

The digital vicious cycle: Links between social disadvantage and digital exclusion in rural areas

Martyn Warren*

*Director, Rural Futures Unit, School of Geography, Faculty of Social Science and Business,
University of Plymouth, 7-12 Kirkby Place, Plymouth PL4 8AA, UK*

Abstract

The Internet confers benefits on its users in a variety of ways, ranging from simple information acquisition and purchasing goods and services, to interacting with a range of individuals and groups in the wider processes of governance. Rural citizens stand to gain more than most, relatively, since the use of the Internet reduces, if not removes, former barriers (particularly that of distance) to such interaction. To that extent, the shrinking of the ‘digital divide’ (and particularly the increased availability of broadband Internet in the countryside) is very welcome. However, there is a danger that non-users of the Internet are disenfranchised by such developments, and these include some of the most disadvantaged and vulnerable sectors of rural populations. There is thus a risk that, as the Internet increasingly becomes regarded as the default communication medium, a minority becomes progressively disadvantaged, first in relative and then in absolute terms. This paper explores the links between digital exclusion and social exclusion in a rural context, to identify the likely consequences of this ‘digital vicious cycle’, and to consider the options for ameliorating these consequences.

© 2007 Elsevier Ltd. All rights reserved.

Keywords: Rural; Internet; Digital divide; Social exclusion; Information intermediary

1. Introduction

The aims of this article are to explore the links between digital exclusion and social exclusion, to identify the likely consequences of what is termed the ‘digital vicious cycle’, and to consider the options for ameliorating these consequences.

A particular focus on rural areas is justified on the grounds that provision of ICT infrastructure can be considerably weaker in rural than in urban areas; that benefits of online communication in the countryside may be relatively greater than in urban areas; that remedies for digital exclusion which rely on provision in specific locations are likely to face additional difficulties in rural areas; and the tendency of social exclusion to have a different character in rural areas to that in urban areas, making it less susceptible to remedies which

*Tel.: +44 1752 238412; fax: +44 1752 233054.

E-mail address: mwarren@plymouth.ac.uk.

rely on peer-to-peer support within disadvantaged place-communities. The primary perspective of the article is Western, reflecting its British origins, while seeking to apply lessons learned from the developing world.

2. Digital exclusion

2.1. Digital divides

The existence of digital divides and digital exclusion has been described and debated elsewhere (for instance Servon, 2002; Warren, 2002). In this article, the term is used to describe a situation where a discrete sector of the population suffers significant and possibly indefinite lags in its adoption of ICT through circumstances beyond its immediate control. Fig. 1 illustrates two ‘divide’ scenarios using the classic ‘s-curve’ concept of technology adoption. In one, the potential for one sector of society to adopt is capped by some factor(s) applying to that group (for instance location, income, education, disability) so that the penetration of the technology falls short of that in the rest of society (societal group 3 compared to societal group 1). The other is a lag effect, where one sector of society (societal group 2) adopts the technology more slowly than others in society (societal group 1), but eventually catches up. Both can be combined.

The most frequently cited studies of the digital divide are those conducted by the US National Telecommunications and Information Agency (NTIA, 1995, 1998, 1999, 2000). The 1995 and 1998 reports found that the most disadvantaged groups in the USA were rural poor, rural and city ethnic minorities; young households; and female-headed households. By 2000, rapid growth had taken place in household Internet access, and some ‘divides’, such as the urban-rural gap, had narrowed. Some showed no decline or a slight increase, such as those related to people with disabilities; ethnic minorities; and single-parent families. The report suggests that people who lack access to Internet-based tools are at a growing disadvantage, and its recommendations include improving public access in schools, libraries, etc. (NTIA, 2000).

Similar patterns of digital exclusion show up in data for the European Union, especially with respect to age (Anderson & Tracey, 2002, pp. 141–146; Norris, 2001, pp. 77–91; SIBIS, 2003). SIBIS uses a Digital Divide Index (DIDIX) as a way of quantifying the digital divide with respect to gender, age, education and income (Selhofer & Huesing, 2002): those with low educational achievement show up as particularly badly affected (an index in the mid-20s in 2002, against a ‘perfect’ index of 100), with those on low income and of advanced age also faring badly with indices in the mid-30s. Little improvement was discernible in the overall index between 1997 and 2002.

More recently, official statistics for the UK suggest that in October 2004, 34% of adults had never accessed the Internet—admittedly significantly reduced from the 47% in October 2000, but indicating that the technology is still far from ubiquitous. Of the 2004 non-users, 54% (19% of the adult population of Britain)

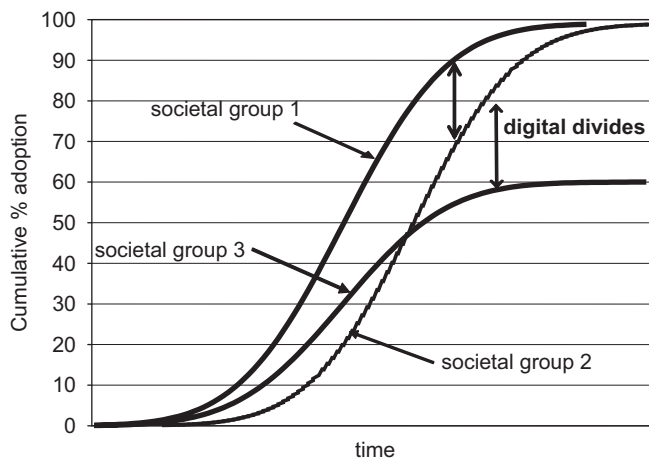


Fig. 1. Multiple adoption curves and the adoption divide. Source: (Warren, 2002).

chose the statement “I have not really considered using the Internet before and I am not likely to in the future”. Forty-two percent stated that they had no interest in, need for, or desire to use the Internet and 37% felt they did not have the ability or confidence to use it (ONS, 2004). Judging by access to computing and Internet in the home, the Future Foundation (2004, p. 7) has estimated that 51% of the adult population (24.2 million people) were digitally excluded. This may be regarded as an extreme measure, ignoring use of Internet at work or at public access points, but reflects a view (not universally held) that for meaningful social use of the Internet, a home connection is essential. Moreover, they estimate that more than a third of the population will still be excluded in 2025, “assuming there is no progress towards producing more standardised, affordable, user-friendly interactive technology” (Future Foundation, 2004, p. 19). Using British Household Panel Survey (BHPS) data, they demonstrate that income, age and education are significant contributory factors. Work in the Netherlands (albeit relying on 1998 data) highlights the same issues, with the refinement of income as the dominant factor in possession of technology, but being eclipsed by age and gender as factors in possession of skills, and in use of technology (van Dijk & Hacker, 2003, p. 319).

In recent years a new dimension has come into play—access to high-speed, always-on ‘broadband’ Internet, enabling fast file transfer, real-time video links, interactive gaming, and a host of other potential benefits. The high speed and the freedom from the constraints of a dial-up modem (including that of blocking normal telephone access while in use) make more likely the use of the Internet as the default means of communication and information retrieval. Moreover most Internet design and development is geared to broadband provision, and this can penalise dial-up users as their modems struggle to cope with the bandwidth-hungry demands of modern websites. Access to broadband is partly determined by geography, with populations of more rural areas being deprived of access in most countries. This is graphically demonstrated by Point Topic’s (2006) map of UK broadband density (lines per 100 population) where the lowest densities (below 11.5%) correlate strongly with remoter rural areas. It is also linked to socio-economic factors, though, given that accessing broadband incurs initial capital costs as well as ongoing subscriptions, and so its advent is likely to exacerbate rather than ameliorate the general ‘divide’ trends noted above. Despite rapid growth, broadband penetration only rises above 20% lines per 100 population in the world leaders South Korea, Denmark and the Netherlands: Western Europe as a whole, and North America, were around 15% penetration in late 2005 (Mueller, 2006).

