Linking Social Deprivation and Digital Exclusion in England

Paul A. Longley and Alexander D. Singleton

Abstract

This paper develops a cross-classification of material deprivation and lack of digital engagement, at a far more spatially disaggregated level than has previously been attempted in the UK. This is achieved by matching the 2004 Index of Multiple Deprivation (IMD) with a unique nation-wide geodemographic classification of ICT usage, aggregated to unit postcodes. The results of the cross-classification suggest that lack of digital engagement and material deprivation are linked, with high levels of material deprivation generally associated with low levels of engagement with ICTs and vice versa. However, some neighbourhoods are 'digitally unengaged' but not materially deprived and the paper investigates the extent to which this outcome may be linked to factors such as lack of confidence, skills or motivation. As with material deprivation, there are distinctive regional and local geographies of digital unengagement and these have important implications for digital policy implementation.

1. Introduction

The key distinction of the 1990s through which society was classified into the digital 'haves' and 'have-nots' is radically changing. Most people in the UK now have access to some digital technology, whether through devices that they own or simply through usage in public places (Burrows *et al.*, 2005). In these changed circumstances, variation in awareness and usage is no longer best represented as the crisp and well-defined 'digital divides' (Compaine, 2001) that were

posited a decade ago (Warschauer, 2004; see also Crang *et al.*, 2006); instead, today's key issues, as in other developed countries, concern emergent patterns of digital differentiation within the population (Burrows and Lane, 2006). Such differentiation is becoming manifest in terms of access to different types of goods and services (Harris *et al.*, 2005), in the speed and convenience of access and in the availability of new technologies in public and private domains. Thus high-speed networks, new hand-held and desktop devices, better interface and system design, and new ways of

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interacting using the Internet are all having important impacts upon productivity, work and social interaction. Yet there is little generalised understanding of the ways in which these new subtle divides match more conventional patterns of social stratification (see Graham, 2002). The principal motivation for this paper is to begin to link the established literature on material deprivation with emergent thinking about digital 'exclusion'. Our approach is avowedly empirical and rooted in the practice of geodemographic profiling of neighbourhood areas (see Harris *et al.*, 2005). Specifically, we see use of data sources additional to those available through censuses of population as key to encapsulating the salient characteristics of small areas.

With respect to the developing literature on 'digital exclusion', the usefulness of binary 'divides' has been challenged in empirical terms by Longley *et al.* (2008), through the development of a geodemographic typology of the ways in which different groups in society use or access technology. They describe how usage is stratified into a spectrum of observed behaviours, covering a variety of connectivity options, access patterns and motivations for usage. Their research was conducted under the UK Economic and Social Research Council's (ESRC) 'E-society' programme and involved the creation of a classification for both individuals and unit postcodes into a series of 21 categories. This paper develops a novel application of an aggregated version of the e-society classification at unit postcode level. A full review of the data and methods used to create the e-society classification is outlined in Longley *et al.*, (2008) and will not be considered in detail here. Briefly, however, the classification uses a series of private-sector data sources, supplied as an 'in kind' contribution to the research by Experian plc (Nottingham, England) and uses the same kind of classification methodology as is used in a number of commercial geodemographic systems. The need to create such a classification

arises in part because of the lack of direct indictors of 'digital engagement' in public-sector data sources. In some countries, there has been an attempt to include such indicators—the Australian Census of Population, for example, includes a question on computer ownership (Gibson, 2003)—but even such (useful) measures fall short of presenting any detailed picture of the spectrum of uses to which the wide variety of available devices can be put. Hence, for England at least, the construction of a classification of this nature is necessary to enable any type of national mapping of digital exclusion.

In England, the 2004 Index of Multiple Deprivation (IMD; see ODPM, 2004) is an attempt to identify neighbourhoods where poor physical and social conditions coincide (Smith and Smith, 2005). This widely used summary measure is an aggregation of seven constituent domains—income, employment, health deprivation and disability, education skills and training, barriers to housing and services, crime, and the living environment. Policy analysis often focuses upon the single or two most deprived deciles, as identified by the summary measure. Hitherto, there has not been any common framework through which local patterns of digital exclusion and material deprivation (as measured by the IMD) might be systematically compared across England.

