in Middlesbrough's deprived communities.

"What you deliver has to be at the same level and of the same quality but you have to deliver it in a different way. The market appears in a quite different context from traditional students. For example people come to courses through word of mouth and want short bites of learning. Most of our community programmes have been run three or four times a year.

You have to address the whole question about what your learning strategy is in terms of people who often have had a bad experience of learning and who are actually being quite courageous to re-engage."

What is needed is the most appropriate mix of informal and formal learning opportunities, based on customers' preferences. Some people are happy to embark on formal courses and are motivated by getting a certificate at the end of it. Cultural issues also need to be taken into consideration; for example, it can be difficult for Muslim women to take up mixed-sex learning opportunities.

ABC only

While much of the debate about the digital divide has focused on access, issues relating to content also pose barriers. It is clear that the Internet, driven by commercial interests, is aimed at consumers in socio-economic groups ABC1. The point of portals is that you sell products through them. I find it useful to be able to click on a map of the UK and select a suitable hotel for business or a weekend away. It is impossible for a homeless person to do the same and find a list of hostels in her or his home town.

The Government's own portal to its own services, UK online, reinforces excluded people's feelings of alienation by almost completely ignoring the life episodes that many excluded people experience: losing a job, becoming mentally ill, being a refugee. The re-launched and improved site now contains information for young people leaving care but it is difficult to find. There is a life episode entitled 'looking after someone' and from there you can find information for young carers, and from a section on emotional support, you can link to information about leaving care. Government portals that are life episode

6 *Mapping the Digital Divide*, Hall and Aitken, DfES, 2001
7 Comment made by male interviewee at Ragworth Neighbourhood Centre, Stockton on Tees, during research for the Fabian Society

led should normalise the full range of life experiences by including where to go for help if you are a victim of domestic violence or racist abuse.

The Children's Partnership, a US not-for-profit organisation, surveyed 1000 relevant web sites[8] and found that:

▌ 6% or less of on-line content was the local information users want and need
▌ 1% of on-line content was developed for adults with limited literacy
▌ 1% of on-line content was created in a culturally relevant manner, and
▌ 2% of sites made information available in a variety of languages.

Contentbank.org: Content-Building for and by Local Communities, Laurie Lipper and Francisco More[9], state:

The research also found that these types of information were precisely what low income and under-served users were often looking for to meet their daily needs.

As a response, the Children's Partnership is creating a 'Community Contentbank' to stimulate content development within deprived communities.

Contentbank.org is envisioned as a community space that will provide an ongoing process for users to develop materials themselves, alongside experts who help quantify and analyse what users need and want. The results will be shared on Contentbank.org with the broader community of those interested in local content and with policy makers, funders, the media and the Internet industry.

Giving them what they want?

Local authorities need to be more creative in the use of content to deliver e-government to excluded customers. So far, the majority of councils have developed web sites which seem to be driven more by 'giving' citizens the information the council wants to give them, than by producing content that makes their site a likely 'favourite' amongst users. It is a very different approach from consumer portals where the objective is to:

Create a community that returns regularly and has a sense of belonging that reaches 'tribal' levels. The critical issues here is to capture customer data and use it to increase sales.[10]

Councils would have a far better chance of capturing the attention of many customers if they offered their services via a community portal that offered a lively, local and interactive front end that was not branded 'Council', or 'Health Authority', or any other public body, but which all public bodies could stream their information and services into. Information could be presented in life episode format and draw on the complete range of services available in the locality, but accessed via a neutral site. Success would be dependent on designing a portal that would be interesting and interactive enough to become a person's home page or at least one of their top ten favourite sites.

In its report, which sought to define how e-government might be rolled out in the UK, the government envisaged a mixed economy of portals through which the citizen can access government services:

The key point is that sites should be built to serve customer needs, and this will almost certainly mean a diversity of entry points.[11]

Simply put, wherever the 'cyber citizen' is most likely to go, government services should be accessible to her or him. Councils need to consider the best channels for providing a contact point to excluded citizens. If public bodies are not able or

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8 Online content for Low-Income and Under-served communities: the Digital Divide's New Frontier (2000)
9 www.comtechreview.org/article_body_print.asp?article_id=97
10 *Ecosystem, living the 12 principles of networked business*, Thomas Power and George Jerjian, FT.com
11 *e.gov Electronic Government Services for the 21st Century*, Performance and Innovation Unit, Cabinet Office, 2000

willing to get together to develop a first class community portal through which all can stream services, but which is perceived as 'neutral' and therefore trusted, then they should consider working with agencies that have a track record of reaching excluded groups.

In its recent report on e-government[12] the Foundation for Information Technology in Local Government (FITLOG) asks:

In the case of the socially disadvantaged groups, we may often have to accept that they should be hearing and learning about technology from other intermediaries. If so, how far are we willing to relinquish control and to trust these other organisations – local community groups for example – to deliver on our behalf?

We're all middle class – aren't we?

We have looked at some of the barriers of structure, access and content, all of which reflect to some extent the lack of professionals' ability to see the world through the eyes of their socially excluded customers. In the world of social exclusion there are two distinct sets of actors: professionals charged with either development of strategy or delivery of services, and people who are experiencing social exclusion, many of whom have been excluded for most of their lives.

It is a lack of understanding of the life experiences of excluded people and the difference in their values, particularly in respect of education, that results in professionals sometimes assuming that what has worked for them will work for their socially excluded customers. The perception, for example, that people want and value formal, qualification-led courses that lead directly to employment, is a norm amongst middle-class professionals. It is not, however, always shared by people who have had a poor experience of education and for whom there are few jobs in their locality. Unfortunately, social inclusion is a messy business that often requires a different approach, one that is informed by what socially excluded customers actually want, rather than by a well trod formula that will only work for the most able. Doing unto others as we would

wish to be done unto seems to be the prevailing view amongst some professionals. Another view, as a member of a community ICT project explains, is treating socially excluded people as people whom things should be done for:

It never occurs to the Council that people want to do something for themselves. It's like an adult/child relationship with the Council viewing its customers as 'those people on the estate we have to deliver services to'.[13]

One of the key points of the national strategy for neighbourhood renewal is that the way things have been done in the past has not worked. It points out that one of the reasons for this is that communities have not had control over deciding what needs to be done and how to do it. By the time funding reaches a deprived neighbourhood, having gone through a layer of number crunchers, it has, in the words of one activist, "turned to dust at pavement level".

Perhaps it is time to take seriously the needs of excluded customers and ensure that ICT learning initiatives, with their enormous scope to help transform lives, are customer led. If not, we can look forward to having little impact on a set of customers and more wastage of public funds.

Michael Mulquin, co-director of IS Communications, deputised for Samantha in presenting this paper. Since 1995 his work has focused on helping to develop a socially inclusive information society, looking at the impact of new technologies on local communities.

[12] *Electronic Local Government: A Framework for Action*, FITLOG, 2001, www.fitlog.com
[13] *Beyond Access*, p. 60

What do we mean by the digital divide?
Exploring the roles of access, relevance and resource networks

Keri Facer

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University of Bristol

Keri Facer is Head of Learning Research at NESTA Futurelab. Until 2002 she was a lecturer and researcher in education and new technologies at the Graduate School of Education, University of Bristol in the Centre for Learning, Knowing and Interactive Technologies (LKIT). Recent research projects have included the Pathfinder evaluation of the National Grid for Learning (Becta/DfEE) and 'Screen Play: an exploratory study of young people's use of new technologies in the home' (ESRC). At the Graduate School of Education she was responsible for co-ordinating the research theme on 'learners' out of school uses of computers' as part of the ESRC-funded Teaching and Learning Programme project, 'InterActive Education', and for co-ordinating the new MSc. in Education, Technology and Society. Keri's other research interests include the study of young people's use of new technologies in the home and the use of new technologies in teaching and creative practice.

Often with debates on the digital divide, we begin by assuming that we have a clear understanding of what it means to 'participate in the digital age' and immediately begin to develop strategies to overcome inequalities without ever asking questions such as: What are the factors that contribute to being 'computer literate', to owning a computer, to finding a role for computers in day-to-day lives? We start off by hunting for 'absences', for things that 'don't happen', and by trying to remedy these. This paper takes a slightly different tack by focusing on the question; 'What are some of the factors that may contribute to regular computer use?'. It then goes on to examine the ways in which these different factors may inter-relate to disadvantage or privilege different sectors of the population. The paper focuses upon computers because, at present, these constitute both a practical and symbolic gateway to the digital age, although, in the future, the same questions may need to be asked of a range of emerging technological environments. Moreover, the question is asked in relation to regular computer use, in order to counteract prevalent measuring systems that focus only on 'exposure' to computers – having ever used a computer is, evidently, a very different experience from making regular (weekly or more) use of a computer and suggests a very different engagement with the resources, practices and experiences that computers might offer.

This paper takes an interdisciplinary perspective, drawing on research from the fields of sociology, cultural studies, psychology and education. It argues that, if we are to understand the complex ways in which technology is appropriated (or not) within the lives and work of individuals in society, then we need to engage both with the macro-level questions of social structures, such as the distribution of income, education, gender patterns, and also the micro-level questions of how individuals interact with and learn to use new technologies. Centrally, an engagement only with how 'individuals' learn to use computers, for example, can blind us to the wider social structures that pattern access and attitudes. Reciprocally, a concern only with these wider structures can lead to a failure to engage with the processes of learning – for the process of first interacting with, then developing expertise in using computers, is both a social act and a cognitive process.

Research base

The paper draws on data gathered as part of an interdisciplinary programme of research into young people's computer use at home and at school, carried out at the Graduate School of Education, University of Bristol. This programme includes the Screen Play Project (ESRC 1998–2000), which took as its focus young people and families' computer use in the home. It included a survey of 855 young people, interviews with 110 young people and intensive case studies of 16 families in their homes in south-west England and South Wales over an 18-month period.

The second project, still ongoing, is the *InterActive Education* project (ESRC 2000–2003), which has a research theme dedicated to young people's out of school uses of computers. The data reported in this paper refers to the 2001 survey of 1818 young people in 10 schools in Bristol and south Gloucestershire. The third project, which will be referred to only for the purposes of comparison or confirmation of data emerging from the other two projects, is the Becta/DfES-funded *NGFL: Roll out evaluation of Pathfinder LEAs*, which includes an annual survey of young people in schools around the UK. Results from this project in this paper refer to the 2000 survey of 2270 young people.[1]

The focus for all these projects is, however, young people and, to some extent, families. Questions about the factors impeding or contributing to regular computer use amongst other age groups, amongst sectors of the population not living in family groups, or amongst individuals with specific educational needs are not addressed as a key focus here. Further research in these areas is evidently needed to clarify what additional or different factors may be significant for these groups.

Analysis of data from these projects indicates that the factors that contribute to young people and family use of computers are complex and various, with each individual's experience of accessing and using computers qualitatively different from the next. However, three key themes did emerge as important in shaping the extent to which individuals were likely to be active users of computers: 'access', 'relevance', and 'resource networks'. It is these factors, and the ways in which they may have differential significance for different socio-economic and socio-cultural groups, that will be discussed here. The paper also suggests that we need to be much clearer about what being an 'information have' (as opposed to 'have not') actually means. What is it that we feel people should be able to have access to, what services, what activities are facilitated by digital technologies and what, then, does it mean to be excluded from them?

Access

The identification of 'access' to a computer as a key factor in determining computer use is not, in itself, either contentious or surprising. For the purposes of this paper, however, we might want to ask what sort of access contributes to regular computer use. Looking at data from the Screen Play and NGfL Evaluation projects, the identification of access to a computer in the home seems to be particularly significant when considering factors that affect levels of computer use. First, the bulk of frequent (weekly or more) computer use was carried out in domestic spaces, with nearly 80% of computer and Internet use reported to take place in private homes (either children's own homes, or those of friends or relatives). Secondly, children reporting home computer ownership were more likely to report a range of strategies for coping with difficulties with the computer (NGfL survey 2000), to report finding computer use in school more helpful (NGfL survey), and to report higher levels of use of computers outside the home (Screen Play and NGfL Surveys).

Fig. 1. **Children's use of computers at home and friends' houses**

	% of children reporting computer use at friends' house
Children with no computer at home	41%
Children with computer at home	63%

Screen Play Survey, 1998. n = 712 (number of children reporting use of a computer outside school)

In focus group interviews as part of the Screen Play project, children without a computer at home also argued that they felt less likely to be given the opportunity to use computers in school than children with computers at home:

Q   Who gets to use the computers mostly in school here?
Girl 1   A boy in our class, he always gets told to set her up and close it down
Boy 1   I think he gets asked because I think there's only about 2 or 3 people who know how to set a computer up in the class.
        (Children, aged 10, city centre primary school)

*Q   Who gets to use the computers most in school?*
Girl 1   People who have computers. They know everything.
        (Girl aged 10, rural market town)

Results from the NGfL Evaluation survey in 2000 also support these comments, suggesting, moreover, that this pattern of higher use of computers in school amongst those with a home computer than those without is stronger at secondary age. Other research suggesting that personal ownership of laptops affects the degree to which teachers use computers in their teaching would also suggest that home ownership is an important factor in contributing to regular adult use.

These figures would suggest, then, that home ownership of computers remains a key factor in supporting computer use. If we focus on this alone as a benchmark by which to evaluate equality of access, some would argue that it would be easy to hope that the problems of the 'digital divide' will naturally disappear, as home computer ownership is year on year becoming increasingly commonplace. Figures from the InterActive Project 2001 survey of 1818 young people, for example, show 88% of young people reporting home computer ownership, a figure which outstrips even games consoles (see Fig. 2).