2.2. Impacts

We live in a knowledge-based society, where access to information, and the ability to make economic and social transactions, confers distinct advantage. As governments, agencies, corporations and individuals increasingly rely on electronic means for the transmission and storage of information, the advantages of access to the Internet rise. Readers of this paper are likely to take the Internet for granted as a means of purchasing goods and services, and maybe selling as well, through eBay, for instance. They can turn to the web for information about health problems, or to find carers for elderly relatives, check education facilities in a particular area, find a new job, check the local authority’s approach to recycling. They may join an Internet community formed to put pressure on politicians to favour higher education in government policy; they may influence the outcome of a local election by email canvassing. They may keep in touch with events in their area by checking the village website; they may find entertainment through interactive games or just ‘surfing’ for interesting sites.

All these things can be done without the Internet, of course, but doing so would take longer, require (in many instances) physical movement over quite large distances, cost more, and probably result in a lower quality of outcome in terms of variety of source, depth of coverage and convenience in use. Hence the first point: given that the Internet confers substantial benefit on its users, its lack confers disbenefit on non-users. Often this relative disadvantage will be followed by absolute disadvantage. This will occur where offline services are actually reduced as a result of increasing dependence on the Internet, and in extreme cases are lost altogether as the Internet becomes the only way of communicating, locating and retrieving information, or making transactions. Use of online communication is advancing rapidly as providers take the opportunity of: (a) lowering costs and (b) improving their services (making them quicker, more flexible, broader, more interactive/responsive). In some cases, notably in provision of public services, this may be accompanied by a

pledge to maintain ‘conventional’ services—for instance production of government leaflets or maintenance of ‘drop-in’ facilities for enquiries. In the absence of independent research it is difficult to be sure whether pledges to maintain standards of offline public services are adhered to, and for how long.¹ Such inhibitions will not apply to private enterprise, however, nor to many other organisations which have to balance limited budgets against costs of postage and telephone. Evidence is abundant, for instance in advertisements that carry just a web address (URL); or in TV or radio announcements that provide merely an email address for audience contact and feedback. Individually these examples may seem trivial: collectively they have considerable potency, especially when they impinge on fundamental rights such as education (Castells, 2001, p. 260) or democracy (Norris, 2001, pp. 97–98).

In the era of digital convergence, non-use and non-access to information technologies may lead to perceived non-existence (Hindman, 2000, p. 549).

2.3. *Factors affecting digital exclusion*

Servon (2002, pp. 6–8) highlights three inhibitors to adoption: access to systems and hardware (personal and infrastructural); IT literacy; and content which is relevant and useful to the societal groups in question. She also reports, though does not include in her definition, a further possible dimension: that of access to the telecommunications policy processes (p6). Servon’s discussion of IT literacy includes both the ability to use the technology, and the understanding necessary to apply it, but it would be further possible to include the problem of lack of ‘engagement’, “whereby people do not see the need to engage with new technology and do not perceive the benefits of the online world” (Future Foundation, 2004, p. 2). This can be unpacked still further to reveal awareness of existence of the technology (Katz & Rice, 2002, p. 128), awareness of its benefits; and the will and motivation to use it (Sanyal, 2000, p. 146). Confidence could also be added in using the technology, which can be inhibiting even if other criteria are met (Future Foundation, 2004, p. 16).

These factors are pulled into a typology by van Dijk, identifying four classes of barrier to adoption: mental access (related to motivation, confidence, and attractiveness of the human–technology interface); material access (opportunity to use technological interfaces and connect to networks); skill access; and usage access (relating to the use of sophisticated information and communication processes as opposed to basic tasks, entertainment, etc.) (van Dijk & Hacker, 2003, p. 315). An alternative approach focuses on ‘effective use’, defined as “*the capacity and opportunity to successfully integrate ICTs into the accomplishment of self or collaboratively identified goals*” (Gurstein, 2003, p. 9). For a specific initiative (Gurstein uses an e-health development as an example), effective use relies on appropriate infrastructure; available and usable input devices; necessary peripherals; appropriate and approachable content; appropriateness of the service application itself; provision for capacity development in users; and an appropriate structure of finance and governance. In ‘Readiness for the Networked World’, a guide for community-based development, factors are collated into five groups: network access; networked learning; networked society; networked economy; and network policy—the first typology to identify policy as a factor in its own right rather than as merely instrumental in removing perceived barriers (Information and Technologies Group, 2000).

However, disparate in their conceptual origins, all of the above have in common an understanding that supply of the technology is necessary, but not sufficient, for effective use of ICT. Overcoming ‘material access’ has been the primary target of digital inclusion policy in most Western countries: make the technology physically accessible to people, and usage will follow (van Dijk & Hacker, 2003, p. 316). But digital exclusion is also a factor of the effective demand for the technology, or rather for the services that it can provide, from society and its component individuals. This is a much more difficult matter to identify, partly because it is so entangled with other social issues, and thus less popular as a policy target.

¹The UK government made such pledges in the early days of its drive towards e-government, but the Office of the e-Envoy issued this advice to government departments: “Have you considered/developed a pro-active strategy to drive customers to the ‘e’ channel? ... Have you considered disincentivising ‘offline’ channels (e.g. limit call centre opening hours, un-pre-populated [sic] forms etc.)?” (Office of the e-Envoy 2003).

3. Social exclusion as a factor in digital exclusion

The term ‘social exclusion’ has a variety of roots and potential meanings, but is commonly used to denote a bundle of factors that combine to marginalise the individual from collective processes and benefits. Thus [Mingione \(1997, p. 12\)](#) refers to “a combination of economic hardship and institutional discrimination, both of which help to create unfavourable life chances and chronic exclusion from normal citizenship”. The term is to be used with care—for instance by recognising that the phenomenon is the result of the combination of a variety of factors, rather than a single-factor phenomenon. [Talbot \(2003\)](#) classifies the relevant factors under four headings:

- income deprivation;
- social deprivation (including poor education or health);
- disengagement and marginalisation (i.e. withdrawal and rejection); and
- lack of local services: public and private, infrastructure.

She identifies the first two as being primarily related to the individual’s lack of resources, and the latter two to relational issues and system failures. Only the last is specific to place: while the other three may be concentrated spatially (for instance in poor inner-city areas), such concentration is not a necessary condition. The largest groups affected are likely to be the elderly, the physically and mentally disabled and the chronically sick, but others include those without the education and/or skills to develop their income-earning capacity or their connectedness with society, single parents, children in low-income households; ethnic minorities, and people prevented by other responsibilities from obtaining paid employment (such as within-family carers) ([Commission for Rural Communities, 2005b](#); [Social Exclusion Unit, 2001, p. 12](#)).