2. Objectives and Methodology

The motivation for the analysis developed in this paper is to understand the interrelationship between material deprivation at Super Output Area Level, as measured by the IMD, and what is often described as 'digital inclusion' (Milner, 2007), as a precursor to the formulation of digital inclusion policy. There is an extensive literature on the nature and characteristics of material deprivation (for example, Harris and Longley, 2004; Lee, 1999; Noble *et al.*, 2006) which we will not review in detail here, except to emphasise

the importance of viewing deprivation as the outcome of a range of dynamic social processes rather than a static state, and the need to formulate policies for areal action in this context. The terms 'digital divide' and 'digital exclusion' are similarly dynamic in terms of neighbourhood trajectory, but the terms are in some senses vague in that they describe states that may be the outcome of quite different processes and behaviours (Nettleton *et al.*, 2004). Although inelegant, we prefer the term 'digital unengagement' to the more pejorative 'digital exclusion' when describing the outcome of processes that fail to engage significant proportions of the population in the use of ICTs. There are likely to be many causes of digital unengagement and there is good reason to anticipate that it has predominantly negative consequences for the unengaged—in terms of core workplace and labour market skills, access to public goods and services (such as health and, increasingly, education) and the ability to obtain the best prices for many privately consumed goods and services (Parayil, 2005).

We see the unique contribution of this paper as its focus upon the coincidence of areas of material deprivation, as measured by the 2004 IMD at Super Output Area level, and those areas which on average are characterised by a lack of digital engagement, as measured by the UCL 'e-society' classification at the scale of the unit postcode. The issues associated with comparing classifications across multiple geographies, and indeed the ecological fallacies inherent in geographical analysis, are also addressed. The results of this analysis are of potential importance to a very wide range of policy-makers concerned with improving the life chances of local residents (for example, Dorling *et al.*, 2007), as well as those concerned to engage the private sector in addressing the likely future needs of those who are yet to embrace ICTs. In addition to examining the relationship between the summary measure of deprivation and different

types of 'digital exclusion', we also examine the somewhat diverse associations between digital exclusion and the different constituent domains of the summary measure.

The UCL 'e-society' classification is based upon a detailed nation-wide analysis of consumer access to new ICTs and a classification of every household and address in Great Britain in terms of the nature of their use of and access to these digital technologies (Longley *et al.*, 2008). It is best thought of as a specialised geodemographic classification (Harris *et al.*, 2005), the likes of which are used by almost every significant private-sector customer-facing organisation in the UK today, and which are attracting increasing attention and use within public-sector applications (Longley 2005; Ashby *et al.*, 2006). Such classifications are usually presented at the scale of the unit postcode and for this reason are often referred to as 'neighbourhood classifications'. Most geodemographic classifications seek to assign people to groups that share similar characteristics or behaviours, although there is rarely if ever any clear theoretical rationale as to why shared characteristics in terms of newspaper readership, credit card usage or vulnerability to particular health problems should account for observed variations in behaviour with respect to social attitudes or consumption of a very wide range of private and public goods. The elements of this debate have been rehearsed in Singleton and Longley (forthcoming) and are not reproduced here; however, a central argument is that it may be more appropriate to create bespoke, or application-specific, geodemographic classifications for clearly specified purposes, rather than rely upon general-purpose classifications. This argument may be centrally relevant in the case of public-sector applications, if the weighting schemes that largely govern classification outcomes are commercial secrets, thereby severely inhibiting scientific reproducibility and hence public accountability.

The UCL 'e-society' classification is specifically concerned with people's engagement with new information and communications technologies. It was devised to provide context to the various projects that make up the UK Economic and Social Research Council's 'e-society' research programme, which remains the biggest-ever research initiative to ascertain the impacts of new ICTs upon society. Using this classification, every unit postcode in England may be assigned to one of eight groups. Each group is characterised by distinctive behaviours and the groups are in turn divided into a total of 23 distinctive types. A summary of the groups and types that make up the classification is shown in Table 1 and brief descriptions of the groups are provided in Table 2. Longley *et al.* (2008)

detail the methodology through which the classification was developed—essentially by combining a series of technology and other surveys with other socioeconomic and demographic data, using an industry standard profiling procedure. The classification was initially created at the level of the individual citizen, but is aggregated to English unit postcodes for use in the analysis reported in this paper. It should be interpreted as a proxy for the general level of e-unengagement of an area rather than the specific characteristics of every individual resident within it and thus is potentially vulnerable to the ecological fallacy (Harris *et al.*, 2005). In common with commercial geodemographic systems, the salient characteristics of the groups and types of the classification are summarised in