Fig 2. **Reported home ownership of technologies**
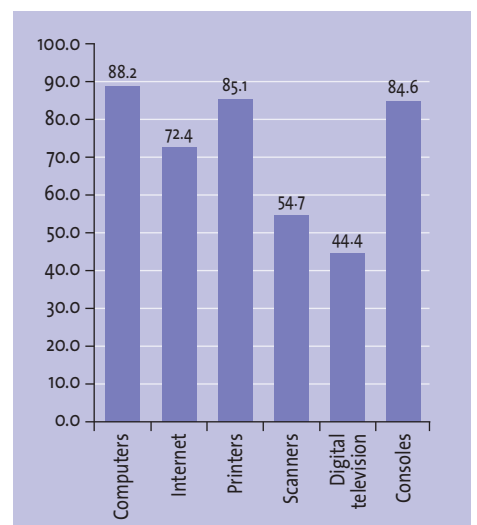
(InterActive Education Survey, 2001: n = 1818, ages 9 – 17, Bristol and South Gloucestershire)

Is it then only a matter of time before all households see computer ownership as an inevitable part of daily life? Given the current cost of computers, the number of households in the UK living below the poverty line, the fact that purchasing a home computer may well be more expensive than purchasing 'essential' household appliances, such as a washing machines or fridge, and the observation that not even telephones or televisions are universally owned in this country, this assumption is in itself problematic.

Fig.3. **Socio-economic make-up of non-computer owning and non-Internet connected respondents**

*% make-up of non-owning respondents by socio-economic area*
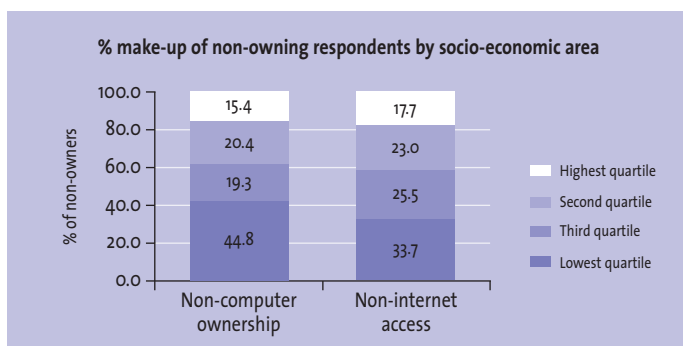
(InterActive Education Survey, 2001: n = 1438, ages 9 – 17, Bristol and South Gloucestershire)

Looking at the socio-economic areas from which those who report not owning a computer in this survey are drawn (Fig. 3), the financial barrier to home computer ownership, it seems, remains real, as the largest percentage of those without a computer at home come from areas with the lowest income and education levels. This explanation alone, however, does not account for all instances of non-computer ownership, as approximately 36% of those reporting no computer ownership in this sample are drawn from the two highest income and education areas.

Owning a home computer, however, should not be read as an automatic indicator that someone is a regular computer user. In the Screen Play case studies of computer owning families, for example, we found wide variations in levels of use in families with computers in the home. There was variation *between* families, with some families not turning it on from one month to the next, while other families made almost constant use of the computer and had to develop a set of rules to manage use. And there was variation *within* families between individuals who used the computer daily, and their siblings, children or parents who never used it at all.

Fig. 4. **Numbers of other people using main computer in the home**
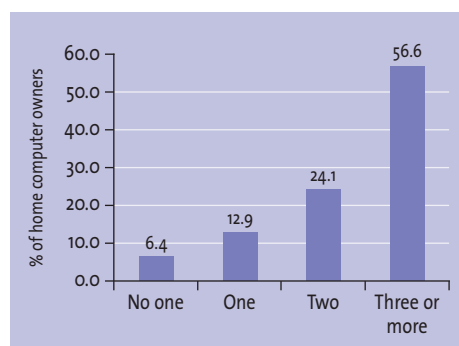
(InterActive Education Survey, 2001: n = 1578 ages 9 – 17, Bristol and South Gloucestershire)

While it is inevitably not only issues of access to the home computer that influences levels of individual family members' use of the computer, it is notable, for example, that boys are more likely to have a computer in their own bedroom than girls and to report having their own computer.

Fig. 5. **Computer ownership and location of computers in bedroom by gender**

	Boys	Girls
Report having their own computer	50%	37%
Report having a computer in their own bedroom	28%	18%

(InterActive Education Survey, 2001: n = 1818 ages 9 – 17, Bristol and South Gloucestershire)

To focus on home computer ownership alone as an indicator of access to a computer, then, is to miss the different ways in which access and use may be patterned along socio-economic and socio-cultural lines within as well as across households.

This concern about whether 'home computer ownership' can be used as a reliable benchmark for access in itself should also be reinforced for a second reason, namely that, unsurprisingly, not all computers are the same. From the Screen Play case studies, in fact, it started to become clear that to talk about 'computers' as an identifiable single artefact was effectively meaningless. On a basic level, some computers are, quite simply, older than others. Some households have access to a range of software, while others have only that which came with the computer. Some households have invested in peripherals such as printers, scanners and digital cameras, while others have nothing but the keyboard. Some households have Internet connections and broadband, others have no, or very slow, connection. While this may be patterned according to family income, with lower income households repeatedly reporting a concern over the cost of Internet connection, for example, as a disincentive from connection, these more complex questions about the types of technology available in the household are also likely to be patterned by the two factors, namely, 'relevance' and 'social networks', which this paper discusses later.

If we are concerned with equity, however, the type of computer equipment in the home and the peripherals and software available to support computer use at home are significant. In respect of children's use of computers for homework, for example, access to a printer remains a key issue as most schools and exam boards continue to accept work in hard copy form alone. In respect of the activities that a 'computer' offers, the question of whether it is networked, of whether it has sufficient memory etc., are all significant in shaping the extent to which the technology can be used for communication, for production of images or Web sites, and so on.

This question of what a technology offers is also significant in an emerging aspect of the 'access' debate, namely the suggestion that with digital television and Internet-connected console ownership rapidly increasing, the problems of unequal levels of participation in the 'digital age' will be reduced. We need to consider, however, what it is that these emerging technologies offer in terms of the range of possible uses. For example, are peripherals such as printers or scanners available that can work alongside the 'interactive' television set? Will audiences be able, as they currently are with PCs, to produce web sites, write letters or CVs, or carry out accounts management via digital television or networked consoles? The question of what it is that households who use digital television as a primary means of access are going to be able to do with these technologies, compared with those households with computer access, remains a subject for some concern.

If we want to consider the factors that affect computer use amongst young people and families, then, it would be fair to say that home computer ownership was likely to be an important component of regular computer use. We would also want to add, however, that in and of itself, owning a computer in the home is not necessarily determinant of regular, or even any, computer use amongst different households or individuals within households. We need to move beyond the question of 'access' if we want to identify how computer use may be patterned amongst different socio-economic and socio-cultural groups.

Relevance

While the question of who owns or has access to computers has been fairly well rehearsed as a key

aspect of the debate on the digital divide, the issue of the relevance and role of digital technologies in the lives of different sectors of society has been relatively under-considered in policy discourse. If we consider why people are encouraged to use computers, the dominant message is that we will need to use them to get jobs. An early debate on the Information Society in the House of Commons reflects this tendency:

"If a person today does not develop the skills to use the information technology that will pervade everyone's life, they probably will not be able to get a job" (Jones, quoted in Hansard, 1997)

To what extent, however, does this message actually play a role in encouraging computer use amongst families and young people?

If we focus, to begin with, on those households with a home computer in which parents were regularly reporting computer use, we could see that the main incentives to use the computer were rarely related to the specific objective of developing vocational skills of relevance to future career prospects. Rather, family members were provided with opportunities to use computers at work or saw computer use at home as a way of improving and easing existing work commitments (as with the teacher who found it easier to produce school worksheets using the computer). They wanted to take up educational opportunities that required computer use or which could be facilitated by using computers (as with the mother who needed to write essays for an Open University course). They had an intrinsic interest in computer technology, sparked off by workplace or social experiences, or they saw computer use as an additional tool for their hobbies, as with the musician father who mixed music on his computer. Computer use for these adults served a range of important purposes that they were able to easily identify as part of their mix of work and leisure activities. Learning to use and utilising the computer was almost never 'an end in itself' or for future workplace opportunities.

In contrast, if we focus on the parents in the Screen Play study who never used a computer in the home, a pattern emerges of these individuals not having an opportunity to identify a 'use' for computers either in their personal or their working lives. These parents tended to work in manual jobs, or not to be employed in the paid workforce, had no experience of computer use outside the home, and had not identified any role for the computer in their domestic or leisure lives, arguing that they enjoyed activities that were incompatible with computers, such as sports. In these cases the parents were happy to observe but not participate in their children's computer use:

"I've never had an interest in them. I enjoy watching Karen. I will sit and watch, but it never interested me." (Mum, factory worker)

Often they argued that learning to use a computer would take time or effort that they simply did not have opportunity to prioritise, given other commitments and responsibilities:

"It [the computer] looks quite simple actually. Looks quite simple. [My husband] is a taxi driver, so he doesn't have the time, and I don't have the time." (Mum, housewife)

"In some ways [I would be interested in learning]. But having said that, I never seem to find the time. As I say, it certainly would be nice to do a bit with this one. But I'm absolutely lost with them, wouldn't know where to start." (Dad, herdsman)

The factor that provides an impetus to move from not having time to use the computer, to making

time and effort to learn, seems to be driven not so much by the dominant message that computer use may be essential in the workplace (especially for parents whose day-to-day experiences contradict this), but when a reason for using the computer and a means for learning how to use the computer are identified in the home:

"I couldn't understand a machine could do all these things and ... and I was really negative, wasn't I, for years I think about computers. And Mike started bringing laptops and PCs and things home from work now and again and playing games with the kids and so on and I got interested in that and I could see the value of that and doing things with the children." (Mum, teacher)

If we look at young people who report being regular users of computers, we can also see this pattern of links between interest and use emerging, as computer use tends to map onto children's already existing interests. Those children interested in art, for example, use the computer for design and image making, or those children interested in writing, use the computer as a writing tool.

Attention to the question of the degree to which digital technologies are perceived to be of relevance to young people's daily lives and interests may also explain different patterns that have emerged in levels of technology use between girls and boys in the 2001 InterActive survey. Within this survey, for example, boys report higher levels of all activities on the computer than girls, with the exceptions of writing, sending emails and educational software use. In contrast, girls report higher levels of mobile phone ownership and use than boys, with particularly high levels of using the phone to talk to or text friends. The acceptance (or otherwise) of digital technologies into young people's daily lives then, may be shaped less by concerns for the future and more by traditional constructions of gendered identity within peer group cultures, in which enjoyment of competitive activity is constructed as an appropriate arena of activity for young men through computer games play, and where young women's social identities are supported through a ready acceptance of computers and mobile phones as communication devices.

As part of the Screen Play study, we also focused on children who reported little or no computer use outside school. When we discussed the reasons for this, in some cases lack of home ownership was a key issue, but in many others there was a consensus that computers did not 'fit into' their daily lives and priorities. Those children who identified themselves as 'outdoors' types, in particular, reported that computer use was particularly irrelevant to them:

Boy   *I don't like computers because I'm sort of not a person who stays in and watches TV that much. And I just think they're boring.*

Q   *You like being outside do you? Is that your favourite?*

Boy   *Yeah, cos I help at a farm... Sometimes they let me drive the tractors but only on the farm because I'm not old enough yet. And I help them get the cows in and I ride in the tractor as well.*
(Boy, 10, rural market town, Somerset)

The culture of 'computer users' in school, the fear of being identified as a 'keener' or 'boffin' (terms still associated with computer use) was also significant in exploring why some children weren't using computers. To be a computer user, amongst particular groups of young people, was seen as not 'having a life':

Q   *So do you ever go on at lunch time onto the computers?*

Boy   *No.*

Q   *No, why not?*

Boy   Go for a fag. [Computers are] all right, but you've got to have a life apart from computers really.
(Boy, 14, rural town secondary)

Girl 1   No one will hang around with us if we go in the library [to use the computers].
Girl 3   You've got to go along with it to keep your friends, haven't you? Because if you didn't have no friends you'd be bored.
(14-year-old girls, ex-mining town secondary)

Unlike the dominant representation of all young people as 'computer mad', it is important to recognise that young people's interests may fall into a range of areas, within which the computer may be neither useful nor compatible. Importantly, certain young people, usually those without a computer in the home and within peer group cultures which do not value computer use, also voiced the opinions expressed by certain of the parents in the study, that computers were for 'other people':

I think it's hard for us... the younger generation now... to get into computers. But like when we have kids it'll be just like really natural, won't it? It'll be natural for them because they've grown up with it, but we haven't grown up with it.
(Boys, 13 and 14, rural market town)

To summarise, then, within this data, the motivation to use digital technologies is generally patterned along the lines of the perceived relevance of technology to individual's lives and existing interests. This pattern of relevance should also be seen to intersect with the question of access, as those without easy access to a computer are unlikely to be able to identify aspects of computer use that meet their present needs. Reciprocally, those already convinced that computer use is a low priority in their day-to-day lives are unlikely to make a decision to purchase a home computer or visit a public site to learn to use a computer.

C   Well, my dad was going to get one but... we were going to have a study but then my mum and my dad had a divorce so he's pretty

skint now... and my mum wouldn't use it and I wouldn't use it and my brother wouldn't use it.
Q   So who do you live with?
C   My mum
Q   Your mum. And does mum use them at work?
C   No not really... she works in Tescos.
(Boy, 14, Ex-mining town)

"Well, some people just don't want to have a computer. They think they can spend their money on better things. My mum probably wouldn't want a computer cos she'd never go on it."
(Girl, 10, city centre primary school)

The question of how individuals learn to perceive computers as having immediate relevance to their social, work or leisure lives, however, brings us to the role played by social networks at work, at school, in the family or in a local community in shaping computer use.