A casual comparison of the characteristics of social exclusion with the adoption factors previously identified suggests an association between the two. Over 35 years ago, Tichenor proposed a ‘knowledge gap’ hypothesis, suggesting that:

...as the infusion of mass media into a social system increases, segments of the population with higher socio-economic status tend to acquire this information at a faster rather than the lower status segments, so that the gap in knowledge between these segments tends to increase rather than decrease. Tichenor et al. (1970) quoted in [Kingsley and Anderson \(1998, p. 307\)](#).

This hypothesis was later adapted by [Katzman \(1974, p. 50\)](#) to move the emphasis away from socio-economic groups towards levels of information and ability—those with high levels will gain more than people with lower initial levels. As well as more obvious socio-economic factors, such as uneven initial distributions of financial resources and ability to make use of the technology, Katzman highlighted the issue of complexity—that the same communication presents more ‘bits’ of information to people with lower initial levels of information than to those with higher (p. 50). He also sensed that motivation was a factor, a theme developed by [Ettema and Kline \(1977\)](#) in focussing the knowledge gap hypothesis on “segments of the population motivated [or not] to acquire that information and/or for which that information is functional”, this motivation again being influenced by, but not dependent on, socio-economic standing. [Ettema \(1984, p. 394\)](#) later identified three stages in creating information inequities:

- system development (systems being designed by, and largely for those who are information-rich early adopters, and discriminating against the information-poor);
- self-selection by the user group; and
- characteristics of the user group: youth, better education, better able to see information value, larger and more innovative businesses).

However, formulated, the knowledge-gap theory suggests that innovations in information technology tend to result in widening information inequities. The prime causative factors may or may not be socio-economic, but nevertheless have some links to socio-economic conditions. This is not unique to ICT innovation: in a general context, [Rogers \(1995, p. 414\)](#) states that usually “new ideas make the rich richer and the poor poorer,

widening the socio-economic gap between the earlier and later adopters... . The effects of an innovation usually cannot be managed to separate the desirable from the undesirable consequences”.

Thus a picture begins to develop of a vicious cycle: Social exclusion leads to digital exclusion, which in turn perpetuates and exacerbates that social exclusion. This is supported by a range of authors (Chen, Boase, & Wellman, 2002, pp. 80–81; Crampton, 2003, p. 168; Servon, 2002, p. 2; including van Winden, 2001, p. 867). “The digital divide... will be mainly the concern of the poorest, most discriminated segment of the population—thus furthering their marginality” (Castells, 2001, p. 254). Kruger (2004, p. 321) invokes the concept of network poverty, lack of access to informal contacts which can help in job-seeking, civic participation, etc. and suggests that the Internet threatens to restrict upward social mobility in excluded groups. He also suggests that as electronic forms of payment proliferate, those forced to use cash (through lack of facilities and/or lack of credit-rating) will find it more difficult and costly (Birch, 1997; Kruger, 2004, pp. 321–322).

Such tendencies are likely to be strengthened in the future as providers of online services increasingly discriminate between users on the basis of social group, area of residence, spending power, purchasing history, and so on. In an article entitled ‘The software-sorted city’, Graham (2004) describes new software devices which automate such discrimination. At the simplest level this can mean that affluent, frequent users could be brought automatically to the front of telephone queues in call centres (leaving the less-fortunate listening to endlessly repeated reassurances that ‘your call *is* important to us’). Where the Internet is concerned, it could mean that even if a low-income person were able to get online through, for example, a public Internet access point (PIAP) in a village hall, library, school, or the like, they would receive a very different level of service to someone identified as being well-off. Where this goes beyond the merely inconvenient is if such ‘software sorting’ results in price-based discrimination between different types of Internet customer (Castells, 2001, p. 257) or in certain groups in society being unable to obtain information about particular financial services, or even being excluded from such financial services altogether.

4. The rural dimension

While the digital vicious cycle is of general concern, there are several reasons for it being of specific interest in rural policy. Firstly, the provision of ICT infrastructure can be considerably weaker in rural than in urban areas. In many rural parts of the world, such problems can be very basic, relating to the quality and capacity of ageing copper-based telephone lines (Grubestic & Murray, 2002), or local monopolies of telecommunication corporations over exchanges and ‘last mile’ infrastructure, with little incentive to open up to alternative providers (Grubestic, 2003, p. 287). In the absence of a universal service obligation (USO) relating to broadband Internet, for instance, its provision is subject to market forces, which do not favour areas of dispersed population because of the high investment and low potential. The United States Government Accountability Office reported in 2006 that broadband deployment was less developed in more rural parts of the country (GAO, 2006, p. 2): analysis of data from the 2001 US Current Population Survey, suggested a significant metropolitan/non-metropolitan digital divide, of which household attributes (especially income and education) accounted for almost two-thirds, and place-based differences (e.g. infrastructure) for a third of the remainder (Mills & Whitacre, 2003). A study using data from the Federal Communications Commission (FCC) and an Office of Advocacy survey concludes that an urban-rural digital divide exists in the provision and adoption of broadband services to small businesses in the US (Pociask, 2005). The Commission for Rural Communities (CRC) points to much lower levels of availability of cable and wireless broadband (FWA) across rural England, with little change taking place over the previous year, and presents data showing that for rural settlements in sparsely populated areas “usage remains notably lower” than in urban areas (Commission for Rural Communities, 2006, pp. 45–47).

It is true that there is evidence of significant progress. In the same report the CRC finds that Internet usage in ‘less sparse’ rural areas is similar to that in urban areas, given that in rural Britain most residents are potentially able to access ADSL (asymmetrical digital subscriber line) broadband (Richardson, 2004). An OECD report suggests that, while there are differences between its members, the market is generally responding to increasing demand in rural areas, and sees no need for a universal service requirement on telecommunications companies. Many developing countries have been able to ‘leapfrog’ intermediate

technologies and benefit from recent innovations in wireless, mobile or cable technologies—such as cheap fibre DSL in Rwanda (Vance, 2006).

A further dimension, though, is added by what might be termed the ‘mutating divide’. Where a digital divide is the result of a ‘lag’, it is reasonable to assume a ‘catch-up’ effect such that the divide is eventually closed (group 2 in Fig. 1, for instance). But, as Katzman (1974, p.43) points out, the world is not a closed system, and any innovation is likely to be overtaken by a new innovation before its adoption has reached 100%—and in ICT innovation this process is frequent and rapid. For instance one could point to videotex being overtaken by dial-up Internet followed successively by low-bandwidth broadband in a PIAP, then at home, then progressively higher bandwidths, then—who knows—3/4G mobile access, or radically new wireless technology. In this scenario of a ‘digital ratchet’, late adopters run the risk of constantly playing ‘catch-up’ as one innovation succeeds another. For instance, despite almost universal availability of ADSL in rural Britain, line lengths and other technical issues mean that most rural dwellers are able to obtain only the basic 0.5 Mbps service, while most urban dwellers have no trouble in obtaining bandwidths of 2 Mbps, and those in metropolitan areas will have access to 8 Mbps (BBC News, 2004). In 2006 the CRC welcomed a forecast that over 50% of UK households would be able to access high bandwidths (Sumner & Yardley, 2006), but continued; “...it is almost certain that most rural communities will be excluded from this capability. This will leave them (and potentially much of the urban fringe) at great disadvantage compared to urban households...” (Varley, 2006).