Table 1.   The e-society classification

e-society groups	*e-society types*
A: E-unengaged	A01: Low technologists A02: Cable suffices A03: Technology as fantasy A04: Mobile's the limit A05: Too old to be bothered A06: Elderly marginalised
B: E-marginalised	B07: The Net; what's that? B08: Mobile explorers B09: Cable TV heartland
C: Becoming engaged	C10: E-bookers and communicators C11: Peer-group adopters
D: E for entertainment and shopping	D12: Small-time Net shoppers D13: E for entertainment
E: E-independents	E14: Rational utilitarians E15: Committed learners E16: Light users
F: Instrumental E-users	F17: Computer magazine readers F18: E for financial management F19: On-line apparel purchasers F20: E-exploring for fun
G: E-business users	G21: Electronic orderers
H: E-experts	H22: E-committed H23: E-professionals

Table 2. Brief descriptions of the e-society groups

Group A: E-unengaged

The 'E-unengaged' are typically groups that do not have access to electronic communications or technologies. Most are too old, too poor or too poorly educated to be able to access them and instead traditionally rely upon personal contacts they trust for advice. Within this group, there are low levels of literacy and many people do not feel that their life outcomes are much subject to their own decisions. Within this group, there is a very low level of ownership of personal computers, very little access to them at work and little ambition to master the skills necessary to take advantage of information technologies. Unsurprisingly, these people have a very low level of using e-mail at any location (home, work and other locations) or participating in other on-line activities.

Members of this group tend to live in the poorer areas of traditional mining and manufacturing towns and to have conservative social attitudes. A high proportion of the group is made up of elderly people, many of whom live in social housing or sheltered accommodation.

Group B: E-marginalised

The 'E-marginalised' are not necessarily averse to the use of electronic technologies but often lack the disposable income to equip themselves with them, or the training and education needed to understand how to make effective use of them. In this group, we find a very low level of PC ownership and very little use of the Internet to obtain information or to undertake transactions. However, there are members of this group who regularly use personal computers to keep in touch via e-mail and more are considering getting on-line. This group does use simpler and less expensive technologies such as mobile phones.

Many members of this group are relatively unskilled young workers, many of whom are in manual occupations. Many also live in low-rise council estates, in areas of high unemployment, low incomes and where people are reliant upon public services.

Group C: Becoming engaged

Members of this group often acquire their competence in the use of information technology at work, since many of them are young people working in junior white-collar occupations in modern offices. They are keen to become more expert in the use of new technologies and to use them for new applications. Many spend time browsing the Internet but without necessarily making many transactions.

Many members of this group work in large cities and may be starting a life in a house that they own, typically in one of the cheaper inner suburbs. Their use of the Internet at work may be a practice that their employers may be keen to control or reduce.

Group D: E for entertainment and shopping

This group includes a number of moderately well paid blue-collar workers for whom the Internet and personal computing provide important leisure activities. This group tends to use the Internet not for obtaining information about products or for learning, but rather to provide access to music, games and general entertainment. People in this group are smart enough to learn new methods of accessing what they want, but they are not necessarily interested in technology for its own sake. Besides providing a form of personal relaxation, they also see the computer as a resource for family entertainment.

Members of this group are found among areas of cheaper owner occupied housing, particularly in neighbourhoods with high proportions of households with children.

Group E: E-independents

This group tends to take a rational and considered view of electronic communications and technologies. These people are not interested in mobile phones, texting or the Internet as lifestyle

(Continued)

(**Table 2.** *Continued*)

accessories; they do not feature as major topics of conversation within the social networks to which they belong and they do not provide a significant focus for leisure activity. However, people are reasonably well equipped and use the Internet to search for information, to buy products and to undertake transactions where there are obvious efficiency benefits.