Social networks

As mentioned above, computer use is not only something that takes place but something which is talked about, discussed and puzzled over within different social groups. Within the Screen Play research, these groups, or loose networks, seemed to play an important role in shaping the degree to which individuals learnt to use an unfamiliar technology, or expanded and developed their use and interest in computers. Amongst young people

this seemed particularly important, as peer groups provided a key site for learning more about computers and supporting young people to become 'expert' computer users in their own homes:

Boy (14) *I probably enjoy the most, the computer and stuff like that because, I probably enjoy the computer the most and I enjoy going over Jim's and talking about computers because almost every single time I go over there, he and myself will have something new to say about it and we'll try it out. Yeah. I had a problem once. I knew that one of my programs called Task Bridge had the function to make a hyperlink with my scanner, but I couldn't get it to do this hyperlink. I phoned James up and he told me how to do it and it worked because then you know how to do it. I knew how to do it since then, and that's it.*

Q *Okay. How come you know more about it?*

Boy (12) *Because me and my friend... well really my friend, he's a computer freak.*

Q *He's a computer freak? Okay.*

Boy *And I work with him and he tells me loads about his computer, and basically our computers are the same. So that's how I know quite a lot.*

These individuals within the household were then able, in some cases, to act as important 'educators' for other family members (when parents and siblings would allow) by solving problems and suggesting solutions for computer difficulties. They played a particularly important role in families where parents had little or no computer expertise, by providing technical support that allowed the household computer to function and as a useful sounding board for other family members' early forays into computer use.

When looking at family computer use it becomes clear that access to these and other wider networks of support can, at times, make the difference between a family never using the expensive computer they have purchased, or becoming so confident in computer use that they end up upgrading and owning multiple machines.

On a basic but fundamentally important level, access to wider networks and resources provided an important safety blanket for certain families in terms of being able to maintain a functioning computer. During the 18 months of visiting these homes, for example, we saw monitors break down, software develop glitches, printers refusing to work, scanners that never worked, Internet connections that failed, computers that simply wouldn't 'start'. Those families with access to workplace environments in which technological expertise was widely available, however, were able to make use of this informal information resource to support their own computer:

Mum *I didn't even know it was broken. I brought it down into the study next door to fiddle with it because I didn't at that time know what was wrong with it. But when I set it all up and the screen came up, it's got to be rebooted, so ...*

Q *How are you going to do that then? How are you going to ..?*

Mum *I've phoned one of my friends that teaches in computing at the university. They're going to come and have a look at it for me.*
(Mother, university trade union rep)

"We've always got people from Computer Flight coming down, checking that things are working, connecting it all up and loading different things on. So if ever I've got a problem at home any of these guys that come down, I pick their brains, cos they're so switched on, they know the ins and outs of computers ..."
(Father, RAF Engineer)

In some cases parents' workplace networks were literally materially supportive. Several of the fathers in the study, for example, were seen as the 'providers' of computer supplies. Printer cartridges, paper and so forth, were brought home from the office. A computer in the home was also, on several occasions, first made available by bringing an outdated computer home from work for the family.

Families also drew upon knowledgeable friends or family members:

"Us having trouble changing the cartridge. It took us a long time to work that out. We had to get Kim's fiancé in to help us sort out ... because the computer wasn't accepting the change of the cartridge from colour to black and white. And he's now set it up. I mean we wouldn't know how to ... he's written it down for us in case it happens again. We do have little crib sheets in certain places." (Mum)

"A friend of mine, her husband is like a computer analyst and he knows what he's doing, so I asked him to do us a favour, 'Here's the boxes, can you do it for me?' So he set you up with it, didn't he?" (Mum)

In contrast, other families did not have access to this informal support either through the workplace or through family and neighbourhood connections. When difficulties emerged with the home computer in these households, and where parents and children had insufficient technical expertise themselves, serious difficulties sometimes emerged:

Q   Is your scanner fixed yet?
Sister   No. Whenever we try and fix the scanner it's just got a little icon at the bottom saying 'Scanner not found'. We've got a scanner disk. My brother's tried to do it a couple of times, but it just keeps on coming up 'Scanner not found'.
Brother I tried fixing it but I don't know how to do it. I read the manual like 100 times.
Q   Have you got a helpdesk you can phone up?
Brother Yeah, we phoned it up and they gave us basic instructions like what we first had and I tried them but they didn't work either.

Q   Oh, so what are you going to do?
Brother Really I'm not sure.
Q   Has it ever worked?
Sister   No.
Q   When did you get it?
Sister   We got it in ... March.
Q   That's almost a year now
Sister   Yeah.

By the end of the research, a year later, the scanner was still not fixed and the parents had decided not to use the help desk any more as it was costing them too much money.

In one household an early and unresolved problem with the printer led to the computer being seen as an expensive and fragile machine, which should be used only when really necessary. In this household neither parent was confident with computers, and the children, both girls, belonged to peer groups in which other activities and interests were prioritised. The computer finally became seen as a machine on which a limited number of games could be played but on which no work could be saved and only the mother in the household was allowed on special occasions to print out documents.

"I mean, if I'm not in they will go in on the computer and start writing what I call love letters to the boyfriends and stuff. That does annoy me because the last time they did something with the printer and, well it wouldn't print, whether they overloaded it or not. They saved what they wrote. They wrote this rubbish and they saved it. No, I told them not to

save it, because I tried getting a document off there, deleting a whole document off there, which I'd saved. Well, I think it's still on there, I'm not sure."

Ultimately, the computer was relegated to life under the family's washing basket under the stairs.

The role played by access to wider resource networks was also in evidence in less dramatic ways. For example, parents discussed the content of games with other parents, in order to decide if they should let their children play them, or to suggest software that would be useful for each other. Some households had a stack of CD-ROMs handed down to the family after children in another family had grown out of them. The lack of such networks was noticeable in other families where cost was a significant factor in deciding whether to purchase software. In certain cases the family had no one to turn to for advice on what to buy and consequently did not want to risk spending money on expensive software that might not be useful:

"We did think getting some languages for Susanna for school, but we didn't know which one to get. We did ask your teacher to let us know didn't you, but she didn't, so we didn't end up getting anything."

The role of social networks, whether parental, through friendship and workplace, or children's peer group and school networks, should not be understated in the role that it plays in encouraging or supporting computer use in the home. These networks can not only function as resources in terms of knowledge about computers, but may also function to generate an interest in computers and to share and deepen that interest over time. Moreover, these networks provide material resources to support computer use, from shared software, to low-cost or free second-hand computers from work, to printer cartridges. Family access to different forms of networks are on one level patterned according to parental occupation and local community. In respect of family uses of computers, however, children's networks and the local community may be important in rendering this patterning more complex, as a young person who is linked in with a community of keen

computer users can come to act as the family expert and subsequently initiate or support the computer use of other members of the family.
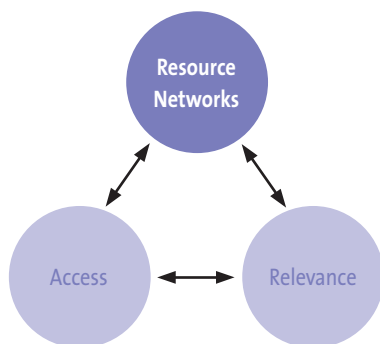
Redefining the digital divide

If we consider these different factors – access, relevance and resource networks – these should be viewed as central components in determining the extent to which families will not only be able to purchase but also to use and engage with computers. This means that the patterns of divides which emerge become more complex than if we focus solely on the issue of ownership.

Centrally, ownership of a home computer remains a key and important factor in contributing to individuals' relationship with digital technologies. It provides, in principle, an access point to computer use; it can act as a catalyst whereby knowledge and expertise are shared within families; it can act as a means whereby individuals can find a purpose and use for computers in their daily lives.

This, however, is a 'best case' scenario. From the data from the three projects, we can see that this is essentially a much more complex process. Ownership does not necessarily equate with use; an individuals' perceptions of the relevance of technology can lead to a lack of interest in learning to use or using the computer; and lack of support and technical resources can leave some machines unusable and others lacking in the software needed to make the most of the hardware.

The intersection between these different factors may mean that particular groups are particularly unlikely to be active and interested computer users. Such groups may be drawn disproportionately from those with financial difficulties in purchasing computers; those who participate in no workplace-based computer use; those who have little social interaction in which computers are seen as a relevant subject of interest; those who have substantial, other priorities and activities in which computer use has no immediate and evident role to play. These different factors will, at different times, privilege men over women, the well off against the poor, the professional against the manual worker. These patterns, however, are not inevitable. It is only when all factors combine that one might begin to predict where there is likely to be little or no computer use.

The digital divide, then, is not 'one' divide, but many, and goes far beyond the rhetoric of 'access' in its defining features. For different groups, therefore, there may need to be different strategic responses. Far from considering that the question of 'access' to computers is the only determinant for all socio-economic and socio-cultural groups, we may begin to suggest that other support strategies are required for those families with no resource networks, helpdesks and informal support. For young people with an interest primarily in outdoor activities, we might want to consider whether schools should focus more on the role of ICT within PE. For low-income households we may want to support the sale and provision of low-cost computers to the home. Above all, we will need to recognise that the decision to purchase and use a computer does not take place in a vacuum. It is shaped by a range of financial, personal and societal considerations, with families and young people having to evaluate whether the technology offers sufficient benefit to them when they might do something else with their time and money. The question of what technology really offers and the challenge of providing technology and services that really meet people's needs remain ongoing concerns.

[1] *Screen Play: an exploratory study of children's techno-popular culture* (ESRC ref: **R000237298**, 1998-2000) Directed by Rosamund Sutherland (University of Bristol), John Furlong (Cardiff University) Ruth Furlong (University of Wales College, Newport). Full summary of research can be found at http://www.bris.ac.uk/Depts/Education/finalsummary.doc

InterActive Education: teaching and learning in the digital age (ESRC 2000-2003) Directed by Rosamund Sutherland and Susan Robertson (University of Bristol). For further information contact **Mary.Oconnell@bris.ac.uk**, or telephone 0117 928 7105

Pathfinder evaluation of the Roll-out of the National Grid for Learning (Becta/DfES,1999-2003) Directed by Rosamund Sutherland and Sally Barnes (University of Bristol). For further information contact **Sally.Barnes@bris.ac.uk**, or telephone 0117 928 7053

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Rethinking Communication Exclusion:
Tackling the Digital Divide

Graham Murdock
Loughborough University

Internet access as a citizenship right

The Internet first emerged in its contemporary form in 1989, when Tim Berners-Lee, who was working at the CERN laboratory in Geneva, developed the World Wide Web. However, it wasn't until half a decade later that easy-to-use web browsers arrived on the mass market, with the launch of Netscape Navigator's free software in 1994 followed a year later by Internet Explorer, which Microsoft bundled in with the latest version of their best selling Word software program. Politically it was a highly resonant moment. Prompted by Vice President Al Gore's genuine enthusiasm for new communication and information technologies, Bill Clinton had made America's rapid transition from industrial to digital capitalism a major plank of his domestic policy. Across the Atlantic, Tony Blair had put this same transition high on the list of planned objectives for his first term in office.

'Digitalisation' was of course a general process with the entire communications system moving unevenly and at varying speeds from the old analogue modes of production, storage, distribution and display, to new forms based on computing's universal code of zeros and ones. But among the emerging array of new digital devices, from compact discs and computer games consoles to mobile telephones, the Internet stood out as having unique properties. It was the only system to operate simultaneously as a distribution system, a communications network, and a space for individual creativity and origination. Users could download pre-produced materials, send e-mails, participate in group discussions, make their own personal web pages, and contribute to developing collective web sites based around community concerns, leisure interests or political campaigns.

This versatility offered attractive new policy options in the key areas of employment, education and citizenship. It could be mobilised to train people in the basic computer skills required by the emerging digital economy. It could provide the basis for more flexible and targeted programmes of curriculum delivery and lifelong learning. And by opening up new channels of information and contact, it might go some way towards repairing relations between voters and politicians and health and welfare services and their clients. In pursuit of these aims, government departments and agencies put more and more material and facilities on the Web, including resources that were not available elsewhere. Voluntary agencies and public institutions such as libraries, museums and galleries, also began to use the Web to make resources and expertise that they could not provide off-line, available on-line. The Tate Gallery's digital collection of Turner's complete works is a good example. Although Turner agreed to leave his work to the nation on the condition that it was put on public display, space constraints and security considerations had made it impossible to build a physical exhibition space that fully met his wishes. The new Internet display meets his stipulation for the first time but because it is only available on the Internet, those without access are unable to view it, even though they have an equal right to access under the terms of his will. This situation is repeated with the BBC's extensive free Internet facilities. These offer an increasingly rich supplement to the Corporation's programming, offering viewers and listeners a chance to talk to programme makers or interviewees and to access a range of supplementary materials. Once again, however, although all set owners have paid the same licence fee, only those with an Internet connection can take advantage of these new services.

If we define the basic entitlement of citizenship as 'the right to participate fully in social life and to help formulate the forms it might take in the future' (Murdock, 1999:8), there is a strong case for

arguing that in a world where more and more information is only accessible on line and more and more activity and interchange takes place on line, access to the Internet has become a basic cultural right of 21st century citizenship. To be permanently disconnected is to be excluded from full participation in contemporary social life.

Recognising this immediately presents a problem, however, since now that 'the Internet has become increasingly central to life, work, and play...it becomes even more important if certain groups and areas are systematically excluded' from a key node in the emerging information and communications networks (Norris, 2001:10). This is not simply a matter of lifestyle, of how people wish to spend their spare time and money. It is an issue of life chances, of missing out on opportunities to develop new understandings, contacts and competencies that can be used in other contexts.