A second reason for a rural perspective is that benefits of online communication in the countryside may be relatively greater than in urban areas, due to barriers of distance to alternatives, and thus the disbenefits of non-adoption—the costs of digital exclusion—that much greater (see, for instance Hindman, 2000; Malecki, 2003; Parker, 2000). An online process, whether transactional or merely informational, which substitutes for one involving physical movement is likely to be of greater utility to rural than to urban populations. Although data on this is not abundant for the Internet, it is possible to observe the effect in studies of telephone communications in developing countries, suggesting high benefit-cost ratios for rural users, despite higher costs and poorer availability (for instance Kayani & Dymond, 1997). This is partly due to the fact that in rural areas, a higher proportion of phone calls relate to commercial and financial matters than those originating in urban areas: the object can be to obtain accurate market prices, to reduce risk in transmission of remittances from family members working away from home, or to avoid losing wages and incurring travel costs in making face-to-face enquiries, for instance. A study of the Grameen Village Phone programme in Bangladesh estimates that the consumer surplus from a single phone call from a village to Dhaka, avoiding the need for travelling, ranges between 2.64% and 9.8% of mean monthly household income (Ramirez, Haq, & Richardson, 2000). Where the rural poor have material access to the Internet, and the necessary technical and language skills, it is reasonable to assume that consumer surplus from its use will show a similar pattern (Forestier, Grace, & Kenny, 2002). In industrialised economies the urban-rural contrasts are likely to be less stark, and may be measured in terms of quality of life rather than consumer surplus, but they exist nonetheless. For instance the facility for online shopping will be of greater relative benefit to those living in remote rural areas than to those within easy reach of a town centre. The same applies to accessing public services, such as health care, education, government information, business advice, and so on. The increasing tendency of governments to regard such services as ‘betterments’, and to reduce or fail to make conventional service delivery in areas of dispersed population (Furusest, 1998, p. 236) merely exacerbates this issue.

A third rationale for a rural view is that remedies for digital exclusion which rely on provision in specific locations (e.g. Internet facilities, training/learning in schools or community centres) are likely to face additional difficulties in rural areas due to the spatial separation of the clientele, and the distances to be travelled.

Finally, a specifically rural focus is justified by the tendency of social exclusion to have a different character than in urban areas: poverty, for instance, tends to be more widely dispersed within the rural population (at least in industrialised economies) than in urban areas (Department of Environment & Ministry of Agriculture Fisheries and Food, 1995, p. 62). This, together with an idyllising of rural existence, makes it easy for rural deprivation to be ‘out of sight and out of mind’ (Cloke, 1997; Milbourne, 1997). As a result, remedies for social/digital exclusion which work well for the urban poor, relying on peer-to-peer support within neighbourhoods, may prove ineffectual in rural locations. Moreover, rural deprivation has different

influences: it is more likely to be affected by limited accessibility, high service costs and poor service provision, and less by overcrowding, poor physical environment and social pathology than its urban counterpart (Furuseth, 1998, p. 240). The dispersal of the disadvantaged through rural society can also affect the focus of service provision. Successful rural community development frequently depends on the more prosperous members of society, often ‘incomers’, who have the experience, social networks and time to engage with governance processes and actors. Though generally an entirely positive force, they can steer processes towards their own visions of community development (which might, for instance, be heavily biased towards online processes) in a way that would be more difficult in more concentrated and homogeneous populations (Furuseth, 1998, p. 238).

5. Addressing the problem

Thus the existence of ‘digital exclusion’ raises serious ethical, social and political issues for knowledge management and communication in rural areas, and implies a need for specific responses. Meeting that need is a complex matter, and has generated a variety of approaches. The ideal, perhaps, is the planning of rural telecommunications as a complete socio-technical system, adapting a combination of established systems methodologies (Andrew & Petkov, 2003), but the reality tends to fall short, with most initiatives focussing on specific dimensions of the digital divide.

Where material access to computer and Internet is concerned, some commentators argue for the extension of USOs to the provision of infrastructure in remote rural areas, given the economic and social benefits of broadband Internet (Sanyal, 2000, p. 146). In an age dominated by market forces, though, it is hard to find a government that will contemplate such an extension (with the associated public spending and/or compulsion of telecommunications corporations (telcos)). It is possible to find national policies which apply carrot and/or stick to the telcos, for instance a levy applied to services in Peru to create a rural telecommunications fund, used to invest in providing communications infrastructure to small rural communities (Kayani & Dymond, 1997, p. 17). The danger in such policies, apart from the market distortions they create, is that if the rural investment is channelled through the large telcos, development of newer, more flexible and more rural-friendly technologies (such as wireless and satellite) can be inhibited, since they tend to be associated with smaller and more vulnerable providers.²

Alternatively, government can act more directly in the cause of creating material access. Gillett, Lehr, and Osorio (2004) identify four types of broadband initiative, based on local/regional government in the USA, but applicable on a wider scale. The first is government as broadband user, where public investment indirectly stimulates private sector development. An example would be the British government’s policy in the early 2000s of ensuring broadband feeds to all rural schools, libraries and health centres, hoping that this will have knock-on catalytic effect as well as the direct benefits in those services. The second is government as rule-maker, using its power to adapt or create legislation (such as spatial planning regulations) that reduces hurdles to the process of infrastructure installation. The third is government as financier, involving the provision of subsidies or other incentives to private sector investment. A variant of this would be the ‘pump-priming’ approach, hoping to create sufficient momentum from an initial investment that will encourage the private sector to continue the process—for example a £30m British investment programme into an experimental roll-out of broadband networks “to parts of the country where they wouldn’t otherwise be commercially viable” in 2002.

Finally, government as infrastructure developer is where the public sector assumes responsibility for providing some part of the infrastructure, such as the ‘back-haul’ or broadband feed to a point where it can be distributed by a commercial or communal wireless network. A popular variant relies on selective provision of public access (for those who do not have the facilities in the home) by, for instance, establishing PIAPs in telecottages, village halls, libraries and even pubs (Huggins & Izushi, 2002, p. 114ff). This has been very popular as an approach in the UK and across Europe: it has the advantages of being very visible (politically

²A similar phenomenon was seen in the UK after British Telecom, the dominant supplier and owner of the bulk of the landline infrastructure, decided in 2004 to enable virtually all its exchanges for ADSL after some years of prevarication: a move welcomed by the rural population as a whole, but one which effectively killed off a significant number of community wireless or satellite-based broadband initiatives.

important) and easy to implement on a small scale, lending itself to project funding from a variety of sources. In early developments results, in terms of value of service provision and of survival rates,³ were very mixed (Cornford, Gillespie, & Richardson, 1999, pp. 33–34; Michiels & van Crowder, 2001; Servon, 2002, pp. 45–76), with the most successful being those which were firmly oriented to the needs of the user, in terms of accessibility, mode of operation, and provision of sympathetic assistance (Skerratt & Warren, 2004, pp. 42–44).

In most countries, training programmes exist to help those in rural areas to overcome problems of competence—a combination of lack of the necessary skills to use and understand the technology, and a lack of confidence in that ability. In the UK there was an early tendency to locate such training in centres such as county agricultural colleges, requiring some trainees to travel long distances and to be away from their work for long periods, but increasingly one-to-one assistance is provided through PIAPs such as the UK Online centres. An example of good practice in taking the training to the user-group was provided by the Agrinet programme in England, where minibuses converted into mobile computing classrooms were used as the base for tuition in farmyards, hamlets and villages (Warren, 2003).