Group F: Instrumental E-users

This group tends to use electronic technologies for purely instrumental purposes, because they provide a practical method of saving time or money. They have plenty of other leisure activities that they enjoy and tend to be light television watchers. However, they find the Internet useful for purchasing on-line and they are smart enough to realise that they can drive better deals when purchasing goods and services if they fore-arm themselves with consumer information. Generally, they use the Net to undertake transactions and manage their personal finances rather than to explore.

This group contains mostly people in well-off, middle-class, owner-occupied suburbia. Many have children.

Group G: E-business users

This group includes many people who use electronic technologies in order to run their business. These may be people working in a technology-related business or in a small business which needs to keep in electronic contact with its suppliers or its customers. Many of this group are self-employed and make relatively little use of the technology as a leisure activity.

The group is well represented in upper-income neighbourhoods attracting older professionals as well as in the countryside.

Group H: E-experts

Members of this group have every confidence in their abilities to undertake on-line transactions and to make full use of electronic technologies. These are the type of people who are able to make use of personalisation and configuration options. They enjoy exploring the features in electronic menus and will navigate them in an efficient manner. They prefer on-line to interpersonal sources of information and make use of the Internet as an information source for obtaining best value for money. These people are heavy e-mail users. Many of them are involved in the development of information technology applications at work and see leisure time spent on electronic technologies as enhancing their human capital. Many recent graduates belong to this group.

This group is particularly concentrated in large cities and in the South East of England.

'pen portraits' and are assigned shorthand names. This procedure encapsulates many of the subjectivities inherent in geodemographic classification and public-sector users of such systems are often very wary of it, because of the values implied by labels such as 'White van culture' or 'welfare borderline'. One 'solution' to this dilemma is simply to use neutral labels ('group A', 'type A01', etc.) instead of pen portraits but this, in our view, reduces the intelligibility of a classification to all but the most specialist of users. The 'pen portraits' of the 'e-society' groups and types presented in Tables 1 and 2 are only summaries (full descriptions of the 23 types may be found at www.spatial-literacy.org/esocietyprofiler/eclassification.php). In general terms, it is helpful to think of the classification as suggesting increasing engagement in usage of information and communications technologies as one moves from type A01 ('Low technologists') to type H23 ('E-professionals').

Comparison of the levels of 'e-engagement' posited by the e-society classification with the IMD requires consideration of the two different geographies (unit postcode and Census Super Output Area respectively) through

which they are structured. They may be linked using a lookup created using the National Statistics All Fields Postcode Directory (NSPD). This file records the spatial references of all unit postcodes in England and lookups are provided to a series of different areal units in which they reside (for example, Super Output Areas). These data were appended to the e-society classification, thus enabling the matching of the IMD at Super Output Area level, yet rendering the comparison vulnerable to further potential ecological fallacy (see Martin and Longley, 1995). This is a common problem with many social science applications involving cross-level inferences and full reviews of the various implications can be found in Tranmer and Steel (1998), Steel and Holt (1996) and Wrigley (1995). However, there is no simple solution. Moreover, Fotheringham *et al.* (2000) note that modelling spatial behaviour at the individual level may also create an atomistic fallacy, where the context in which behaviour occurs is missing.

The IMD classification is derived using multiple data sources relating to different aspects of material disadvantage and, using a methodology which combines this information, a summary score is created which aims to present a measure of the level of overall deprivation of every Super Output Area. In addition to this overall measure, the constituent sub-domains are also presented as a series of separate scores; these concern health, employment, income, education, crime, the living environment and barriers to housing and services. Additionally, both the summary score and scores of each of the constituent domains are commonly divided into deciles. A full review of the detailed statistical methods and data used to create this classification is provided by ODPM (2004). It is important to note that, post-devolution in the UK, the basis to the calculation of the IMD is different in the constituent parts of the UK: for this reason (and also because the e-society classification is

not available for Northern Ireland), we restrict our comparison to England.