Mapping the 'Great Divide'

The governmental publicity given to the Internet's potential for 'providing job opportunities, strengthening community networks and facilitating educational advancement' (Norris, 2001:10), made the issue of unequal access more than usually sensitive politically and prompted a concerted effort to map the scale of the problem. In the United States, a series of studies, under the generic title, Falling Through the Net, were conducted under the auspices of the Department of Commerce using data from the Current Population Survey. The first survey simply talked of 'have-nots' but the second, published in the summer of 1998, was subtitled 'New data on the Digital Divide'. This highly resonant phrase came to dominate the debate that followed and has now become a universal capsule description of the problem. However, while it has considerable rhetorical power, analytically it conceals more than it reveals.

At the time, though, it seemed an apt description of the huge differences in access that the survey revealed. Income and education emerged as particularly significant factors, with those earning over $75,000 a year being seven times more likely to have Internet access at home than those with an income under $10,000. Those with a college degree or higher were also sixteen times more likely to have home access than those with only an elementary school education (National Telecommunications and Information Administration, 1999). It seemed that for many of the poorest American citizens, the invitation to mobility and choice promoted in Microsoft's advertising slogan 'Where do you want to go today?' was totally at odds with their daily experience. They were stuck, going nowhere. The Report's sponsors were well aware of this. As they noted; 'The "digital divide" is now one of America's leading economic and civil rights issues' (US Department of Commerce, 1999:xiii). Nor was this simply an American problem. Research using British and European data revealed similar patterns of unequal access and once again underlined the importance of income and education as key predictors (see Norris, 2001:chapter 4). It seemed that the 'heart of the problem lay with broader patterns of social stratification that shape not just access to the virtual world' but full participation in social life (Norris, 2001:91-2).

A number of commentators disagreed, however, arguing that the present 'digital divide' in computer ownership (which remains the main entry point to the Internet) was temporary and would lessen over time as access followed the earlier pattern of television set adoption. There are two problems with this argument. Firstly, in Britain at least, the initial set that many poorer families acquired was rented rather than bought, relieving

them of the need to find the full purchase price. There is no rental system for personal computers. Secondly, viewers who simply want to watch the main analogue terrestrial channels only need to buy a basic set which they can be reasonably sure will work reliably for a decade of more. More expensive sets, with wide screens and surround-sound, enhance their normal viewing experience but they do not alter it. For this they need to switch to the interactive capacities offered by some digital services, a decision that the majority of viewers have so far been reluctant to take. In contrast, personal computers are designed to have a working life of around four or five years. After that, and sometimes sooner, users find that their machine will not run the latest software and are obliged to buy a new model.

Further, to gain access to the full range of Internet possibilities, such as receiving and saving images and video and audio material, they have to purchase the more expensive models offering substantial amounts of memory and additional facilities – such as CD re-writers – together with a range of peripherals such as scanners. To get on line they also have to pay recurrently for telecommunications connections. The result, as the Red Queen reminded Alice in Lewis Carroll's Through the Looking Glass, is that in cyberspace 'it takes all the running you can do, to keep in the same place' (see Wilhelm, 2000: chapter 7). Many families find this impossible in a situation where the development of the Internet has coincided with a widening income gap between the poorest and richest segments of the population (see Goodman, 2001).

In addition, affluent users, who have been able to acquire Internet access early, enjoy cumulative rather than one-off advantages since the system has been organised around their needs and demands, making it more difficult for those arriving later to change its basic principles and structures.

Although income differentials have begun to narrow in recent years in Britain, the evidence suggests that the gap between those with and without home access to the Internet remains stubbornly resilient. A Consumer Association Survey in 2001 showed that only one in ten of those not on line expected to become connected in the near future.

Failed interventions

This situation has prompted the Government to launch a range of interventions designed to encourage more people to go on line. They include National lottery money to enable all public libraries to go on line by the end of 2002; increased funds to the National Grid for Learning Standards to help all schools go on line; a phased launch of 1000 ICT learning centres across the UK; and two major initiatives aimed at significantly increasing access for those on low income, the 'Wired Up Communities' programme and the 'Computers with Reach' scheme. Neither of these schemes has been an unqualified success but the problems they have encountered have important lessons to teach.

In March 2000, £10 million was allocated from the Capital Modernisation Fund to develop a series of ten pilot projects for the Wired Up Communities (WUC) Programme, with the aim of enabling people in the most disadvantaged communities to use the Internet to access information on jobs, learning opportunities, and material supplied by government and other agencies. However, interviews with residents in one of the areas covered by the scheme revealed that even when access was available locally, substantial barriers to use remained with many, including lack of time and the absence of affordable childcare. The interim evaluation of the project also found that the planned involvement of private sector partners had been minimal. They were happy to act as suppliers but reluctant to become full partners or project sponsors.

However, as the experience of the Computers within Reach project revealed, even when they do participate, some suppliers are prepared to assume only minimal responsibilities. The scheme was launched in 1999 when Gordon Brown set aside £15 million in his March budget to provide up to 100,000 personal computers to low-income households. Recipients would be identified by local charities and voluntary groups and IT companies would be brought in to buy up old PCs from companies and public sector organisations, refurbish them, and deliver a package comprising an Internet-ready machine, software and printer to participating households. They would be paid £210 for each package, with the recipient contributing £60. The scheme operated most effectively when it was administered by a public sector body and fully funded out of public money, as in Liverpool, where it operated under the 'I Take My Place' initiative with regeneration money covering the £60 cost of the package and ITMP assuming responsibility for distribution and support.

Elsewhere, however, customer experiences were less positive. In some pilot areas people were asked to pay their £60 in advance but had to wait up to six months before their machines were delivered. Suppliers were under no obligation to install the machine and ensure that it was working. Because the initial contracts had failed to specify the terms and conditions under which help lines should be operated, some took the opportunity to charge £1 per minute for help line calls from users whose lack of familiarity with computers made it difficult for them to follow instructions quickly. In February 2002 the scheme was quietly shelved. Despite working well in areas where it was linked to existing public initiatives, a source 'close to the scheme' told journalists that the relevant minister had come to believe that 'it doesn't have enough positives'.

The experience of schemes designed to address the 'digital divide' so far then, points to two basic conclusions. Firstly, the public sector must assume primary responsibility for funding and administering interventions. Private companies will contribute only when it is in their commercial interests to do so, and when they do, the terms of their participation must be carefully defined. Secondly, interventions are more likely to be successful if they are based on a comprehensive understanding of the multiple factors that structure access

and use. Simply delivering a working machine to the door of a low-income household is not enough.

Rethinking access

Unfortunately, the phrase 'digital divide' encourages tunnel vision. Firstly, it suggests that what is important is access to the Internet, and implies that all kinds of access count more or less equally. The relevant question in the widely used 'Eurobarometer' surveys of access within the EU, for example, simply asks 'Do you have access to, or do you use, the Internet or World Wide Web?'. It does not specify where. This is politically useful since bundling all forms of access together produces the highest possible figure for connectivity, but it obscures the very different dynamics of use at work in different locations. Access at work, where e-mails sent and Internet sites visited may be monitored by employers and private use on the firm's time penalised, is clearly more constrained than domestic use. Similarly, using a terminal in a community centre or public library where people may be queuing to log on and looking over your shoulder is far less flexible than accessing the Internet at home. As Pippa Norris points out, 'people living in poorer neighbourhoods may be able to surf the Web from public libraries, schools and community centres, or even cyber cafes, but this is not the same as having automatic access via high-speed connections at home' (Norris, 2001: 92). When we measure 'access' then, we need to distinguish carefully between different modes and to insist that the primary goal of policy should be universal home provision.

In addition, talking about 'the digital divide' in the singular implies that access is a one-off event, and that once a user has been persuaded to log on for the first time they are likely to become a regular user. This ignores the substantial body of research evidence showing that while some people go on to become increasingly confident and adventurous in their patterns of use, others become frustrated and drop out. To understand these outcomes we need to explore user 'careers', looking particularly at the factors that encourage and sustain active and creative Internet use. Research has repeatedly shown that most people use the Internet primarily for sending e-mails, keeping up with the day's news, and obtaining practical information on jobs, health and leisure opportunities. This pattern of use fits well with the Government's somewhat utilitarian conception of the Internet's potential, which has tended to emphasise job seeking, information searching and skills acquisition, but it ignores the Internet's other possibilities, as an arena for debate and creativity. As mentioned earlier, its importance lies not just in its distribution and communication functions but in its capacity to support new forms of personal expression and social organisation. The aim of policy should be not simply to ensure universal home access but to encourage people to use the Net's full capacities.

'Careers' and resources

As we noted earlier, surveys have consistently pointed to the pivotal role of income and education in structuring patterns of access and use. These are both compound indicators, which we use as convenient proxies for a range of resources people have available to them. Once we unpack them we see that these resources operate along three main dimensions: the material, the social and the cultural.

In market societies where access to many facilities and opportunities (including home Internet access) is organised through the price system, the amount of discretionary spending a household can command is clearly a major factor in determining patterns of choice. In low-income households, where spare money is in short supply, the desire to own a home computer is

likely to be crowded out by demands that offer a better or more immediate return on expenditure. But income is not the only relevant material resource. There is also 'free' time and available space. Women, or lone parents, who assume the major responsibility for family care, are less likely to have time to themselves to explore the Internet and when they do they are likely to have to work in a makeshift area, set aside in one of the main living rooms, rather than in a dedicated home 'office'.

Social resources also play a key role. There is little point in being able to send e-mail if no one you know can receive one. Similarly, when your computer crashes or freezes for the first time or you encounter problems and glitches with the software, it helps enormously to have a friend, workmate or neighbour you can call on for practical help and advice and who, when things are going well, can provide new software and suggestions for use. Because those working in unskilled jobs are less likely to use computers in the workplace or to know someone who does, and because disadvantaged neighbourhoods are least likely to have extended networks of users who can offer support and encouragement, the barriers thrown up by lack of material resources are reinforced for low-income households.

The salience of education in shaping access and use highlights the importance of the third set of resources – cultural resources. These are often thought of simply in terms of concrete keyboard and operating skills. These are important, as are more

generic skills, particularly literacy. Despite the Internet's growing use of images and music, many of its most used functions still rely heavily on users being able to read and write fluently. For many minority groups the fact that the majority of available Internet sites use English as their main or only language, presents additional problems. But it is not simply that some members of these groups may not be fully fluent in English. It is also a question of identity.

Being able to recognise yourself as the sort of person who regularly uses the Internet and see yourself as someone major web sites wish to speak to is crucial in shaping people's involvement. By excluding or marginalising some sections of the population – the elderly, ethnic minorities, middle aged women – the publicity surrounding computers and the Internet, particularly the commercial advertising, inadvertently conveys the impression that the technology is 'not for them', an impression that is easily internalised. Similarly, the fact that the majority of web designers are young men has important consequences for the look and style of what is offered and reinforces the technology's dominant associations with youthfulness and contemporary masculinity. The fact that when asked, people who are not connected to the Net tend to say that they are 'not interested' or 'don't need' it, has been taken by some critics as proof that they have no one to blame for their exclusion but themselves. They see the problem stemming from lack of personal motivation rather than structural inequalities in the distribution of key resources. As one American critic of the Falling Through the Net report's claim that Internet exclusion was a denial of citizenship rights argued, 'now that some personal computers cost less than TVs and Internet access is cheaper than cable...every American who wants it is getting a computer and becoming connected to the Net' (Powell, 2001:313).This is a classic instance of blaming the victim and is simply plain wrong.

Prevailing assumptions about who the Internet is 'for' can, however, be effectively countered by web sites designed by and for their users, which speak to people about issues that concern or interest them in a language they immediately feel at home with and which they feel comfortable using in their own contributions. The success of community web sites and sites built around specific issues or shared interests, such as elderly people developing a local

oral and photographic archive, testify to the value of these initiatives not only in overcoming barriers to access but in encouraging users to be active and creative participants, rather than just consumers of other people's material.

Recognising the multi-dimensionality of the resources that underpin access and use should prompt us to think about policy interventions differently and to see social and cultural resources as being as important as material resources. Developing a fully worked out and argued programme for change would take us well beyond the space available here, but by way of conclusion let me just sketch in some indicative suggestions.

Reorienting intervention

The experience of the Computers Within Reach scheme underlines the continuing centrality of public sector initiatives operating according to public service principles. However much governments may wish to share the costs of widening access with private sector partners, it is clear that the bulk of the funds will have to come out of the public purse. This is not simply a matter of making more earmarked grants available to install Internet-enabled computers in low-income households, it requires 'joined-up' thinking that recognises the relevance of initiatives that may have been designed primarily to address other issues. Our discussion of material resources, for example, has underlined the importance of having 'free time' to develop Internet experience at one's own speed rather than squeezing

it into the cracks between other activities. Adequate childcare facilities are an essential support for this, particularly for lone parents.

The importance of social networks in developing and sustaining use suggests a central role for local mentors in low-income neighbourhoods. These would be local people who had been trained at no cost to themselves in return for their agreement to operate a local help line and act as trouble shooters and animators, tasks for which they would be paid. Additionally, our analysis of cultural resources underlines the value of community and interest-based web sites in attracting new users and encouraging them to become active participants.

While these kinds of local initiatives are essential, they are unlikely to work effectively unless national policies also address the key infrastructural processes that are reshaping the overall communications environment within which individual Internet use is embedded. There are two immediate issues here: the roll-out of broadband connections and the possible migration of Internet use from home computers to digital television systems.

