

Open Research Online

The Open University's repository of research publications and other research outputs

Grassroots initiated networked communities: a viable method of overcoming multiple digital inequalities within communities of locality?

Conference or Workshop Item

How to cite:

Gaved, Mark and Mulholland, Paul (2004). Grassroots initiated networked communities: a viable method of overcoming multiple digital inequalities within communities of locality? In: Building & Bridging Community Networks: Knowledge, Innovation & Diversity through Communication conference, 31 Mar - 2 Apr 2004, Brighton, UK.

For guidance on citations see [FAQs](#).

© 2004 The Authors

Version: Accepted Manuscript

Link(s) to article on publisher's website:

<http://www.cmis.brighton.ac.uk/research/seake/cna/documents/proceedings/index.html>

Copyright and Moral Rights for the articles on this site are retained by the individual authors and/or other copyright owners. For more information on Open Research Online's data [policy](#) on reuse of materials please consult the policies page.

oro.open.ac.uk

Grassroots initiated networked communities: a viable method of overcoming multiple digital inequalities within communities of locality?

Mark B. Gaved & Paul Mulholland
Knowledge Media Institute
The Open University, Milton Keynes, UK

Abstract:

The expression 'community network' has been used to describe a wide variety of networks with different aims and objectives, utilising diverse technologies, funding mechanisms, and existing for varying lifespans. This paper will focus on a specific form of community network - grassroots initiated networked communities. These are communities of locality that have developed their own Internet and /or intranet infrastructure with minimal external support. We analyse five examples of UK networked communities, and present preliminary survey results, identifying key characteristics and highlighting their approaches to achieving sustainable IT usage.

We contend that the design of many 'community networks' have been influenced by a discourse predominated by a focus on the provision of potential physical access, and as a result fail to provide an effective solution to the 'digital divide'. We argue a more complex model of multiple digital inequalities should be considered, as proposed by DiMaggio and Hargittai (2001). Our research extends this work by placing the community at the centre of action, as active participants within the process of achieving Internet connectivity, rather than as passive recipients of external intervention led projects. Furthermore, we suggest sustainability to be an additional, critical factor when considering digital inequalities. We hypothesise that grassroots initiated networked community projects offer a viable method of overcoming multiple digital inequalities and are likely to ensure sustainable IT usage, with individuals moving online as part of an active community of locality.

Further research has commenced to analyse how the presence of social software and near-ubiquitous Internet access affects the sharing and storage of information within a community of locality. An outline of this work is presented and indications of likely future developments are offered.

1. Introduction

The expression 'community network' has been used to describe a wide variety of networks with different aims and objectives, utilising different technologies, funding mechanisms, and existing for varying lifespans. The utility of community networks as a means to enable interaction has been of particular interest to researchers.

This is not a new phenomenon: the ability of the Internet to allow communities to communicate has been discussed since its origin. Licklider envisaged "on-line

interactive communities... not of common geography, but of common interest" (1968: 37 - 38). Technoevangelists have discussed the ability of the Internet to allow "the death of distance" (Cairncross, 1997), and much research has been carried out to investigate purely 'virtual communities', where the sole or primary means of communication is via the Internet.

However, as with previous innovations in telecommunications, existing social structures have not withered away or been replaced, and "local community undoubtedly matters in the lives of the great majority of people" (Willmott, 1986). A significant number of 'community networks' are based in part around physical communities, and the US Association for Community Networking declared in its inaugural publication that "community networks...refer to a particular geographic space containing community members in close physical proximity" (Kubicek and Wagner, 2002: 202). Schuler noted that in 1995 "there are nearly 300 operational systems" (1996: 25) and since then there has been a global expansion in the number of geographical communities using IT in a variety of methods to support or develop their locality.

This paper will focus on one specific form: grassroots initiated networked communities. These are communities of locality that have developed their own Internet and /or intranet infrastructure with minimal external support. Leveraging existing social ties and resources, they have developed network infrastructures linking residents within the physical community. Providing residents with Internet access, services, and tools to help store and communicate information within and beyond their neighbourhood is seen as beneficial to both the recipients and the community itself.

We consider five examples of such networked communities, studied during the summer of 2003, placing them within a broader context of the digital divide. Such initiatives may offer a more viable method of sustaining purposeful Internet usage than many current policy led interventions, and provide lessons that can be applied to the wider discourse surrounding the digital divide and the development of community networks.