Competence development programmes also do much to enhance motivation, since there is an element of persuasion inherent in any training process, and those who are thus raised to full capability will tend to interest others by word of mouth. Governments, particularly those with strong e-government agendas such as the UK and Canada, commit money and effort to promoting both services and the means of access. A major factor in motivation is the availability of relevant, attractive and easy-to-use content. In an experiment set up in South West England in 1996, where a group of farmers was provided with Internet facilities and support, a major factor in their limited use of the Internet during the first year was the difficulty in finding content that related well to farming, and the lack of opportunity for relevant e-commerce and access to public services. By 2002 most of the subjects were making regular use of the Internet, partly as a result of improvements in both factors (Warren, 2000, 2004).

Most Internet content is provided by commercial concerns, and is more responsive to spending power than to the welfare of the socially and economically disadvantaged. In Europe, and notably in the UK, the emphasis placed on ‘e-government’ has resulted in a rapid rise in web content devoted to public services, much of it from local government. Given that much of this relates to health, education and welfare services, this offers considerable benefit to some of the less-well off and to the infirm, and particularly those in rural areas who might otherwise depend on travelling considerable distances to acquire information. This is primarily top-down provision: a more user-centric service is provided by the many community-based networks⁴ (Servon, 2002, pp. 60–76)—see, for instance, the ruralnet|uk website (<http://www.ruralnet.org.uk/>) and the listings provided by the Community Broadband Network (<http://www.broadband-uk.coop/>). More local content may be provided by a village website (Warren & Skerratt, 2003), and increasingly individuals are supplying relevant (and approachable) content through publishing in their own web diaries or ‘blogs’.

However, efficacious these various approaches are, there will remain a significant part of the population, at risk of social as well as digital exclusion, who will not, in the short to medium term, be able to make use of direct access to high speed Internet, due to one or more of:

- insufficient means to acquire computer hardware and to pay access fees;
- lack of ‘engagement’—pathological lack of ability, confidence, understanding and/or motivation (and limited opportunity for remedying);
- no chance of access to a PIAP, due to distance combined with lack of transport; or lack of physical mobility;

³Survivability of the facility is not the same as sustainability of the initiative: most studies are focussed on the former, and it is very possible that some projects that have ceased, having failed to win long-term support from users and/or funders, have actually served their purpose as pump-primers, and have created a critical mass of users in their locality which can be further developed by communal and/or micro-entrepreneurial processes.

⁴‘Community’ can here be one of place, practice or interest, or a combination.

- inability to interact with information due to illiteracy, language or cultural barriers; and
- inability to make direct use of computer equipment due to debilitating physical (including visual) or mental infirmity.

The last of these has given rise to a new term, ‘the disability divide’, identified and measured using US Bureau of Labor Statistics and the Census of the United States, though the authors find some of that divide to be due to the low levels of income and employment which are associated with disability (Dobrinsky & Hargatti, 2006). New technical solutions allowing some of those affected to make direct contact with the Internet will certainly help (Cabinet Office: Prime Minister’s Strategy Unit, 2005; Commission for Rural Communities, 2005a, p. 20; Kubitschke & Cullen, 2004). For instance the development of new interfaces (e.g. alternatives to the conventional keyboard and mouse, or displays which compensate for visual impairment) offers hope to some people with physical infirmity or who are intimidated by the computer; the spread of digital television, with facilities for interaction with the Internet, may help those for whom television is a necessity, but a computer an expense too far; increasing the number of subsidised PIAPs will overcome transport problems for some.

Quite apart from the time needed to develop them fully, however, such initiatives do not deal with a central issue—that for many in our society, even in countries where ICT development is advanced, easy and direct access to the Internet is not a practical reality even in the medium future. Moreover the solutions can be slow to arrive: “Not only is adaptive technology difficult to learn and expensive, but it lags in development behind the technology to which it is supposed to enable access” (Dobrinsky & Hargatti, 2006, p. 329). For a large proportion of the rural disadvantaged, conventional technocentric approaches are not appropriate, and there is little sign of credible alternatives beyond fuzzy statements such as ‘social programmes must intervene’ (Future Foundation, 2004, pp. 3–4).

6. Towards the digital intermediary

In searching for alternative approaches, Western nations can look towards developing areas, where the problem of information poverty is many times more acute, far larger segments of the population are affected, and consequently more attention has been given to the problem by policy-makers and advisors. Here most emphasis has not so far been on the Internet, though this is increasing in importance, but more on conventional sources such as newspapers or official pronouncements, radio, television, and telephone.

A dominant theme in ICT and development studies is that of communal development processes in multi-stakeholder environments. Thus Gumucio-Dagron (2003, pp. 4–6) advocates a participatory approach, with intended beneficiaries involved in the process, and identifies four vital ingredients: ownership and appropriation; development of locally relevant content; language and cultural pertinence; and appropriate technology (e.g. equipment which may be crude by ‘normal’ standards, but is user-centric in design and fit for the intended purpose). The latter theme is echoed by McBean (2004, p. 7) she also usefully identifies nine key dimensions of participatory communication, including horizontal processes rather than vertical, and collective rather than individual. The focus here and in related writings (for instance Ballantyne, Labelle, & Rudgard, 2000; Besette, 2004; Gumucio-Dagron, 2001; Mefalopoulos & Kamlongera, 2004; The Communication Initiative, 2005) is on communal capacity building, on the premise that this will have maximum potential for inclusion of individuals into the communication process.

While participatory approaches are common in Western rural development (for instance through the European LEADER programmes, now enshrined in the EU Rural Development Policy 2007–2013, European Commission, 2006), they will not necessarily meet the needs identified at the end of Section 5. One potential problem is that “participation by certain group members and communities may be culturally or socially determined and inclusion (or, rather, exclusion) reflects power and influence within a community” (McBean, 2005, p. 3). Those already marginalised and vulnerable have a high probability of exclusion from the participatory process. This will be amplified in rural areas of many industrialised countries, where the physically dispersed nature of disadvantage can make it difficult for the poor and excluded to engage even with ‘bottom-up’ development processes. Participatory processes may be necessary, but are not sufficient for effective tackling of digital exclusion.

Turning back to developing areas, studies of information flows and needs among the urban poor have identified a phenomenon which has been termed an ‘information intermediary’ (Max Lock Centre, 2000a, p. 5; O’Farrell, 2001) or ‘infomediary’ (EKOS, 2002, p. 11; Schilderman, 2002, p. 3). These terms are often used for a type of software device, or for an organisation which acts as ‘middleman’ in a commercial or governmental transaction (Griffin & Halpin, 2004), but here it is used to denote some form of human agency which, having access to a source of information, interprets and communicates it to a group which does not have access. The communication is ideally two-way, with the emphasis on sharing knowledge rather than on top-down dissemination (Talyarkhan, Grimshaw, & Lowe, 2004). The agency is commonly an organisation or its representative—a non-governmental organisation (NGO), the church, social services, a community organisation—but could just as well be a private individual (Max Lock Centre, 2000b, p. 3). It could be a natural evolution of a specialist ICT ‘mediating organisation’, established originally to develop infrastructure, aggregate demand, and/or create local content, whose ‘intermediary’ role now evolves in a different direction as goals in those areas are achieved (Ramirez, 2001, p. 326).