Always-on broadband connections transform the experience of using the Internet. They avoid the sudden disconnections that characterise dial-up connection links using a standard telephone line. They massively increase the speeds with which material is accessed and displayed on the screen. And they allow users to comfortably handle the 'fatter' Internet traffic involved in downloading moving images. The price of broadband access has recently fallen to around £27 a month, but this is still well beyond the pockets of poorer households. Nor are there any guarantees that everyone will eventually have access to broadband services. New subscriptions to cable television services using broadband technology are static while the major telecommunications companies are primarily interested in wiring up commercial and residential locations containing high concentrations of potential customers. Consequently, as Manuel Castells notes, if nothing is done 'it could well happen that while the huddled masses finally have access to the phone-line Internet, elites will already have escaped into a higher circle of cyberspace', creating new digital divides (Castells, 2001:256). However, if broadband access

is essential to realising the Internet's full potential, and I would argue that it is, policy makers need to think long and hard about a new principle of universal service for the digital age.

Some observers argue that upgrading domestic telecommunications connections will become progressively less important once digital broadcast services with interactive and Internet capacity become the modal form of domestic television. Although the early optimism surrounding digital broadcasting has been dented by the recent collapse of ITV Digital and by the financial crises besetting Britain's two major cable companies, most commentators agree that analogue services will eventually be switched off and that television homes will 'go digital', although many predict that the process will take longer than the Government's original date of 2010. However, we can already begin to see how digital television's interactive capacity is likely to be organised.

One option is represented by Sky 's satellite services. They are offering shopping opportunities rather than a space for debate, participation and creativity. In 1999 they launched their Open service based around a virtual shopping mall containing the kinds of shops and other services (such as banks) one might find in a real mall. It was not a success. Viewers were reluctant to interrupt their viewing to log on to the retail opportunities on offer. In response, Sky adopted a new strategy, integrating shopping directly into the programmes and allowing access directly from their main

programme menu. This seamless flow of material is carefully constructed. As the division's Managing Director, put it, "We are not competing with the PC. We are competing for a slice of the four hours a day that people sit down in front of the box to be entertained. Interactivity has to an integral part of the viewing experience" (Florsheim, 2001:2). In this vision, interactivity is reduced to shopping opportunities inserted into a stream of entertainment viewing.

In contrast, the BBC's public Internet site offers a rather different vision of the future. Here the Net is used to develop a range of facilities that amplify and continue the momentum established by the programmes through e-mail, on-line discussions, and additional web-based materials and links. This is an enormously valuable resource and its development is central to a revivified conception of public service broadcasting designed for a digital environment. Some observers go further and see it as offering a comprehensive alternative to computer-based access. As a recent report on closing the digital divide put it, since 'television is ubiquitous' in poorer housing estates 'digital television may offer a more likely future route to home access in these neighbourhoods' (DTI, 2000). This is a mistake. Broadcasters, however well intentioned, are primarily interested in promoting their own programmes, polishing their brand image, and strengthening viewer loyalty. They are not in the business of using the Net for other purposes. There are also doubts about whether a 'lean-back' technology like television can effectively substitute for a 'lean-forward' technology like computer access to the Net. People have a need to relax and be entertained and stimulated by professional programming as well as a right to participate with their own voice. At the same time, because the BBC remains one of the country's most trusted institutions, it could play a very valuable role as the public Internet gateway of preference, providing a first port of call for users wanting an authoritative guide to available links and resources on issues that concern and interest them.

In the immediate future then, we must assume that personal computers will remain the major point of entry to full Internet access and design policies accordingly. But in doing this we need to think beyond the simple dichotomies offered by the idea of 'the digital divide' and to see Internet access as a contemporary right that can only be translated into a substantive opportunity by recognising the full range of resources it requires.

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The importance of digital information and tools design in enhancing accessibility

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Some hard questions

I want to begin with an extended prologue which raises a number of fundamental issues which will set some kind of context for a discussion of the design of digital information and tools and, in particular, the use of tools.

A few months ago I was asked to bid for a DfES contract to establish an evidence base for the proposition that adults acquire literacy skills more effectively through the use of ICT than they would through traditional methods. I thought that the proposition was so self evident that it would be a waste of public money to pursue it. Just before the deadline, I was telephoned by an official who asked why I had not submitted a bid. My answer was that it seemed obvious to me that somebody learning to read would clearly be better off using a screen and voice output simultaneously rather than struggling with a book. The response was that the research would only compare the use of a book with screen output. The comparison, in other words, was simply a matter of analysing the ability to comprehend symbolic, written language using the two methods. This was, in my view, a clear case of pretending that voice output did not exist.

Clearly, it is important to comprehend symbolic language where there is no voice output but such occurrences are bound to become ever more rare. I do not regard it as any more demeaning to listen to an audio book than to read a printed book.

At the heart of this small controversy there is a big question: what balance are we to strike between learning a process and producing an output? Do we want

people to learn how to read print for its own sake or are we equally, or more, concerned with people being able to get hold of and understand information?

Important though this debate is for members of the general adult population who need to acquire literacy skills, however defined, these are vital questions when discussing the education of children with special needs. How far are we justified in withholding a technique that improves output on the basis that we wish to emphasise process? It is, after all, difficult enough to function as a special needs child and there is a strong argument that you need all the technological help you can get. There has to be a very powerful argument for withholding technical support. That argument has to rest on some idea of centrality, on the notion that symbolic language is so fundamental that its acquisition must over-ride all other considerations. In a world of cinema, television, DVD and a multimodal, multimedia Internet, popularised through digital television, that assumption surely has to be questioned.

There is another set of factors on the horizon that also have to be taken into account. I can best sum these up by going back into the history of arithmetic. The Roman system of recording numbers made even simple addition quite difficult; you could neither add from the right nor from the left, dealing simply with two symbols that were one above the other; the convention, for example, of writing four as a V with an I to its left made this impossible. Equally impossible was adding from the left using the

abacus technique. The articulation of the concept of zero and the introduction of Arabic numbers changed all that. Addition and subtraction became simple and long multiplication and long division became possible. Still, these were made easier after the development of tables of logarithms. These, in turn, were swept aside by the development of calculating machines.

What is interesting about this string of developments is that the skills needed for achieving an output have been reduced with each. There is, however, in our contemporary world, a new factor in the relationship between human beings, technologies and techniques, and output: the simpler a process, the more amenable it is to automatic machine transaction.

Since the birth of the telephone exchange we have become accustomed to various levels of hybrids involving machinery and human beings, what we might call 'hybrid systems'. As digital information production becomes ever more sophisticated and modular and as computers become more powerful, an increasing number of formerly hybrid processes become totally machine transacted. Here is a familiar example. If you telephone a financial services company for a loan, you may be asked a long series of questions which the operator enters into a computer. They are then sent to an automatic evaluation system which gives a 'yes/no' answer. If you fill in these questions using an Internet pro forma, you can cut out the operator at the end of a telephone. You have moved from a hybrid to a machine-only system.

So the root question this poses is, what is the point teaching people what will only ever be very low-grade literacy and numeracy skills if these will soon no longer provide people with low-grade office jobs?

Your answer may be that such skills are useful in life outside work - and that may be true - but I would argue Government's policy towards the education system is that it is a pre-vocational instrument.

You may hear these machine processing developments referred to as 'The Semantic Web' or 'Resource Description Frameworks'. You might not need to know about them yourself but you surely need to know somebody who does.

On the face of it, this is pretty depressing for many special needs children and for those whose achievements fall below national benchmarks. It is worse than that. I will discuss some major issues in digital information and tools design, pointing out that new products offer new opportunities, before coming to the sad conclusion that the current system, far from mitigating the disadvantage of special needs children, is exacerbating it and that, without some radical re-thinking, new technologies will make that situation much worse.

The topic will be split into the following eight broad headings:

▌ Holistic Systems
▌ Demographics
▌ The Accessible Information Matrix
▌ Multimedia and Multimodal Information
▌ Tools, Meta-data and Data
▌ Manipulation, Customisation and Heuristics
▌ E-learning: Choice, Control and Collaboration
▌ Conclusion.

Holistic Information Systems

Digital information systems can be divided into three basic components:

▌ Hardware and applications which receive, process and send information

- Carriers that move information between senders and receivers
- Information, systems and tools producers.

Since the advent of the personal computer we have thought of the chief barriers to access in terms of finance and hardware. I am not saying that these are not still important but I think it will be granted that the cost of ICT in real terms has fallen and continues to fall at a significant rate.

In the medium term, too, the cost of hardware per individual will drop significantly. At the moment you might have a PC, CD player, DVD, television, radio, land and mobile phone, not to mention the processors in other domestic appliances. Soon we may each have modular hardware for access, processing and transmission, one at home and one that travels with us. At the moment this hardware duplication results in a heavy focus on intelligence inside machines, on what are called client side services, but this de-duplication will free up resources for server side applications. These are better for most applications because they can be centrally updated and allow for a much more powerful nerve centre. This will mean that people with disabilities will be much more like their peers, designing and using customised hardware constructed from modules.

In my own case, I estimate that my consumption of refreshable Braille cell technology will drop from its current 98 cells at £100 each to 40. I will also be able to use these cells to access equipment, such as my stereo, television and cooker which are currently inaccessible.

The second part of a holistic digital information system is the 'carrier', the telephone lines, wireless and satellite systems. The scarcity of bandwidth has caused considerable problems in the past decade. We have known that certain new developments, such as audio captioning, are possible but the technology has not been able to deliver again, and the economics and availability of broadband are still in flux; however, the ultimate destination is not in doubt. Always remember, in the digital age two rules of forecasting have so far always held: first, new developments are hyped and, as a result of that, secondly, the medium-term outcome is always grossly under-estimated.

What is not in doubt, on the basis of these rules, is the growth of digital television, particularly amongst what we used to call 'Social Classes D and E'. This development has been grossly under-estimated by the Government because it is still blinded by prejudice in favour of the PC and against the television on the basis of a neo-Cromwellian prejudice. It may be argued that whilst 'poor' people are buying digital television services at their own expense, the Government is throwing clapped-out PCs at them.

So, although there are still some problems with the first two elements of the whole system, we need to focus on the third element, the manufacture of the information, the way that it is made and that is the subject of the majority of this presentation. However, we firstly need to briefly look at demographics.
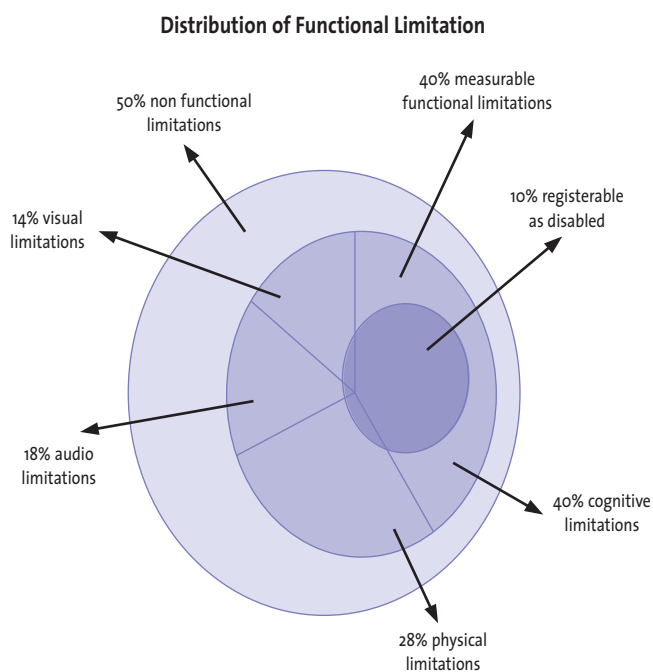
Demographics

To a certain extent, disability is an epidemiological construct but at its base it is an administrative device. There is a line between those classified as disabled and the rest of the population which determines criteria for public and private expenditure on benefits, services, special provisions, privileges and even Christmas dinners. This may be necessary for certain classes of financial decision but it obscures the underlying demographics of functional limitation, not least as they relate to ICT. To understand the complexity of this you only have to imagine two examples: a wheelchair user who can function perfectly with a PC and a person with no measurable functional limitation who freezes when presented with a PC.

The best way to imagine the broad demographics is to think of Four Major Clusters of Functional Limitation:

❙ Cognitive
❙ Physical
❙ Hearing
❙ Visual.

These are shown in descending order of magnitude and they do not relate necessarily to a medical condition. I am not attempting to separate those who have literacy problems because of a cognitive difficulty from those who are alienated from the educational process, or those who simply do not know English. Each of these clusters is represented by a spectrum running from severe to mild. The four clusters can each be represented by a wedge-shaped piece of pie with the mildest cases at the outside and the severest nearest to the centre.

Distribution of Functional Limitation

50% non functional limitations

40% measurable functional limitations

14% visual limitations

10% registerable as disabled

18% audio limitations

40% cognitive limitations

28% physical limitations

So, in the diagram, the population as a whole is represented by a circle: half of it, represented by the outer band, consists of people with no measurable functional limitation; the inner 50% consists of people with some form of measurable functional limitation; within that, there is an inner core of 10% of the whole, or 20% of the inner 50% which consists of people who would be registerable as disabled. The approximate proportions of the inner 50% by cluster are: cognitive 40%, physical 28%, audio 18% and visual 14%.

It is important to say, to avoid being side-tracked into a massive statistical dispute, that these figures are approximate and cannot easily be verified because of problems with transposing health, benefits, and ICT functionality data to form a coherent pattern. However, whatever the statistical quibbles may be, the broad picture to bear in mind is the 50/50 split. Admittedly the inner half is heavily biased towards the elderly. It is also important to be clear about this 'hinterland' of people between disability and full functionality.

To take an example from my previous specialist field: there are approximately 12,000 Braille users in the UK, but the people who cannot read Times New Roman 10-point on a standard PC screen run to millions. Between these two points there is a bewildering variety of functional limitation concerning the size of print, its font, contrast, ability to handle right-hand justification, and performance variants according to background and ambient light.