2. Background: the digital divide

The British Government has declared the UK will be "a world leader in the new knowledge economy" (Cabinet Office, 2004). It is keen to make sure nobody will be "left behind in the new knowledge economy" (Gordon Brown quoted in Shearman, 1999: 3) and is seeking to achieve "universal access" to the Internet by 2005 (Cabinet Office, 2004). The Internet is seen as an important resource, offering "access to education, good jobs and better health ... and (providing) citizens with direct access to government" (DiMaggio and Hargittai, 2001: 3).

To facilitate the goal of 'universal access', government and policy makers have funded several initiatives. An 'Office of the e-Envoy' has been set up to lead "the drive to get the UK online" (Cabinet Office, 2004). Public buildings are being provided with Internet access and identified as 'UK Online Centres' to enable "everyone in the UK ... to have access to the Internet and e-mail near to where they live." (DES, 2004). One of the largest initiatives has been the Wired up Communities project, providing

computers and Internet access to seven communities¹ across the UK, investigating how Internet usage is affected by different combinations of access (dial-up or always on) and terminal (new or recycled computers, or set-top boxes).

We are concerned that these projects primarily focus on achieving potential physical access to the Internet. UK policy makers appear to have been greatly influenced by the original concern of the 'digital divide' – ensuring universal access to telecommunications (McConnaughey and Lader, 1998)². This focus has led to a discourse overemphasising the importance of establishing network infrastructure, to the detriment of other factors which may affect the achievement of sustained usage (Gillett, 2000; Evans, 2002).

The emphasis on achieving physical access may limit the success of these and similar projects. In reality, there are multiple barriers to meaningful Internet usage, and these must all be overcome in order to claim that that nobody has been 'left behind'. DiMaggio and Hargittai (2001) argue that as Internet penetration continues, researchers should shift their focus from analysing a dichotomous *divide*, to a study of multiple *inequalities* between those who are potentially connected:

- **Equipment:** the quality of computer hardware, software, and Internet access
- **Autonomy:** the control an individual has over how they can use their connection
- **Skill:** the knowledge to make best use of the equipment and access
- **Social support:** to be able to draw on others to develop skills and overcome obstacles
- **Purpose:** to have meaningful reasons to be connected

DiMaggio and Hargittai consider the effect these inequalities may have on an individual. We propose to extend their work by placing it within the community network discourse. An effective method of addressing inequalities may be to leverage the social resources of an established 'community of locality', a group of people residing within geographical proximity and connected by an existing network of social relationships. Moving online in a social environment may resolve the lack of formal support mechanisms (Hafner, 2003) and help users to maintain their skills set in the complex and rapidly changing technical environment (van Dijk and Hacker, 2003). Unlike IT usage in the workplace, where expert help is usually available, home users have limited access to technical support.

Many community network projects have been based on an external intervention to a selected recipient community and observing the consequences (e.g. Hampton, 2003).

¹ A 'community' was defined as "those living in relative proximity and made up of no more than 4000 people" (Devins et al., 2003).

² A 1995 US National Telecommunications & Information Administration report explored whether the US government's goal of ensuring universal access to telephones had been achieved, and extended its research to study penetration rates of computer and modem ownership. The report identified that "access to the computers and networks may be as important as access to traditional telephone services" (McConnaughey, Nila, and Sloan, 1995). A second survey noted that the US government had "made it a fundamental goal to connect all Americans to the information infrastructure" (McConnaughey and Lader, 1998).

We contend that the community needs to be placed as the central actor, and that Internet initiatives are most effective when undertaken by an elective community of active participants, rather than a selected community of passive recipients.

We propose that an important extension to DiMaggio and Hargittai's work is to consider long term *sustainability* as a significant factor. Dimensions of inequality must be readdressed periodically to ensure continued and meaningful Internet usage, and certain inequalities may evolve dynamically (van Dijk and Hacker, 2003). For example, computer equipment must be renewed, and software skills regularly updated.

An externally funded project may finish when its own goals have been achieved, regardless of the intentions of the recipient community. Concerns were raised within the Wired up Communities project as to whether Internet access would continue after the project funding ceased (Devins et al., 2003), and home buyers in the Canadian community of 'Netville' were dismayed when their network infrastructure was switched off. The residents had assumed that they were purchasing houses with a guaranteed utility, while the funding technology research consortium perceived the provision of services as a limited technological experiment (Hampton, 2003).