Information intermediaries perform one or more of the following functions, the first three operating on both a local and a broader stage; and the remainder being primarily local in nature (Max Lock Centre, 2000b):

- (1) mediate exchange of information between one or more groups;
- (2) gather and disseminate information sometimes over large distances;
- (3) interpret technical information so that it is intelligible to users;
- (4) initiate and support dialogues among stakeholders;
- (5) transform information into suitable local media; and
- (6) store information for easy access and monitor its use.

Thus as well as the more obvious collation and dissemination processes, infomediaries have an important role in synthesising information, so allowing the recipients to benefit from a multiplicity of sources without undue complexity (and thus to some extent reducing uncertainty)—although at the risk of inaccuracy of interpretation.

Here is a mechanism for allowing indirect access to information sources, which is entirely consistent with participatory, communal processes but at the same time can be adapted to a more individualistic approach. The latter is exemplified by the one person in a village who has access to a computer and the Internet, who can interrogate the Web on behalf of neighbours to establish market prices for produce, translate into the local language, and send and receive emails for them—rather like the professional letter-writer of old. Such an intermediary—who one could term a ‘digital intermediary’, reflecting the specific Internet orientation—might translate well into a Western rural context.

‘Digital intermediaries’ already exist informally, even in industrialised societies: the friend who helps an elderly lady to send photos and emails to and from her grandchildren; the neighbour who goes online to order a home delivery from Tesco.com for a single mother without transport; the son who searches the web for information about home care on behalf of an infirm parent. But the question arises as to whether this is a process which could be more formally promoted by, for instance, incorporation into rural policies addressing service provision, civic engagement etc., and/or explicitly encouraged as a form of mutual help within place-based rural communities, for those who are not fortunate enough to have their ‘own’ intermediary in the shape of neighbour or family member? Something of the sort is envisaged in Gant and Walford’s concept of the ‘minder’ for rural disabled people—a volunteer with access to phone and Internet links, acting as a gateway for “households with basic telephones, but who need access to a wider range of computer-accessed information services and agencies” (Gant & Walford, 1998, p. 262). Variants might involve training personnel in post offices and mobile libraries to perform the same functions—assuming that both services survive in sufficient numbers (not a safe bet in the UK).

The use of volunteers works in other contexts—for instance ‘hospital car’ schemes, staffed by retired volunteers using their own cars to provide transport to hospital for those who find the alternatives physically or financially impossible. The analogy is not exact, of course: it is not clear, for instance, whether independence or pride would inhibit uptake in this particular context; whether negative features (such as ‘digital busybodies’ and fraudsters) would appear; and whether an intermediary can progress beyond the

simple seeking and printing of information to a more interactive mode. Many of the functions performed through the Internet—transactions in particular—require a degree of security and privacy which would be difficult (though not impossible) to ensure through an intermediary. We know from previous research on village websites that rural populations commonly contain people, often retired, who enjoy the challenge of using their ICT facilities and skills to ‘put something back into the community’ (Warren & Skerratt, 2003), but it remains to be seen whether the attractions of privately helping individuals would be comparable to those of building a website for public display.

In a pilot project conducted by the author in a village in the South West of England during autumn 2006, 44% of the 41 Internet non-users interviewed had been helped to use the WWW by a digital intermediary—primarily to buy products or make travel reservations. Nearly 80% of the intermediaries were family members—otherwise friends or neighbours. Though generalisation from this is impossible, it does give an indication that there is a burgeoning intermediating process at work, which might provide the catalyst for a more widely available service.

7. Conclusions

In this paper it has been argued that for the ordinary citizen easy, ready access to online services is becoming a matter of major import, not just something which is nice to have. The Internet is becoming embedded in society so rapidly that it is becoming a default medium for anyone wishing to provide information, to perform transactions, to create civic engagement. It is suggested that Internet ‘have-nots’ will increasingly be penalised by not being able to share in the new informational opportunities, and are likely eventually to lose some of their existing information and communication channels as the providers thereof respond to the lower cost/benefit ratios of electronic media. Have-nots may have voluntarily resisted or withdrawn, but all too many are involuntarily excluded by factors outside their control—the factors that characterise social exclusion. Thus social exclusion leads to digital exclusion, which in turn leads to deeper inequalities, new social exclusion—the vicious digital cycle. This is a general phenomenon—it operates at various geographical levels: global, regional, local. It applies in both urban and rural areas, but there are factors which have particular resonance in the countryside, and because rural dwellers have apparently more to gain from the ‘death of distance’ than urban dwellers, the costs of exclusion are likely to be higher. Conventional approaches—focussing on access, competence and motivation—will help reduce digital exclusion, though at slower rates in rural areas than in urban reflecting the lower benefit-cost ratios in providing to dispersed populations, and adversely affected by what I have termed the ‘mutating divide’.

The Internet offers the rural citizen significant benefits, helping to overcome the disadvantages of distance and social dispersion. The flip side of that coin is that the disbenefits to non-users are increasing, with the prospect of non-users of Internet suffering first relative disadvantage (not being able to participate in new, additional services open to users) and then absolute disadvantage as facilities and services which were previously available by conventional means are withdrawn in favour of online provision.

There may be a new ‘killer’ technology just around the corner which frees up many of the existing physical and social constraints on Internet use, that will do for Internet communication what the mobile has done for phone communication in many parts of the world (see for instance [International Telecommunication Union, 2004](#)). Realistically, though, it is necessary to accept that for the foreseeable future there will be a significant part of the rural population, even in high-income countries, that will not use the Internet. This has direct implications for policy at local and regional level, but more work is needed before policy design and implementation, including:

- collection of data that allow more precise quantification of the scale and location of the problem, perhaps using the US Current Population Survey Internet and Computer Use Supplement as a model, with enhanced sophistication to allow discrimination between different types of disability and disadvantage;
- encouragement of research into radical and cheap approaches which enable people to reap some at least of the benefits of the Internet without necessarily having direct access. Such research should look for inspiration from initiatives in developing countries, including ‘appropriate technology’ projects;

- development of pilot projects to test such approaches—including ‘digital intermediaries’—under field conditions with a view to incorporating them into policy alongside the promotion of advanced technological innovations.

If the only alternative is the shrug of the shoulders, it is likely that some of the most vulnerable members of rural society will be excluded from the most potent opportunities to play their full part as citizens, and to reap the benefits which are their right.

Acknowledgements

This article has benefited considerably from comments on earlier drafts by Professor Geoff Wilson and Dr Paul Brassley, both of the Governance and Policy in Europe Group of the School of Geography, University of Plymouth, and of the anonymous reviewers for this Journal. All sins of omission and commission remain entirely the responsibility of the author.