In the area of cognitive functional limitation the array of competencies and barriers to optimal performance is even more bewildering. Here the problems even stray over into the blank half of the pie chart. There are Nobel Prize winners who do not know left from right and have problems with navigation, particularly in a disorganised, three-dimensional space.

I should also say, from the point of view of digital information and tools design, that these areas of difficulty do not include considerations of usability, i.e. whether the system accords with natural human information processing.

This is raised here because although the classification for benefits and even for Statementing may be justified, any understanding of the use of ICT must abandon the strict line between those who are legally classified as having 'Special Needs' and those who are not. A line drawn for one purpose should not be used uncritically elsewhere. There are all kinds of reasons why children may have short attention spans. However, there is no reason why one child should have a special package, which simplifies process and reinforces attention, while her neighbour has to make do with the standard PC bundle even though she suffers, without an official piece of paper, from the same condition.

Unlike analogue material, digital material is capable of immense variation and manipulation. As will be elaborated later, as long as the initial design is correct, what is good for extreme cases will invariably be helpful to mild cases.

The Accessible Information Matrix

Having established that there are four broad categories of functional limitation, what kinds of capacities are limited or, to put the matter more positively, what must we consider when designing a system? I will briefly consider seven criteria:

❙ Accessibility
❙ Apprehension
❙ Transparency
❙ Navigation
❙ Interaction
❙ Expression
❙ Fitness.

Accessibility

There are, of course, some quite basic physical arrangements which are often overlooked, such as adjustability of the intensity and spread of ambient light, adjustability of the relationship between the hardware and the user and a choice of keyboards, mice and other hardware input devices. You would be surprised how often such simple things are overlooked in accessibility suites. Ask yourself the question, for example, how many PC screens have you seen where you can adjust the tilt as well as the orientation?

These physical factors, however, are only one subsection of a classification we call 'Accessibility', the ability of the user to possess the intellectual content that is being offered. You have to remember in this context that hardware peripherals alone are no guarantee of accessibility. Most require adjustments to configuration systems, new device drivers and proprietary software. What is more, many of the somewhat Heath Robinson set-ups that are needed to drive special access peripherals throw up conflicts so, for example, if you run a refreshable Braille display it is almost certain to disable the tracker-ball device. So accessibility depends crucially upon aspects of operating system and software design.

This, of course, is only the beginning. You will all be familiar with such aspects of information customisation, such as the ability to alter size of print, font, foreground and background colours and contrast. But - and here I am straying back into the process/output controversy - what about the ability to adjust the lexicographic range of a document or to invoke automatic grammar simplification, parsing, thesaurus-like functions, or translation into another language? What about the ability to get rid of part of the file, such as a background picture or foreground text, in order to make better sense of what is being presented? Without such tools, many people will not be able to use their senses to get hold of the information.

What we are faced with here is a fundamental issue about the relationship between the creator of the intellectual property and the consumer, where we have to define the optimal balance between what we might call entropy, as the information passes from the creator to the consumer, and the ability of the user or intermediaries to reduce the entropy through customisation. We are familiar with this in the analogue world where Braille books are often produced without pictures and where sound tracks are subtitled for deaf people.

To what extent should we be allowed to alter the digital files of content creators? My answer, broadly, is that we should insist on the right of customisation and the use of tools as long as the output is in temporary files that self-destruct according to certain agreed criteria. We will return to this, but my key point is that 'accessibility, per se, is only the beginning, not the end, of the story.

Apprehension

Apprehension is rather difficult to define but it is a much simpler idea than 'comprehension', which is not a responsibility of a system. Apprehension is the ability to grasp what you are being told as opposed to what it means. The central problem here is the use of spatial devices for aesthetic purposes, which cloud the author's intention. The classic case is skewing the sequence of information on a screen so that the user doesn't know the order in which elements should be read or dealt with. Usually, this involves breaking our traditional left to right and top to bottom sequences for aesthetic or 'playful' reasons.

Transparency

Related to apprehension, transparency requires that there is a separation between style and content so that the user is clear about what is being said, as opposed to becoming involved in how it is being said or, more precisely, rendered. Failure to observe this simple rule is the most widespread problem in web design. XML should minimise this problem.

There is also the dimension of separating the tangential from the central; this is an occidental concept but most of our users are being brought up in an occidental cultural context.

Navigation

Navigation is probably the most critical aspect to think about, particularly in respect of tools and options. Ironically, there has been an almost complete failure by web designers to use hypertext properly, which is, after all, the basis of the Web itself. The defining quality of hypertext is its ability to multi-classify any node. Look at the average PC and you still see menu trees, the very device which hypertext was developed to overcome.

I would say that at the very least, a good knowledge management system (KMS) should have the following navigation choices as appropriate to the subject:

- Alphanumeric/chronological
- Key word search/voice in (with micro vocabulary)
- Spatial/image mapping
- Variable numerical taxonomy (2/4 for switches, 9 for numeric keypads) - maximum display (for pointing).

Interaction

The term 'interaction' is usually used in the narrow television sense of choosing a game or a camera angle, but by it I mean the ability of the user to do what she is being asked by an interrogator. This means, for example, knowing how to fill out your tax form because the relevant note appears above the box you are trying to complete. One of the main techniques for bringing this about is that the system should be interrogative instead of being a simple digitisation of an analogue process.

I should also make a simple point here about voice input systems. It is commonly thought that these are particularly beneficial to people with poor writing skills. There are cases where this is true but, in general, because voice in systems are rigidly rule based, they are by no means a panacea. The key concept here is the definition of micro vocabularies for specific topics.

Expression

Most digital systems are simply sales or information systems designed to send material from big organisations to individuals. They are, in the jargon, one to all messaging systems. The chief delight of the new technology, however, is that it allows all to all-messaging systems. But this is only possible if the information system allows the user to express a view and add to the sum total of the system. This is partly a moral requirement but it dictates a technical requirement.

Fitness

Finally, there is the fitness for purpose criterion, which applies to the whole information system. Is this the best configuration to do the job for the customer or child?

This is a long agenda but most of it is implicit in a multimodal, multimedia environment.

Multimedia and Multimodal Information

In general terms, the assumption that multimedia information is highly beneficial can only be right but, as we have observed in the previous section, it can cause difficulties for apprehension and transparency. What some users will find helpful, others will find distracting. Some people will find that two media will be mutually reinforcing while others will find them mutually distracting.

When building multimedia information the simple rule is that each medium, no matter what its reinforcing characteristics for another medium, must be as individually comprehensive and coherent as possible. So, for example, the visual track does not depend on audio, nor the audio track on the visual. In other words, the information is built so that it is multimodal as well as multimedia with each mode as independent as it can be.

This is not a simple matter of invoking some basic, bare bones principle of interchange ability. If you cannot access a given mode, such as graphics, you do not just want to know the title of what you are missing but also some estimate of its significance. This involves either an extra effort on the part of the content creator or the facility of an intermediary.

Let us take an image of a soldier who is pictured against a line drawing of a public building with a slogan at the top saying 'END THE WAR!'. Now without further detail the significance of this picture to the blind person or someone not schooled in visual imagery cannot be understood. It might be a recruitment poster with a fresh-faced young lad in contemporary military garb standing outside the national assembly, with a slogan in straightforward bold type; and the implication of the slogan might be, as it was in the First World War, that the level of recruitment will determine the length of the war. Or it might be an ironic poster with a clearly camp soldier dressed in antique military uniform standing against the line drawing of a war memorial with the slogan in gothic letters associated with funeral invitations.

I ought to make one aside here. That is, that although we are eager enough to label pictures, we are very poor at explaining their significance and we also do not understand well enough the huge variation in the ability to see and understand pictures. As the Internet becomes ever more graphics based this will become an increasingly significant challenge. On the other hand, many of us still struggle to do everything ourselves rather than using the vast resources of the Web. If I want a description of the Mona Lisa and associated links, I go to the Louvre Catalogue.

There are some fairly simple tests that any designer can do in order to establish the degree of multimodality of a multimedia site; turn the sound off, turn the pictures off, turn the graphics off, turn the text off.

There is a basic philosophical issue here which we need to confront. No matter how good your multimodal site is, it will not be equally good in all modes. You can't translate between media without considerable entropy; it's not easy to dance about architecture or write music about wine; nor is it easy to explain the significance of the smile of the Mona Lisa to a congenitally blind child. Here we need to be honest about limitations but that is quite different from not designing to the best of our ability, having borne in mind different sets of user requirements for different modes.

As with so many other aspects of this topic, retrospective adaptation by intermediaries is far more expensive and inaccurate than placing a requirement on the author, as part of the brief, to produce multimodal material. Of course, this can't apply to a Damian Hurst, Jonathan Franzen or Thomas Ades but it can and must apply to authors of public sector material, particularly for the National curriculum.

Tools, Meta-data and Data

The Internet brings into focus the symbiosis between data, meta-data and tools. In the analogue world these were very separate. You might, for example, take a book and use a dictionary to simplify a passage from it. You might then write out the simplified passage and draw an illustration pointing out key features. You might consult some bibliographies to create cross-references, including, perhaps, some references to cultural artefacts other than printed books. At no point in this process, however, other than making pencil marks in the original text, would you in any way interfere with the product sold to you by the author. Even then you would not be altering the author's product in such a way that the alteration would not be immediately recognised.

I talked earlier about temporary files as a way of preserving the author's intellectual property rights. However, the subject of the relationship between the author and the consumer is far more complex than establishing rules for copyright and

intermediary manipulation. Information designers should stop thinking of what they do as creating digital artefacts that work like books or celluloid films or pieces of music. The design of information should take place in the full and certain knowledge that there are tools that can assist users in benefiting from it and the information should be amenable to those tools.

The navigation issue also raises the acute problem of meta-data. It is not enough for us to take huge quantities of information from a variety of sources and simply hope that users will find what they need. Authors and systems managers have a responsibility for meta-data. In academic papers this is now a standard obligation met through the author's identification of key words but in most fields creators are lazy. Take, as a simple example, the total lack of a science of subject line creation in e-mails. I make a simple rule now; if I don't understand the subject line I automatically delete the message without reading it. Again, there are lexicographic issues here. Because we are working in a digital environment, not only can the same node be classified in a variety of ways, it can also be described in a variety of ways which will lead users to it.

The key points here are that:

▌ Information design is not a purely aesthetic pursuit
▌ Taxonomy is highly significant; but that
▌ Adopting the Dewey System is an inadequate response
▌ Data and meta-data should be amenable to tools
▌ Tools should be integral to information systems rather than being clumsily invoked in parallel applications.

All of which leads neatly to the fundamentals of digital information and tools design.

Manipulation, Customisation and Heuristics

And now I come right to the heart of my theme. There are three central requirements which all information - meta-data as well as data - must meet

if it is to be optimally amenable by the population in general and special needs children and adults in particular. It must be (and please forgive this rather ugly shorthand):

▌ Optimally Manipulable
▌ Intuitively Customisable
▌ Heuristically Amenable.

Optimally Manipulable

The fundamental criteria for manipulation are that digital information should be as granular as it possibly can be and each element should be labelled as precisely as possible.

These attributes relate closely to the use of the Semantic Web and to Scalable Vector Graphics but let me give you a simple illustration.

Let us return to the picture of our soldier. The image is made up of a figure of a soldier, a line drawing of a building and a slogan. Let us say that there is also a piece of explanatory text at the bottom to the effect that this is a pacifist picture which explains the dress of the soldier, the choice of building and the choice of the Gothic font. We now have four discrete elements to which must be added the background on top of which all these elements have been placed; let us call this dove grey. So, we have:

▌ Dove grey uniform background
▌ Fine line drawing in navy blue of war memorial
▌ Multi-coloured figure of soldier

- Slogan in 16-point red Gothic script
- Caption in 10-point times New Roman.

A user could manipulate the five layers of the picture totally separately; they could, for example:

- change the dove grey background to white or another colour or intensity of colour
- embolden the line drawing without altering the slogan or caption
- 'lift' the soldier into another window and magnify features of his uniform, such as the brass buttons
- change the font of the slogan from Gothic to a simple upper case sans serif
- alter the size of the caption without adjusting the size of the slogan.

The central point here, is that you cannot do any of this unless the whole collage, which was probably built up from separate elements anyway, is presented as a series of precisely labelled layers or strata. Some of this manipulation is beneficial, particularly to people with a visual impairment. But much of it is of great benefit to people with cognitive problems. It has the added beneficial side effect of allowing the originator to update one element of the collage without having to make a totally new product.

Intuitively Customisable

Almost all children with special needs require some form of customisation for their information system, that is, in a sense, what defines their condition. They cannot use a standard system optimally. But you cannot customise a system that has not been designed to be manipulable. Even then, however, there are some important criteria. Put briefly, any system must allow the user to:

- identify features and optimally customise
- store characteristics/profile
- invoke characteristics/profile from anywhere in the system
- restore the system to default from anywhere in the system.

The first of these four, the initial customisation, is the most important. Even with subjects who know exactly what colours, fonts, size, combination of media they want, the process of customisation is tedious. Systems have certainly improved, particularly since the advent of NT, but the process is still very complex. Again, reverting to my own field, visually impaired children have a wide variety of needs and devices so you cannot make any uniform provision based on a rough and ready assessment. A child that uses a screen reader will want text set to the left; a child using screen magnification may want the text spread evenly across the page; a child with retinal damage may want all the text bunched tightly in the middle of the screen, whereas this would be troublesome for a child with retinitis pigmentosa. You can't make any rule on the basis of visual acuity, not least because all our eye tests are designed for the agricultural and industrial age, not for a life spent largely inside.