Temporary interventions may move people online and encourage uptake of Internet services, but if they are not sustained users may become ex-users. For the digital divide to be crossed, and constantly readdressed, we need to find a sustainable model. One possible solution may be grassroots initiated community network projects, where communities of locality, independent of significant external funding, have developed their own network infrastructure. Combined with a lack of dependency on external bodies, this may offer a more sustainable and long term solution to crossing the digital divide.

We argue three hypotheses:

- Approaching digital inequalities from a community rather than an individual perspective allows the opportunity to support the process through social interaction
- Grassroots initiated networked community projects can be more effective than external interventions as they are developed from elective rather than selected neighbourhoods, and can draw on existing social capital to achieve their goals
- Grassroots initiated networked community projects are likely to be more sustainable as they can set their own goals and may not be so dependent on external resources such as IT skills.

3. Case studies of grassroots initiated networked communities

Five grassroots initiated networked communities spread across the UK were analysed in summer, 2003. An ethnomethodological approach was employed: semi-structured interviews were undertaken with project initiators in all locations, and end users were

interviewed within one of the communities. Interviews were carried out with project initiators as it was felt that they could offer the best overall view of how each project worked. However, we were also interested to speak to end-users of the projects to see if their views and goals were similar to those of the initiators.

An initial classification of projects has been undertaken and key characteristics are presented. We report on preliminary findings; identifying examples of networked communities, their structure, key software tools utilised and chief aims and objectives. The projects studied have been given pseudonyms. A summary of the communities is provided in Table 1 below.

Project	Digital Estate	Northern Coop	Southern Wired	Southern Wireless	Scottish Wireless
Location	Northern English city	Northern English city	Southern English city	Southern English city	Scottish city
Geographic spread	Housing estate (250 houses)	Housing estate (75 houses, 25 business units)	Housing Association (30 houses)	City wide	City wide
Established	1998	1998	2001	1997	2001
Predominate infrastructure	Wired	Wired	Wired	Wireless	Wireless
Number of users	150	Approx 80	37	100+	30
% of physical community connected via network project	>60%	>80%	>90%	<1%	<1%
Training	Initial setup, drop-in centre, cascading model from experienced to novice members	Initial setup, informal support, cascading model from experienced to novice members	Initial setup, informal support, cascading model from experienced to novice members	Workshops, documentation through website, cascading model from experienced to novice members	Initial setup, documentation through website, cascading model from experienced to novice members
Access to Internet	2Mb shared connection	2Mb shared connection	2Mb shared connection	Variable, multiple nodes	Variable, multiple nodes
Internet services provided	Public website, mailing lists	Mailing lists	None	Public website, wiki, mailing lists	Public website, wiki

Table 1: Key characteristics of grassroots initiated networked communities

3.1 'Digital Estate'

Location

Digital Estate is based within a low income housing estate in a large northern English city. The community of locality consists of six blocks of three storey, 1940s built maisonettes, bordered by three streets, the remaining properties from a formerly greater estate that has since been rebuilt. The population has a distinctive cultural identity, with a large number of single adults.

Goals

The project aims to offer low cost Internet access to all properties on the housing estate and facilitate communication amongst residents via intranet services. The project offers "connectivity not social support" and sees its remit as providing basic service access, and giving residents the opportunity to develop their own services within the infrastructure. The project started in 1998, and has connected 150 out of 250 properties. The core team are seeking to achieve full coverage of their defined locality, but do not see advantage in expanding beyond this, preferring rather to help other communities develop similar projects.

Operating model

The project started as an informal group of active residents and has recently become an independent limited company to enable the project to apply for government funding. The core project team consists of four volunteers, occasionally supported by additional residents for specific task, e.g. grant applications. End users are charged 5 pounds (UK sterling) each month to access Internet and intranet services, and the project maintains a "no cut-off policy" for residents who do not keep up with the subscriptions: however such users are not entitled to vote at meetings. Members are responsible for purchasing their own computers while the project develops the underlying infrastructure. As users are connected, they are given informal training by the project member carrying out the work. Most user support is carried out on an informal basis, with expert users helping novices. However, the Digital Estate project benefits from an open-access office, shared with the tenant management group, which effectively provides an informal drop-in support service to its members.

Technical infrastructure and tools

The project has a 2Mb connection to the Internet, shared across the community from a central access point via standard computer cabling run between houses. The core team maintains mailing lists to facilitate communication within the community, and further services have been set up and run by members, such as music and games servers. A website informs the public about the project and the community of locality.