References

- Anderson, B., & Tracey, K. (2002). Digital living: impact (or otherwise) of the internet on everyday British life. In B. Wellman, & C. Haythornthwaite (Eds.), *The internet in everyday life* (pp. 139–163). Oxford: Blackwell Publishing Ltd.
- Andrew, T. N., & Petkov, D. (2003). The need for a systems thinking approach to the planning of rural telecommunications infrastructure. *Telecommunications Policy*, 27(1–2), 75–93.
- Ballantyne, P., Labelle, R., & Rudgard, S. (2000). *Information and knowledge management: Challenges for capacity builders*. Maastricht: ECDPM (Policy Management Brief No. 11).
- BBC News (2004). *UK broadband gets speed injection*. Retrieved 16 November 2004, from <<http://news.bbc.co.uk/go/pr/fr/-/1/hi/technology/4016031.stm>>.
- Besette, G. (2004). *Involving the community: A guide to participatory development communication*. Ottawa: Southbound/International Development Research Council.
- Birch, D. (1997). Do you take cash? In I. Christie, & H. Perry (Eds.), *The wealth and poverty of networks: Tackling social exclusion* (pp. 71–80). London: Demos.
- Cabinet Office: Prime Minister’s Strategy Unit (March 2005). *Connecting the UK: The digital strategy*. Retrieved 7 April 2005, from <http://www.strategy.gov.uk/downloads/work_areas/digital_strategy/digital_strategy.pdf>.
- Castells, M. (2001). *The Internet galaxy: Reflections on the internet, business and society*. Oxford: Oxford University Press.
- Chen, W., Boase, J., & Wellman, B. (2002). The global villagers: World internet use. In B. Wellman, & C. Haythornthwaite (Eds.), *The internet in everyday life* (pp. 74–113). Oxford: Blackwell Publishing Ltd.
- Cloke, P. (1997). Poor country. In P. Cloke, & J. Little (Eds.), *Contested countryside cultures: Otherness, marginalisation and rurality* (pp. 252–271). London: Routledge.
- Commission for Rural Communities (2005a). *Beyond digital divides? The future for ICT in rural areas*. Retrieved 7 April 2005, from <http://www.ruralcommunities.gov.uk/images/CC17_Broadband.pdf>.
- Commission for Rural Communities (2005b). *Rural disadvantage: Our first thematic study*. Retrieved 7 April 2005, from <<http://www.ruralcommunities.gov.uk/article1.htm>>.
- Commission for Rural Communities. (2006). *The state of the countryside 2006*. Cheltenham: Commission for Rural Communities.
- Cornford, J., Gillespie, A., & Richardson, R. (1999). *Regional development in the information society: A review and analysis*. Newcastle upon Tyne: Centre for Urban and Regional Development Studies, University of Newcastle.
- Crampton, J. (2003). *The political economy of cyberspace*. Edinburgh: Edinburgh University Press.
- Department of Environment & Ministry of Agriculture Fisheries and Food. (1995). *Rural England: A nation committed to a living countryside*. London: HMSO.
- Dobransky, K., & Hargatti, E. (2006). The disability divide in internet access and use. *Information, Communication and Society*, 9(3), 313–334.
- EKOS (2002). Tracking the dual digital divide: EKOS.
- Ettema, J. (1984). Three phases in the creation of information inequities: an empirical assessment of a prototype videotex system. *Journal of Broadcasting*, 28(4), 383–395.
- Ettema, J., & Kline, F. (1977). Deficits, differences and ceilings: contingent conditions for understanding the knowledge gap. *Communication Research*, 4(2), 179–202.
- European Commission (2006). *Rural development policy 2007–2013*. Retrieved 26 January 2007, from <http://ec.europa.eu/agriculture/rurdev/index_en.htm>.
- Forestier, E., Grace, J., & Kenny, C. (2002). Can information and communication technologies be pro-poor? *Telecommunications Policy*, 26(11), 623–646.

- Furuseth, O. (1998). Service provision and social deprivation. In B. Ilbery (Ed.), *The geography of rural change* (pp. 233–256). Harlow, UK: Pearson.
- Future Foundation (2004). *The digital divide in 2025: An independent study conducted for BT: Future Foundation*.
- Gant, R., & Walford, N. (1998). Telecommunications and disabled people: A rural perspective. *Health & Place*, 4(3), 245–263.
- GAO (2006). *Broadband deployment is extensive throughout the United States, but it is difficult to assess the extent of deployment gaps in rural areas*. Report to Congressional Committees. Washington, DC: United States Government Accountability Office.
- Gillett, S. E., Lehr, W. H., & Osorio, C. (2004). Local government broadband initiatives. *Telecommunications Policy*, 28(7–8), 537–558.
- Graham, S. (2004). The software-sorted city: rethinking the ‘digital divide’. In S. Graham (Ed.), *The cybercities reader* (pp. 324–331). London: Routledge.
- Griffin, D., & Halpin, E. (2004). *Local government: A digital intermediary for the information age?* Leeds: University of Leeds, School of Information Management Working Papers.
- Grubestic, T. H. (2003). Inequities in the broadband revolution. *Annals of Regional Science*, 37(2), 263–289.
- Grubestic, T. H., & Murray, A. T. (2002). Constructing the divide: Spatial disparities in broadband access. *Papers in Regional Science*, 81(2), 197–221.
- Gumucio-Dagron, A. (2001). *Making waves: Stories of participatory communication for social change*. New York: Rockefeller Foundation.
- Gumucio-Dagron, A. (2003). *What can ICTs do for the rural poor?* Paper presented at the World Summit for the Information Society, Geneva, December 11, 2003.
- Gurstein, M. (2003). Effective use: A community informatics strategy beyond the digital divide. *First Monday*, 8(12).
- Hindman, B. (2000). The rural-urban digital divide. *Journalism and Mass Communication Quarterly*, 77(3), 549–560.
- Huggins, R., & Izushi, H. (2002). The digital divide and ICT learning in rural communities: Examples of good practice service delivery. *Local Economy*, 17(2), 111–122.
- Information and Technologies Group (2000). *Readiness for the networked world: A guide for developing countries*. Cambridge, MA: Centre for International Development, Harvard University.
- International Telecommunication Union (2004). *Africa: The world's fastest growing mobile market*. Retrieved 26 January 2006, from <http://www.itu.int/newsarchive/press_releases/2004/04.html>.
- Katz, J., & Rice, R. (2002). Syntopia: Access, civic involvement and social interaction on the Net. In B. Wellman, & C. Haythornthwaite (Eds.), *The internet in everyday life* (pp. 114–138). Oxford: Blackwell Publishing Ltd.
- Katzman, N. (1974). The impact of communication technology: promises and prospects. *Journal of Communication*, 24, 47–58.
- Kayani, R., & Dymond, A. (1997). *Options for rural telecommunications development*. Technical paper, no. 359. Washington DC: The World Bank.
- Kingsley, P., & Anderson, T. (1998). Facing life without the internet. *Internet Research: Electronic Networking Applications and Policy*, 8(4), 303–312.
- Kruger, D. (2004). Access denied. In S. Graham (Ed.), *The cybercities reader* (pp. 320–323). London: Routledge.
- Kubitschke, L., & Cullen, K. (2004). Policy approaches to involve societal at-risk groups in European e-services. In P. Cunningham, & M. Cunningham (Eds.), *e-Adoption and the knowledge economy: Issues, applications, case studies*, Vol. 1 (pp. 150–157). Amsterdam: IOS Press.
- Malecki, E. (2003). Digital development in rural areas: potentials and pitfalls. *Journal of Rural Studies*, 19, 201–214.
- Max Lock Centre (2000a). *Improving knowledge transfer: Identifying the appropriate medium for communication (Guide 5)*. From <http://www.wmin.ac.uk/builtenv/maxlock/KTweb/KTF_Guide5.htm>.
- Max Lock Centre (2000b). *Improving knowledge transfer: Intermediaries in knowledge transfer and exchange (Guide 4)*. From <http://www.wmin.ac.uk/builtenv/maxlock/KTweb/KTF_Guide4.htm>.
- McBean, H. (2004). *Do unlikely partners contribute to an informed society?* Maastricht ECDPM (InBrief 11A).
- McBean, H. (2005). *What matters in a communication strategy*. Maastricht ECDPM (InBrief 11B).
- Mefalopulos, P., & Kamlongera, C. (2004). *Participatory communication strategy design: A handbook* (2nd ed). Rome: FAO.
- Michiels, S., & van Crowder, L. (2001). *Discovering the “Magic Box”: Local appropriation of information and communication technologies (ICTs)*. Retrieved 21 March 2003, from <http://www.fao.org/sd/2001/KN0602a_en.htm>.
- Milbourne, P. (1997). Hidden from view: poverty and marginalisation in rural Britain. In P. Milbourne (Ed.), *Revealing rural ‘others’: Representation, power and identity in the British countryside* (pp. 84–116). London: Pinter.
- Mills, B. F., & Whitacre, B. E. (2003). Understanding the non-metropolitan–metropolitan digital divide. *Growth and Change*, 34(2), 219–243.
- Mingione, E. (1997). Enterprise and exclusion. In: Christie & H. Perry (Eds.), *The wealth and poverty of networks: Tackling social exclusion*.
- Mueller, K. (March 2006). *World broadband statistics: Q4 2005*. Retrieved 12 May 2006, from <<http://www.point-topic.com/contentDownload/dslanalysis/world%20broadband%20statistics%20q4%202005.pdf>>.
- Norris, P. (2001). *Digital divide: Civic engagement, information poverty, and the Internet worldwide*. Cambridge: Cambridge University Press.
- NTIA (1995). *Falling through the net: A survey of the “have nots” in rural and urban America*. Retrieved March 2001, from <<http://www.ntia.doc.gov/ntiahome/fallingthru.html>>.
- NTIA (1998). *Falling through the net II: New data on the digital divide*. Retrieved March 2001, from <<http://www.ntia.doc.gov/ntiahome/net2/>>.
- NTIA (1999). *Falling through the net: defining the digital divide*. National Telecommunications and Information Administration.
- NTIA (2000). *Falling through the net: Towards digital inclusion*. National Telecommunications and Information Administration.