Obviously, once you have got through this process you want to be able to store the characteristics and invoke them immediately from anywhere in the system and also put the system back to its default. This is vitally important where different children are using the same machine.

Heuristically Amenable

The extent to which any system should be heuristically amenable reverts to my key questions about process and output. There are, of course, some aspects of heuristics that are not controversial. If a

system can learn to adjust to the behaviour of individual clients then it will take care of a good deal of the customisation we have just discussed. A system will also help to sort out priorities and make searching more fitted to the needs of the client. Based on past behaviour it will steadily shift priorities.

Do we want this? Or do we really think that the whole essence of education is that if it's not hurting, it's not working? Having asked the questions, I want to put the whole issue of heuristics onto one side while I look at some e-learning issues. However, I will come back to it in my conclusion.

E-learning: Choice, Control and Collaboration

There are key advantages, to users in general and disabled people in particular, of the move from analogue to digital learning tools and environments.

Of course, whatever these tools and environments may be, we need to remember that any learning system is a hybrid between artefacts and human beings as facilitators. So I am not advocating that children with special needs should operate in a totally virtual e-learning environment any more than I would advocate a traditional environment without teachers and mentors. But there are three key areas of advantage in e-learning which ought to be noted. These are:

▌ Choice
▌ Control
▌ Collaboration.

Choice

Making analogue learning materials amenable to individual needs is costly: transcribing books into Braille; making different kinds of print; altering colours and contrast; simplifying images; removing background sound from audio drama; isolating individual elements; multi-tasking between different products. All of these are made much simpler in a digital environment but this

is only possible if the whole information system from creator to consumer, via the system, the tools and the organisation, make it possible.

These requirements highlight one of the most important aspects of granularity, and that is the separation of tools from content. To give a simple example, if a file contains a piece of text and the page making is integral to the file, it is more difficult to enlarge the text without producing corrupt pages at the page-making process. If the text and associated images can be manipulated and then the page-making tools applied, adjustments are much easier. If we can establish what I call the 'flat file' and define a set of manipulation tools, it is much easier to alter formats and outputs.

Control

All the above devices help individuals to control the environment in which they learn. This does not simply apply to the micro-environment of the learning system, but it applies to the wider environment of where people learn. If information systems are designed properly it will facilitate much more remote or distance learning which may be particularly useful for students who find mobility difficult. Teleconferencing and advances in surveillance systems provide a great deal of flexibility if used sensitively. However, one area, which needs much sharper definition and design, is that of procedural tools: 'Click here' and 'Are you sure?' are somewhat primitive.

The additional area of choice, which these systems offer, is the ability to work outside conventional school hours but, again, this requires high-quality procedural tools. One emerging phenomenon in the e-learning environment is the apparent failure of users to notice that on-line assistance from a tutor cannot be available on a 24/7 basis even though the basic materials are always available. Tutors cannot be available on that basis, but the better the procedural tools, the less need there will be for assistance on routine matters. There ought, also, to be much better heuristic tools so that a system recognises when a user is confronted with difficulties he cannot solve and where he is referred to a tutor or, if it's three in the morning, advised that he would be better off taking a break because he is getting nowhere.

Collaboration

Last but by no means least, there is the issue of collaboration. It is my contention that the development of a National Curriculum, largely based on solo achievement, has disproportionately disadvantaged children with special needs whose life chances are best enhanced through collaboration. It is unfair to place such a high value on solo achievement in the testing process when that simply disadvantages people in seeking opportunities in largely collaborative environments. I recognise that this is a profoundly political issue but with the new digital learning environment, we are confronted with the following question: Are we going to take advantage of collaborative potential in digital learning systems or are we going to pretend they do not exist, as some have done with pocket calculators?

On-line collaborative learning requires highly sophisticated procedural tools and the design of these is only at a primitive stage. But if there is a case to be made for allowing children to behave at school as they are likely to behave at work, then that case is even stronger for children with special needs who start with severe disadvantages and finish school facing a competitive and largely hostile world.

We have come full circle. Employers are much more interested in the ability to output rather than the process people use to get there. If I am puzzled by

a problem I usually resort to my e-mail list, just as others frequently send me enquiries. That is what collaborative learning and output is all about. We are looking at a real, as opposed to a metaphorical, network.

Conclusion

Periods of rapid change, economic, social or technological, always widen the gap between the best and worst off. Even if the worst off benefit absolutely, they suffer widening comparative disadvantage, and that is the situation we currently face with the Information Society. I do not think it is difficult to argue that in the learning environment children with special needs can readily be classified as sufferers from that comparative disadvantage. As the skills ratchet continues to operate, as machine processing advances, as learning opportunities proliferate, as new techniques are developed, it is not difficult to understand why children with special needs are in danger of being left behind. You only have to look at the pathetic state of the digital games market for children with special needs to understand the depth of the problem. While the major manufacturers turn out vast numbers of products for Play Station and Game Boy, a small voluntary organisation or a mad professor makes a little game for a special needs child. I am not asking for a dedicated niche market industry of special needs games suppliers but I am asking for a better understanding of the importance of digital information design as a way of broadening and deepening access to the

Information Society at school and at home. We can crack the hardware problems, we can even, with some persistence, extract funding from the public purse, but the central task now is to understand information systems as holistic entities and concentrate on basic digital information design. If we do this, we will have to answer some important philosophical questions, but without a great advance in design, those questions will only be theoretically interesting.

Who are the Marginalised?

Sally McKeown

Special Needs and Inclusion Officer, Becta

Much of the most useful material on inclusion is anecdotal. For example, a report in the *Evening Standard* recently identified that in London schools children now speak an overall total of 307 different languages and that in one home in four, the home language is not English. I highlight this at the beginning of this paper as I think the images of disability that are put forward through the media often represent a very white, middle-class image of disability and have little in common with social exclusion issues. This wider concept of social exclusion is something we focus on to a large extent in many of Becta's projects. But who are the excluded groups we need to focus upon?

Inclusion who?

There are at least six categories that can be identified.

Disabled people – There are those with physical or mental disabilities who, for a variety of reasons, would have difficulty in using standard ICT applications, at least without the aid of a range of access technologies or considerable individualised support.

Learning disabled people – This group may be seen as distinct, as one of the central differences here is poverty. Many learning disabled people, for example, are concentrated in inner-city council housing. Their particular learning disabilities may be genetic and passed down through generations. They are often the ones that have a social worker but are trapped in a poverty cycle. This cycle of poverty is something that is often overlooked. We need to keep such groups in our consciousness when thinking about inclusion and not just proceed with a narrow conception of disability.

Elderly people – We were recently involved with some projects in Wolverhampton with Help the Aged. We were able to work with these specific elderly groups and ascertain what they wanted from the technology and how it might affect their lives. Many were West Indian and they wanted to use e-mail to keep in touch with friends and relatives back home.

Marginalised groups – We are currently involved in numerous projects with prisoners, refugees and asylum seekers. One project at Haslar Holding Centre in Gosport is looking at the use of IT to help with English and also to help with providing access to information. One of the big issues surrounding work in any kind of prison in this country is that they can't use the Internet. When you talk about prisoners and use of the Internet, everyone seems to think that every prisoner is going to start finding out how to make bombs. We've had a lot of work in prisons over a number of years and we keep coming up against similar perceptions. Obviously there are security issues, but the digital divide is a major concern, especially when you think of how much others in society use the Internet. People in prisons can do Open University courses, they can extend their intellectual horizons – as long as they don't use the Internet to do so.

In many prisons there is often one supplier who has responsibility for providing Managed Services who won't let staff load other pieces of software. We have been fighting quite a few issues on that front.

Religious groups – Work with this group has raised some interesting questions surrounding equal opportunities. Plymouth Brethren parents won't let their children use computers. Some teachers are frustrated and angered by this but when we are talking about inclusion and we are talking about equal opportunities, we have to take all the sectors of society into account, including the views of those who are not in complete accord with our own.

Unemployed people – There is the notion that gaining computer skills will get you a job, yet we know that there are an awful lot of unemployed computer programmers, and an awful lot of computer 'experts'. We have to consider more critically the link between computer skills and employment opportunities. For many people, whilst they may use computer technologies as part of their job, they may not need specific computer training. If you work in a garage you will use a computer every time you deal with a customer. You don't necessarily need a qualification in databases and spreadsheets.

Are schools inclusive?

Currently, following new legislation, disability issues are moving more to the forefront of people's attention. However, it is still clear that we don't manage disabilities well in the classroom, let alone in society more generally. There is still a tendency to put people who are different in a kind of ghetto. On a recent school visit, I met two Kurdish refugees aged 13 and 15. These children had been in the school for 18 months and, in theory, were included, particularly as there was a peripatetic ESOL teacher going into the school. But in practice, they had learnt virtually no English. Part of the problem was that they had had no education in their home country. They were using a program called Wellington Square, a reading scheme for native speakers. Not only was the program not the most obvious choice for ESOL learners, nobody had thought to put sound cards in these computers, so they had computers reading them stories which they could not hear. They had also been excluded from such things as drama, ironically, because their English wasn't thought to be good enough, which begs the question, what do they think drama is? Those children were completely excluded, and yet in theory, they had been included in a mainstream school.

Related issues

There are a whole range of issues around the technology and I'm just going to touch on those briefly. One crucial aspect is training, how to use the whole package, and who that training is intended for. Quite often a disabled child knows how to use the software they have been given but they may have a

succession of learning assistants, and as one child said to me, "I seem to spend my time training other people how to help me". There are also issues about the parents and about involving and training them.

Without adequate training you can be left with a child with communication difficulties, for example, who has ownership of quite expensive, complex equipment, but is not able to use the technology. We don't at present provide computer training to learning support assistants in schools and that is another big barrier for children with disabilities.

Complementary home provision is getting better but we still need more continuity. It is not so long ago that we had that really 'interesting' time when schools were using Archimedes and people had PCs at home and never the twain would meet. Children were taking stuff backwards and forwards and this caused all sorts of issues with file formats. Now the world is much more PC and it should be easier to start work at school and finish it at home, or in the local library or at an after-school club.

There are also a lot of issues with laptops. Some people think that if you give disabled children their own personal laptop then you've solved the problem. However, if you're in a wheelchair, a laptop is something that is very heavy and sits on your legs. The batteries often run out at the wrong moment and schools don't necessarily have good set-ups for battery re-charging. This means there is a real risk of losing material you have already produced.

We also need to have a co-ordinated approach through different agencies. This is a much bigger and more diverse issue than the technology. For example, one of the big issues for disabled people is transport. What is the point of knowing that you can get access in a local community centre or college, if you can't get there? If someone decides that you are no longer eligible for taxis, or there isn't a bus service or it only operates twice a week, getting to the place where the technology is becomes a huge issue.

We need to do a lot more work with producers. Some years ago when CD-ROMs were just emerging, we did a nice project, working with a number of companies who were looking to produce CD-ROMs, including museums and a whole range of different organisations. We concentrated on putting in the accessibility aspects at the beginning rather than producing a product and then trying to make it accessible to a wider audience. From the outset, for example, it was considered what might be needed to make it work with switches and so on, in order that it would work with the voice. There needs to be much more work on such projects.

It is easy to think that if we provide access and access technologies to those with disabilities, that we are then addressing the inclusion agenda. However, we also need to think what we mean by inclusion. Technology can, in fact, be isolating and therefore not always inclusive.

Conclusion

I return to the opening question, 'Who are the marginalised groups in society?'. It seems to me that as we move people with disabilities, with mental health problems, refugees and the elderly out of specialist provision, out of homes, hostels and 'secure accommodation' of all kinds, we think we are achieving integration and inclusion. If they are physically in the community, they must be part of that community; we have integrated them. This is a fallacy. Give a blind child a computer and you may open a world of virtual friends to her but she will still be isolated and lonely. The community cries out against homes for the mentally ill, against refugee housing or small units for young people in care. Everyone likes the idea of such projects but doesn't want them in their street or neighbourhood. All groups which are not white, middle aged, middle class and comfortably off are likely to be subject to prejudice.

The barriers have been erected by people and technology will not pull them down. What technology can do is give individuals knowledge, give them access to information, to ideas and to expertise. What we may find is that if the digital divide narrows, we breed a nation of real firebrands – people who are not prepared to make do with second best. Are we ready to cope with that?

Developing a Digital Divide 'Headline' Metric and Resource: Initial Conceptual Ideas

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To some degree, the digital divide is likely to have an impact on most aspects of social life as society's formal and informal participatory mechanisms become increasingly electronically based. Failure to tackle the divide may lead to a structuring or institutionalisation of inequalities, affecting social mobility, educational and occupational opportunities and the whole notion of citizenship and democracy.

However, the term digital divide tends to be employed as a generic term without any substantive meaning. This can mask the complex nature of inequalities, their extent, characteristics and dimensions. There are, in fact, multiple divides that have been shown to occur along a number of dimensions. No agreed criteria or way of measuring these divides exists, at least in the public domain. As a result there is no simple way of determining what constitutes a digital divide, nor any way of evaluating if is being addressed.

The need for a resource

There is a distinct need for a UK resource that enables debate around such issues and provides advice and information that can help practically. Moreover, there is a need for a dynamic and interactive forum whereby individuals and groups from a range of organisations can contribute to the debate and offer varying perspectives on solutions. There is a need for a more co-ordinated, collaborative and concerted mechanism for drawing together information that can inform practitioners and policy makers. This paper puts forward some initial conceptual ideas that we hope will stimulate feedback and interest.

We propose establishing a 'headline Digital Divide Metric' to be published monthly by several agencies, each including their interpretation of the values. Information and resources would be published and co-ordinated on the web sites of those organisations involved in conception and development, with clear and accessible links to one another. For example, within Becta, there could be links between the various areas relating to the Community and Programmes Team (CALL area) and the Evidence and Practice Directorate. The Evidence and Practice Directorate could also link to its own Research web site and through the ICT Research Network it currently hosts. Other organisations involved would also need significant and specialised areas of expertise and interest that they could draw upon effectively.