3.2 'Northern Coop'

Location

Northern Coop is based in a newly developed self contained housing redevelopment in a large northern English city. The project contains approximately 75 flats and 25 business units, owned by a social landlord with the intention of providing affordable urban housing. The housing development is clearly defined modern block that has won several architectural awards, and is run as a housing cooperative by its tenants.

Residents have a wide demographical spread, with strong communal and environmental culture.

Goals

The networking project started in 1998 and aims to offer all members of the housing development low cost access to the Internet and shared intranet services. The project seeks to use the intranet to communicate news and information between the residents of the housing development and hence is devising a model where access to the Internet is charged, while access to the community intranet is free, so as not to exclude residents on cost grounds. Currently the project has connected approximately 60 of the residential flats.

Operating model

The project is currently part of the housing cooperative so all decisions carried out have to be approved by the parent body, however, it is in the process of becoming a separate cooperative allowing financial and decision making independence. The project has a core team of four volunteers, with residents of the community becoming involved in specific projects such as extending cabling to their own houses. The core team are actively seeking to encourage additional participation by residents. Informal training is provided by the core team but they see their primary role as providing connectivity, and technical support mainly exists as a cascading model, with knowledge being passed informally from experienced to novice users.

Technical infrastructure and tools

The project has a 2Mb connection to the Internet, shared across all the properties, via cabling that has been laid by residents to building regulation standards. The project team recycles computers and offers these to residents at low cost. Mailing lists are used to communicate within the intranet, and the project team are considering developing additional services.

3.3 'Southern Wired'

Location

Southern Wired operates within a housing association formed to regenerate 30 properties in two Victorian streets in a large southern English city, saved from demolition by the occupants. The properties are a mixture of multiple occupancy live/work units, and one and two bedroom flats. The community mainly consists of single people aged between 25 and 45, with some young children.

Goals

The networking project aims to provide low cost Internet access to all residents of the housing association. Residents have identified a need for better communication of housing association information and the project seeks to develop an intranet with services to facilitate this goal. The project also aims to provide the means for informal communication between residents. Southern Wired was set up in 2001 and has 28 out of 30 properties connected. The project is considering extending the network to support neighbouring clusters of properties, in response to requests from their residents.

Operating model

The project is run by four residents on a voluntary basis, and has independent financial status. Three of the project team are also committee members of the housing association, and key decisions are made in close cooperation with this parent body, for example deciding to investigate the possibility of running CCTV cameras through the intranet. The majority of the residents are highly computer literate, and generally own equipment of a high standard. Training is provided by experienced users informally supporting novice users, though the project is seeking funding for training sessions as these have been requested by end-users.

Technical infrastructure and tools

The project provides a shared 2Mb connection to the Internet, and houses are connected by cables run from the central server. No intranet services are currently running, however these are seen as key resources to develop. The core project team are keen to provide services to support the storage and dissemination of housing association information, as well as discussion boards and document repositories for the tenants.

3.4 'Southern Wireless'

Location

Southern Wireless operates within the eastern part of a large southern English city. This is a mainly low income area, with a mixture of high density residential housing, and light industrial and commercial properties. Participating members of Southern Wireless are spread in a wide area across the city, and are mainly young and highly Internet literate.

Goals

The project describes its mission as providing "a collaborative strategy for the self-provision of a broadband telecommunications infrastructure". The project aims to connect together interested parties within a large metropolitan area, using wireless networking technologies, to "build clusters of interconnecting networks" and gradually develop wireless access to the Internet across the UK.

Operating model

Southern Wireless is an affiliation of interested parties. Its main activity is to coordinate developments through training, meetings and providing public web services. Southern Wireless is keen to develop individual members' skills and runs regular open access technical workshops as well as core members providing informal support to new members and encouraging experienced participants to buddy up with new members. The project started in 1997 and the majority of activity is focussed in the south and east of the city, with approximately 100 members, but the project has a wider membership across the UK and collaborates with similar projects internationally, for example with the Seattle Wireless Network.

Technical infrastructure and tools

The project does not provide any centralised technical infrastructure, rather it seeks to encourage the sharing of members' own resources. Wireless technologies predominate and the project encourages members to set up broadband Internet access and wireless access points and to share facilities with other interested parties. As a loose

confederation, Southern Wireless acts as a meeting point and a catalyst, and encourages common protocols and equipment standards to facilitate the growth of the network.

3.5 'Scottish Wireless'

Location

Scottish Wireless is based within a large Scottish city. The city is densely populated with mainly tenement housing and has a wide demographic spread. Participating members of Scottish Wireless are mainly young and computer literate.