- O'Farrell, C. (2001). *Information flows in rural and urban communities: Access, processes and people*. Paper presented at the Development Studies Association, University of Manchester.
- ONS (2004). *Internet access*. Retrieved 15 February 2005, from <<http://www.statistics.gov.uk/CCI/nugget.asp?ID=8&Pos=1&ColRank=1&Rank=160>>.
- Parker, E. (2000). Closing the rural digital divide. *Telecommunications Policy*, 24(4).
- Pociask, S. (2005). *Broadband use by rural small businesses*. Charlotte, NC: United States Small Business Administration, Office of Advocacy.
- Point Topic (18 January 2006). *New results show a deeper 'digital divide'*. Retrieved 5 February 2006, from <<http://www.point-topic.com/content/dslanalysis/bbusdeepeningdigitaldivide060117.htm>>.
- Ramirez, R. (2001). A model for rural and remote information and communication technologies: A Canadian exploration. *Telecommunications Policy*, 25(5), 315–330.
- Ramirez, R., Haq, M., & Richardson, D. (2000). *Grameen telecom's village phone programme: A multi-media case study*. Guelph: TeleCommons Development Group.
- Richardson, T. (2004). *BT moves to 'universal availability' of broadband*. Retrieved 5 May 2005, from <http://www.theregister.co.uk/2004/04/27/bt_broadband_exchange/>.
- Rogers, E. (1995). *Diffusion of innovations* (4th ed). New York: The Free Press.
- Sanyal, B. (2000). From dirt road to information superhighway: advanced information technology (AIT) and the future of the urban poor. In J. Wheeler, Y. Aoyama, & B. Warf (Eds.), *Cities in the telecommunications age: The fracturing of geographies* (pp. 143–157). New York: Routledge.
- Schilderman, T. (2002). *Strengthening the knowledge and information systems of the urban poor*. London: Department for International Development (DFID).
- Selhofer, H., & Huesing, T. (2002). *The digital divide index—a measure of social inequalities in the adoption of ICT*. Retrieved 4 May 2005, from <http://www.sibis-eu.org/files/Huesing_Selhofer_DDIX_2002.pdf>.
- Servon, L. (2002). *Bridging the digital divide: Technology, community and public policy*. Malden, MA: Blackwell Publishers Ltd.
- SIBIS (2003). *Statistical indicators benchmarking the information society: General population survey*. Retrieved 4 May 2005, from <http://www.sibis-eu.org/statistics/stat_ind.htm>.
- Skerratt, S., & Warren, M. F. (2004). *Buckfastleigh broadband community network: Final report*. Plymouth, UK: University of Plymouth.
- Social Exclusion Unit. (2001). *Preventing social exclusion*. London: Social Exclusion Unit, UK.
- Sumner, P., & Yardley, M. (2006). *Predicting UK future residential broadband bandwidth requirements*. Cambridge: Analysis for Broadband Stakeholder Group.
- Talbot, H. (18–22 August 2003). *ICTs and social exclusion (and inclusion)*. Paper presented at the XXth Congress of the European Society for Rural Sociology “Work, leisure and development in rural Europe today,” Sligo, Ireland.
- Talyarkhan, S., Grimshaw, D., & Lowe, L. (2004). *Reaching the last mile: Knowledge sharing for development*. Paper presented at the fifth European conference on organizational learning, knowledge and capabilities, Innsbruck.
- The Communication Initiative (2005). *Planning models: Community driven development (CDD) principles*. Retrieved 26 January 2007, from <<http://www.comminit.com/planningmodels/pmodels/planningmodels-108.html>>.
- Vance, A. (2006). *Need cheap DSL? Go to Rwanda*. Retrieved 2 February 2007, from <http://www.theregister.co.uk/2006/02/23/rwanda_terracom/>.
- van Dijk, J., & Hacker, K. (2003). The digital divide as a complex and dynamic phenomenon. *Information Society*, 19(4), 315–326.
- van Winden, W. (2001). The end of social exclusion? On information technology policy as a key to social inclusion in large European cities. *Regional Studies*, 35(9), 861–868.
- Varley, J. (2006). Predicting UK future residential bandwidth requirements (open letter). In: B. S. Group (Ed.). London: Commission for Rural Communities.
- Warren, M. F. (2000). *E-farming or e-folly? Adoption of internet technology by farmers in England*. Newton Abbot, Devon, UK: University of Plymouth.
- Warren, M. F. (2002). Digital divides and the adoption of information and communication technologies in the UK farm sector. *International Journal of Information Technology and Management*, 1(4), 385–405.
- Warren, M. F. (2003). Agrinet—taking technology to the countryside. *Journal of Agricultural Education and Extension*, 9(1), 1–2.
- Warren, M. F. (2004). Farmers online: drivers and impediments in adoption of internet in UK agricultural businesses. *Journal of Small Business Enterprise Development*, 11(3), 1–2.
- Warren, M. F., & Skerratt, S. (2003). *Virtual villages: A new force in rural development?* Paper presented at the communities and technology conference, Amsterdam, 19–21 September 2003.