Although the IMD is presented as a continuous score, public policy usually focuses upon the areas that are observed to fall in the most materially deprived quintile (20 per cent) or decile (10 per cent). The main analysis that we will develop here examines the associations between the most deprived quintile of the deprivation measures and the neighbourhoods that are least engaged with ICTs. Conception of a phenomenon clearly impacts upon the ways in which it is measured and subsequently analysed, and the conception of 'digital unengagement' set out at the beginning of this paper suggests at least three possible ways in which the groups and types of the UCL 'e-society' classification, as shown in Table 1, might be used in comparison with the IMD measures: type A01 ('low technologists'), which comprises approximately 9.2 per cent of all Super Output Areas; group A (the 'e-unengaged'), which comprises approximately 31.4 per cent of areas; and, groups A and B combined (the 'e-unengaged' plus 'e-marginalised'), which together comprise approximately 39.6 per cent of areas. In our analysis, we have experimented with each of these groupings. Our emergent view, guided by research findings of the Social Exclusion Unit (SEU, 2000) and Scottish Office (2000), was that combination of groups A and B offered the most useful operational definition of 'digital unengagement', consistent with the likely scale of the problem. Therefore, for the purposes of this analysis, the 'digitally unengaged' are construed as consisting of the neighbourhood types shown in Table 3.

It is important to emphasise that this definition of 'digital unengagement' does not simply comprise neighbourhoods that are 'digitally deprived' through lack of means to access or acquire information and communications technologies. Rather, the richness of the e-society classification also makes it

Table 3. The e-society neighbourhood types that define 'digital unengagement'

Group A: E-unengaged
A01: Low technologists
A02: Cable suffices
A03: Technology as fantasy
A04: Mobile's the limit
A05: Too old to be bothered
A06: Elderly marginalised
Group B: E-marginalised
B07: The Net: what's that?
B08: Mobile explorers
B09: Cable TV heartland

possible to identify neighbourhoods where residents feel unmotivated to become engaged under their prevailing circumstances. It is also important to note that this definition relates not only to Internet usage, but also inability or reluctance to use a wide range of ICT tools for day-to-day tasks that are increasingly commonplace. These aspects of the definition are made clear in the detailed 'pen portraits' of the different neighbourhood types that were developed as an intrinsic part of the classification.

3. Results and Analysis

A four-way cross-tabulation of digital unengagement, as defined in section 2, and material deprivation, as defined by the bottom quintile of the 2004 summary index, are shown in Table 4. Using the 2001 population counts disseminated by the Office for National Statistics to produce population estimates for Super Output Areas, the implication is that in 2001 approximately 5.61 million people in England were living within areas which were characterised as both materially deprived and unengaged with respect to ICT usage. More people (an estimated 17 780 513) are living in digitally unengaged areas, as defined using our preferred measure, than fall into areas classified as falling into the bottom quintile of the IMD areas (9 782 511).

Figure 1 shows the cumulative frequency of unit postcodes (as a proxy for population size) that fall into each of the e-society types, ordered from the most engaged to the least. The straight line presents the 'equal share' trend that would prevail if each of the 23 types accounted for the same share of the population. The path of the 'postcodes' line shows that most of the types that make up group A are larger in population size than the average type. Type A01 ('Low technologists') accounts for a particularly high proportion of all postcodes, consistent with Longley and Singleton's (forthcoming) observation that this may have been a 'catch all' category in the classification.

Figure 2 (in which D10 is the most deprived decile and D1 the least deprived) shows a high-level breakdown of e-society groups across the deciles of the summary IMD measure. The general picture is that as one moves from low levels of engagement with information and communication technologies towards more engaged groups, so the incidence and degree of material deprivation decline. The pattern of usage of group A (the 'e-unengaged') is anomalous, however, in that it occurs in some numbers across the material deprivation distribution. We suggest later that this reflects motivations as well as material circumstances, notwithstanding the issues of ambiguity in the assignment of neighbourhoods to this group noted earlier.