Aims

Whilst the ideas surrounding a headline and resource are in a theoretical and developmental stage and therefore open to negotiation and discussion, the overall aims could include the following:

▌ The development of a usable 'headline' metric to identify and indicate what the most important digital divide issues are, what needs to be addressed most urgently, and how this might be done

▌ A mechanism for discussing all digital divide related issues through the development of an on-line forum and community

▌ The making of information widely, publicly available and an invitation to public discussion using an Open Source/Open Documentation model

▌ Practical examples of mechanisms and practice to overcome the digital divide

▌ Links to resources

▌ Information and research on a diverse range of issues and from various methodological and theoretical perspectives

▌ An on-line support network

▌ Databases and information about organisations, agencies, commercial companies and voluntary groups who lend their support to overcoming the digital divides

- Information on initiatives being undertaken in the UK as a whole, as well as the GO regions, Wales, England and Northern Ireland
- Publishing the information on the web sites of the contributing organisations on a simultaneous basis
- Informing and influencing policy and practice through a number of mechanisms, including short briefings resulting from information gathered
- Working across organisation (for example, Becta, NIACE, HumanITy, Citizens Online), as well as linking with the Digital Divide Network in the US. (There will need to be alignment with Government Policy initiatives, particularly PAT 15 and the relevant DfES Departments).

Discussion and debate over the definition, dimensions and characteristics of digital divides will be a significant focus of the proposed future resource. However, the aim will be to take the issues arising from such debates and support these with links to research and information, and most importantly, practical examples and links to resources to assist the reduction of digital inequalities.

Issues to be addressed

Listed below are just some of the more pertinent areas that could be a focus for discussion and action.

Multiple Divides in relation to a range of measurable indicators:

- Ownership of new technologies – including which are considered to be the most important
- Access to those technologies (which is distinct from ownership)
- Problematising issues of access and ownership
- Type of technologies, their age, capacity and functionality
- The availability of technological and human support and resources
- Reasons for use, relevance and aspirations
- Levels of experience
- Content
- Literacies, including ICT literacies.

Dimensions of the Divide(s)

- Socio-economic status
- Employment status
- Household types
- Gender
- Geographical location
- Ethnicity
- Cultural perceptions
- Disability
- Age
- Specific populations such as the prisoner population, refugees, asylum seekers, the homeless, and those in hospitals and in care.

Contributory factors

The following factors have been identified as contributing to the digital divide(s)

- Cost
- Lack of relevance, interest and aspirations
- Lack of access and support
- Lack of literacies
- Lack of joined up approaches
- Unsustainable initiatives
- Shortcomings of the markets.

Interconnection with wider disparities

We need to raise questions as to whether we should be considering discussions in terms of a knowledge democracy rather than a knowledge economy because of the participatory and social

aspects into which ICT is becoming more widespread, and also because content should be 'chosen' and not prescribed.

The complex web of interconnected social, economic and cultural factors and inequalities, which interact and overlap with access and use of ICT, cannot be fully captured by singular definitions.

The 'digital divide', must also be considered alongside the following:

▌ **Community:** does the technology enable the development and spread of effective and strong communities on and off line? Are there disparities in the relevance, desires and needs for different communities to use ICT? A focus upon community building should also be present.

▌ **Literacy:** certain levels of both language and computer literacy may be needed to benefit from a range of new technologies and the content they offer. The sites should focus upon combatting illiteracy in its many forms.

▌ **Pedagogy:** from an educational and occupational perspective, ICT may be of little use without effective training, curriculum and teaching. With much informal learning with ICT being undertaken in the home, the human and educational resources, or capitals, that individuals can draw upon in their home and cultural backgrounds become significant in discussions about digital divides.

▌ **Content:** does computer-based content that has equal relevance and value for all groups in society exist or does content tend to reflect wider inequalities and power differentials? Is there sufficient and relevant content developed to attract under-served groups to community-based initiatives? What are the best ways of creating culturally and socially relevant materials? The sites could consider how to create content for under-served populations and communities and discuss the Internet and cultural diversity.

Proposed areas to be covered by the various web sites

It is proposed that the web sites of those organisations involved in the development of a 'Headline 'Metric' might include the following:

▌ **A resource area** – identifying free and low cost materials, software, advice, hardware, technical support etc. and eventually including case studies of practice

▌ **Databases of involved organisations and individuals** – data gathered to foster public/private and commercial/non-profit partnerships

▌ **Advice and support** – a special area for links to advice and support for designing web pages, starting initiatives with consideration for a range of inclusion and special needs issues

▌ **Initiatives** – examples of initiatives in the UK (and elsewhere) from small, independent initiatives to government ones, that aim to reduce the various dimensions of the digital divides; this would also include best practice from local, national and international digital divide efforts, public policy matters and issues of funding

▌ **Issues for inclusion/designing data collection tools** – an area where tools are developed that help collect data on communities and assist in the planning of community initiatives tailored to end-users' specific needs this could include tools for profiling local communities and examining inclusive measures through consultation and focus groups etc.

▌ **Technical/community implementation issues** – dealing with environment, technology, training and support issues and examining diversity of access; the Internet is not replacing other forms of access to information but must co-exist alongside a range of other delivery mechanisms

- Education and training – listing and linking to Governmental and non-governmental training and other on-line and community provision of training and education
- Digital divide news and events – including new tools for measuring the divide, new research and a facility to contribute
- Frequently asked questions – examples include areas covered by the Benton listserv, The Digital Divide Network (http://www.digitaldividenetwork.org/)

Conclusion

As noted, the above proposals represent a collection of ideas based on our existing knowledge of research, practice and gaps in provision in the UK, rather than exhaustive or concrete plans. One aim of this paper is to stimulate comment from others and include issues and ideas we may have overlooked. We also want to establish whether others feel that such a development would be a useful resource and whether they would be interested in taking part. There are obviously a number of funding, logistical, practical and political implications to consider before such a proposal could become a reality, yet we feel such a resource could act as a conduit to help tackle the digital divide.

Please send any comments or observations to:
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Tim Rudd (e-mail Timothy_Rudd@becta.org.uk) or
by post at:
Becta, Millburn Hill Road, Science Park, Coventry CV4 7JJ

Feedback from Delegates

Digital Divide Issues

Below is an analysis of data on specific digital divide issues and needs, collected from delegates at the seminar.

Next steps

Specific future events and activities that attendees would like to see happening can be grouped under four headings and included:

▌ A need to develop electronic mechanisms and resources
  ▌ Case study and research material collected together on one web site
  ▌ Collection and publication of links to relevant research
  ▌ A specific digital divide web site
  ▌ A Government interface
  ▌ Development of an on-line community to discuss digital divide issues and network events

▌ A need to conduct, collate and collect case study materials
  ▌ A small working group to visit examples of good practice and write up findings
  ▌ Providers, facilitators and community groups talking about their projects and case studies
  ▌ An international conference with elective and break-out elements

▌ The need for the development of cross-organisational 'working parties' or advisory groups
  ▌ To get advocates, different organisations and perspectives together to work towards solutions
  ▌ A forum where academics, industry, Government and NGOs meet to formulate public policy
  ▌ Development of a digital divide lobby group

▌ The need for a 'measure' for the digital divide
  ▌ Develop measures to assess how and whether the divide is being bridged.

What would help reduce the digital divide?

A number of recommendations were made, which attendees thought would make a significant impact in reducing the digital divide. These were:

▌ Setting up Computer Advice Bureaux that could offer independent advice for potential and existing users
▌ Making second-hand computers more freely available (although security issues need to be considered)
▌ A change in liability legislation on second-hand computers
▌ Making an e-learning foundation the same as other charities; all ICT other than that purchased by business should be VAT exempt
▌ Promoting digital TV and subsidising peripherals and interactive functions for DTV
▌ An end to software licensing or putting software under the licensing of software act
▌ Setting information design standards
▌ Developing a closer relationship between 'makers', 'designers', 'doers', 'funders' and 'strategy/policy makers' – more joined-up thinking
▌ Rationalising the funding of learners for non-accredited and accredited courses
▌ Changing cultural perceptions of the Internet from 'bowling alone' into collaborative and shared activities – empowerment and training

of community champions already involved in local development

- Motivating non-users by showing them what resources are available
- Concentrating strategies on learners rather than delivery mechanisms
- Fewer initiatives and more targeting
- An infrastructure and tools to make ICT accessible, usable and relevant for community development.

What are the biggest barriers to 'digital equity'?

Delegates considered the following to be the biggest barriers to digital equity:

- Cost – including issues surrounding VAT/'learner funding'
- Disjointed incrementalism
- 'Bowling alone' syndrome
- The speed of technological change
- Lack of infrastructure
- Insufficient/poor formal and informal support
- The wider aspects of inequality structured in society make equity unlikely
- Lack of understanding and awareness of the ICT needs of excluded groups
- Lack of willingness to trust and empower community-driven initiatives.
- Inappropriate access
- Lack of relevant resource material
- Bad design of ICT and content
- Lack of coherence in funding streams.

What aspects of the digital divide need to be researched?

The following aspects of the digital divide were thought to require greater research:

- Why people opt out/in of ICT engagement, why they have crossed the divide, why they did, and what the motivation for this was
- The role of education in relation to the digital divide
- The digital divide and its impact on teaching and learning

- The role of teachers/classroom assistants and learning mentors in teaching and learning
- The use of collaborative technologies and their impact on personal and community development
- The role and nature of community champions and how best to engage and empower them
- The affordability of rental, leasing and tax-break systems
- The extent to which people want to be creators/producers rather than consumers
- Assessment of ILT/ICT access, provision and use in the adult and community learning sector
- How to get joined-up collaboration between different projects and funding
- Usability and accessibility criteria
- Information design
- Human–computer highbred e-learning models
- Computer language engineering
- Work on problematising the concept of the digital divide, keeping separate 1) between countries, 2) within countries, 3) other overlapping cultural factors
- The viability of interactive TV in terms of ICT and equality
- Intellectual property – the dangers in relation to e-commerce and neo-liberal regulation.

Issues from the floor

A number of general comments were also raised by attendees during the course of the day, and are outlined below:

- It was highlighted how technology was

changing people's daily practice, and that some groups may be disempowered as a result

▌ It was suggested that there was a need to help community groups become more active by helping to identify mentors or champions within the community

▌ It was also highlighted that there are problems because there are many wider social issues, and that debates about the digital divide need to account for these wider issues and changes that occur

▌ Despite not having a clear or agreed idea of ways forward, and instead of waiting for policy to change to facilitate more holistic and contextualised approaches, we should act now in whatever way we can

▌ The dangers of schools opening their doors to community use was raised, as many do not understand the issues relating to the digital divide and may have false ideas of what may happen and that may be in stark contrast to the reality.

Delegate List

Anne Diack	BBC Factual and Learning
Avril Loveless	University of Sussex, Brighton
Barry Phillips	DfES
Bernard Zakary	QCA
Bob Harrison	Toshiba
Chris Comber	Leicester University
Chris Hewson	Lancaster University
Christina Preston	Institute of Education
Claire Hillier	Toshiba
Claire Shearman	Communities Online
David Wortley	Mass Mitec
Emma Aldridge	Age Concern
Fern Faux	Bristol University
Fred Garnett	Becta
Graham Murdock	Loughborough University
Helen Brown	Becta
Helene Guldberg	Spiked Online
Ian Wood	BT Social Policy Unit
Jill Day	NAACE
John Fisher	Citizen's Online
Keri Facer	Bristol University
Kevin Carey	humanITy
Len Daniels	Toshiba
Lesley Law	Becta
Lesley Waddell	RNIB
Louise Madden	Cardiff University
Malcolm Hunt	Becta
Mervyn Flecknoe	Leeds Metropolitan University
Michael Mulquin	IS Communications
Mike Butler	Djanogly City Technology College
Mike Harris	Becta
Neil Selwyn	Cardiff University
Niel McLean	Becta
Paul Hynes	King Edward VII School, Melton Mowbray

Sally McKeown	Becta
Steve Thompson	Teeside University
Sue Webb	Women Connect
Susan O'Donnell	Models Research
Terry Goodison	The National Research Centre
Tim Rudd	Becta
Trevor Evans	Toshiba
Wendy Olphert	Loughborough University of Technology

Further Information

Becta

Becta has established a Research Web site that has a growing number of reports and publications, including the **Digital Divide Discussion Paper:**
http://www.becta.org.uk/research/

A **digital divide discussion group** has been established. If you would like to become a member, e-mail Timothy_Rudd@becta.org.uk.

Becta has recently established an **ICT Research Network**. If you would like to become a member, e-mail ictrn@becta.org.uk, or send postal enquiries to Mike Harris, ICT Research Network, Becta, Millburn Hill Road, Science park, Coventry CV4 7JJ.

Toshiba

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The Toshiba Best Practice Research Programme

Toshiba has formulated The Best Practice Research Programme (in partnership with Leeds Metropolitan University). Its roots are firmly grounded in government policy and its foundations are built on the Green Paper 'Schools, Building on Success' and the White Paper 'Enterprise, Skills and Innovation'.

It is predicated on three strong beliefs, that Toshiba's products play a critical and vital role in:

▍ Raising levels of achievement in schools/colleges
▍ Reducing exclusion
▍ Removing the bureaucratic load from the teacher/lecturer.

Toshiba is committed to education and as part of this commitment, the company has formulated ResearchEd. The Strategy behind ResearchEd is to provide support to the world of education, through its understanding of the new demands educational technology places on learners.