Goals

The project aims to develop a wireless network infrastructure across the city to provide low cost, high speed Internet access via multiple nodes, and a shared intranet, on a peer-to-peer model with resources provided by members. Ideally the project team would like to connect a large number of residents in the city but realistically they believe their goal is to act as a focus for early adopters using wireless technologies.

Operating model

The project was initiated in 2001 by members of 'Southern Wireless' and follows a similar operating model. The core team consists of three volunteers, with a wider membership of approximately 20 other members participating in varying degrees of activity, mostly working at the local university. The members form a loose affiliated collective, and no charge is levied for participation. The core team provide advice in helping members set up their equipment initially, and informal ongoing technical support. There is a strong ethic of knowledge sharing and experienced members seek to help novice users increase their skill levels to the point at which they can in turn support new members.

Technical infrastructure and tools

The project does not provide any technical infrastructure, rather members are expected to purchase their own equipment, and share network resources. The core team drives this goal by acting in an advisory role, offering technical support, and producing documentation, standards, and software to help the adoption of wireless networking across the city. The project has a public website which is the key repository for resources.

3.6 Summary of end user studies

In addition to interviews with initiators, fourteen semi-structured interviews were undertaken with end users in 'Southern Wired' in Autumn 2003. The intention was to gain an understanding of end users' levels of abilities, goals, and perceptions of the networking project. Key findings included:

- End users valued the ability to access the Internet from their own home. While many users were able to access the Internet from other locations such as public libraries or workplaces, these were seen as being limited in terms of how and when the services could be used.

- End users generally rated their 'Internet skills' as higher than their 'computer skills', suggesting a high degree of comfort with the idea of the computer as an interface to the Internet: one user commenting "if the computer is offline it's only 10% of the machine it is when it's online". The two most popular usages of the computer were 'Email' and 'Looking for information on the web' (third equal were 'Working from home' and 'Word processing').
- The community network was seen as integral to the community of locality. Price of service was noted as a significant factor. There was a widespread desire to see greater exploitation of the potential of the intranet, with document repositories, discussion boards and music sharing as popular suggestions. Few users were interested in synchronous communication tools such as Internet Chat, preferring to use the Internet to supplement existing proven methods of communication: "If I want to talk to somebody I'll just pop round for a cup of tea".

4. Key findings of research

The study of these examples of grassroots initiated community networks is ongoing, but it is possible to offer some preliminary conclusions.

There is a clear division between the 'wired' projects that have connected a specific community of locality, and the 'wireless' projects seeking to encourage usage of wireless networking across wider localities. The former appear to be networking projects *of* communities, while the latter are networking projects *in* communities. The wireless projects could be perceived as communities of interest operating within a larger of community of locality, whereas the 'wired' projects are more integral to the communities they serve, and are identified as such by their users. This may not be for simple technological reasons, but rather the level of participation in the project within the community of locality, or the more defined identity of the smaller communities.

The studied projects are of a very informal nature, with a small core team supported by varying degrees of support from the wider user community. Several have evolved to more formal independent structures, but all very much consider themselves as part of the host community of locality. The three projects that work within a community of locality supported by a housing organisation have regular and close contacts with this management organisation.

The 'wired' projects appear to be managed in a more formal, hierarchical style, with a central team initiating developments, controlling the central servers, and responsible for installing and maintaining network infrastructure. The 'wireless' projects operate closer to a peer-to-peer model, and the project team themselves seem to encourage this more horizontal structure. The latter appear to place a greater emphasis on providing training and documentation to enable members to develop their own autonomy.

All projects studied are relatively small scale (less than 200 members), and all interviewees indicated that they felt that a sense of identity would be lost if the projects grew too large. Initiators indicated that they would prefer to enable separate

projects to form rather than expanding their own beyond the bounds of their immediate community, talking rather in terms of 'federations' of networks.

Training is undertaken through largely informal procedures: initial help in setting up new users' equipment, informal support through personal contact with the core team, and a form of cascading training with experienced users helping novices. The model appears to be similar to Lave and Wenger's description of apprenticeship, or training within communities of practice (Lave and Wenger, 1991).

All groups emphasise the value of the networks to enable the host community to store and disseminate local information, and to provide more than merely cheap Internet access. This may support sustained IT usage within the communities, providing a meaningful reason to be connected.

The results of end user interviews in Southern Wired suggest that there is a close match between the goals and ambitions of end users and initiators. In itself this may be a significant factor in assuring the long term sustainability of grassroots initiated networked projects.

5. Summary and future work

Based on current findings, we hypothesise that grassroots initiated networked community projects offer a viable method of overcoming multiple digital inequalities and are likely to ensure sustainable IT usage, with individuals moving online as part of an active community of locality. This approach offers individuals a purpose for using IT, autonomy of usage, and a support structure to help keep them online. In turn, the community itself may benefit from the enhanced ability of its members to store and share knowledge afforded by the community network.

In the light of our findings so far, we will concentrate on researching the following aspects:

- Continued analysis of networked communities, contacting further examples of grassroots initiated networked communities, and interviewing initiators and end users
- A survey of social software. We will seek to develop Bashaw and Gifford's work (2004) and research whether it is possible for social software to significantly support a community of locality and increase communication between members.
- Participatory development of social software within one community. Working alongside core members from one project, we will aim to identify user needs and implement a suitable set of software tools within the community's intranet. A test suite of applications will be implemented within the network, and usage monitored through log files and semi-structured interviews. The resulting data will be analysed to test the hypothesis that community based social interaction can help overcome multiple digital inequalities and provide meaningful and sustained IT usage.

References

- Bashaw, D. and Gifford, M. (2004) *Top ten tools for eActivism*. Online. Available HTTP: <http://www.mail-archive.com/do-wire@lists.umn.edu/msg00121.html> (15 February, 2004)
- Cabinet Office (2004) *Office of the e-Envoy*. Online. Available HTTP: <http://www.e-envoy.gov.uk/Home/Homepage/fs/en> (15 February 2004)
- Cairncross, F. (1997) *The death of distance: how the communications revolution will change our lives*. Cambridge, Mass: Harvard Business School Press.
- Department for Education and Skills (2004) *UK Online Centres*. Online. Available HTTP: <http://www.dfes.gov.uk/ukonlinecentres/> (13 February, 2004)
- Devins, D., Darlow, A., Petrie, A., and Burden, T. (2003) *Connecting communities to the Internet: evaluation of the Wired Up Communities Programme*. Leeds: Leeds Metropolitan University.
- DiMaggio, P. and Hargittai, E. (2001) *From the 'digital divide' to 'digital inequality': studying Internet use as penetration increases*. Princetown: Princetown University (Working paper # 15).
- Evans, K. F. (2002) *Introducing information and communication technologies into marginalised neighbourhoods: an exploration of the digital divide*. Ph.D. Thesis. Salford: University of Salford.
- Gillett, S. E. (2000) Universal service: defining the policy goal in the age of the Internet. *The Information Society* 16,2: 147–149.
- Hafner, K. (2003) *Techies by necessity, not by choice*. New York, New York Times, July 24, 2003. Online. <http://www.nytimes.com/2003/07/24/technology/circuits/24boot.html?pagewanted=1&ei=5007&en=3e4d3d02e87cf9c7&ex=1374379200&partner=USERLAND> (Accessed 15 February, 2004)
- Hampton, K. (2003) Grieving for a lost network: collective action in a wired suburb. *The Information Society* 19,5: 1-13.
- Kubicek, H. and Wagner, R.M. (2002) Community networks in a generational perspective: the change of an electronic medium within three decades. *Information, Communication & Society* 5,3: 291–319.
- Lave, J. and Wenger, E. (1991) *Situated learning: legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Licklider, J.C.R. and Taylor, R. (1968) The computer as a communication device. *Science and Technology: For the Technical Man in Management* 76: 21 – 31.
- McConnaughey, J. W. and Lader, W. (1998) *Falling Through the Net II: new data on the digital divide*. Washington, D.C: National Telecommunications and Information Administration.
- McConnaughey, J.W., Nila, W., and Sloan, T. (1995) *Falling through the Net: A survey of the 'have nots' in rural and urban America*. Washington, D.C: National Telecommunications and Information Administration.
- Schuler, D. (1996) *New community networks: wired for change*. New York: Addison - Wesley.
- Shearman, C. (1999) *Local connections: making the net work for neighbourhood renewal - Communities Online's response to the Social Exclusion Unit's report: Bringing Britain together: a national strategy for neighbourhood renewal*. London: Communities Online.
- van Dijk, J. and Hacker, K. (2003) *The digital divide as a complex and dynamic phenomenon*. *The Information Society* 19,4: 315 - 326.

Willmott, P. (1986) *Social networks: informal care and public policy*. London: Policy Studies Institute.