Within this broad picture, Table 5 shows the distribution of e-society types across the deciles of deprivation (where again D1 is the least and D10 the most deprived decile) and Figure 3 presents bar graphs of the distribution of the types that make up e-society groups A and B across IMD summary score deciles. Figure 3 shows that the types that make up groups A and B fall into the five broad aggregations. First, types A02, A04 and A06 are skewed *towards* materially deprived neighbourhoods and are where lack of digital engagement is likely to reflect advanced age,

Table 4. The pattern of material deprivation and e-engagement areas in England

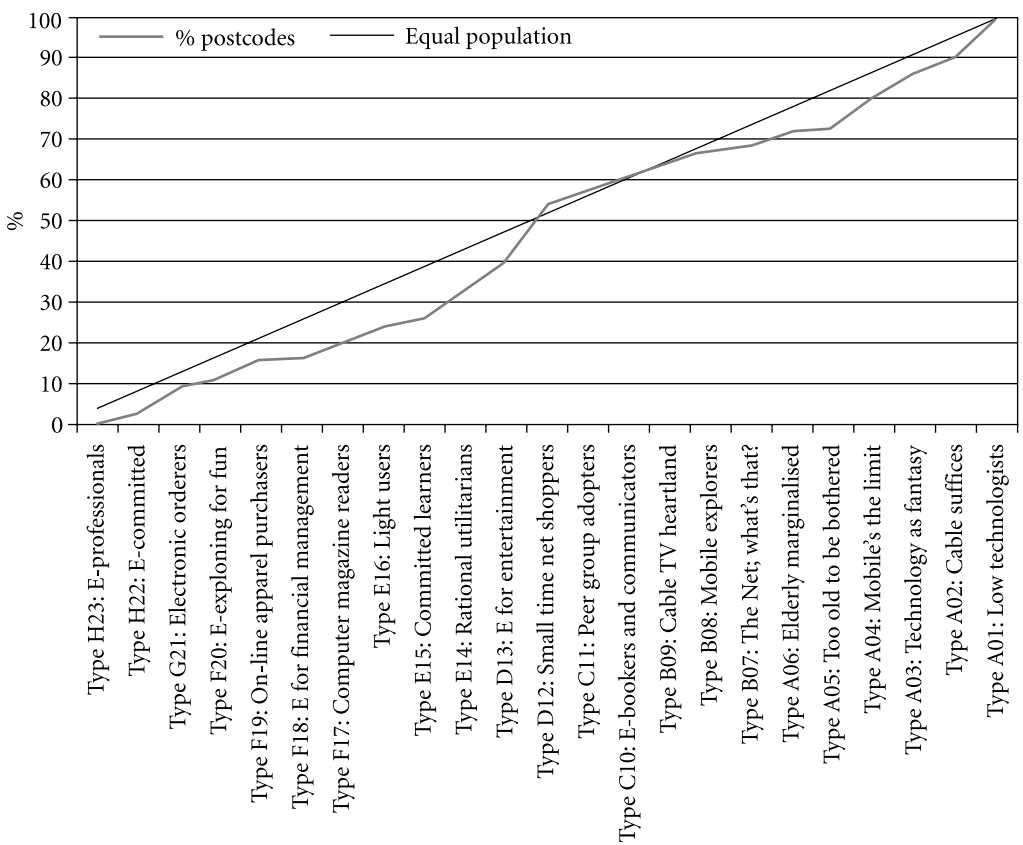|	*Materially deprived area*		*Not materially deprived area*	
Not e-engaged area	Group 1		Group 2	
	5 608 318	11.4 per cent	12 172 195	24.8 per cent
E-engaged area	Group 3		Group 4	
	4 174 193	8.5 per cent	27 117 876	55.3 per cent

Figure 1. The distribution of the English population across e-society types

low income and lack of skills. Together, these types represent 48.9 per cent of the digitally unengaged (Figure 3(a)). Secondly, types B08 and B09 are, like A02, A04 and A06, strongly skewed *towards* materially deprived neighbourhoods, demonstrating only very limited engagement with mature technologies such as mobile phones and cable television (Figure 3(b)). Thirdly, the distributions of types A03 and A05 (accounting for 21.6 per cent of the digitally unengaged), are skewed *away from* materially deprived neighbourhoods, suggesting that lack of engagement may reflect lack of motivation (Figure 3(c)). Fourthly, the types extracted from group B are also skewed *towards* materially deprived neighbourhoods, although type B07 shows no discernible trend (Figure 3(d)). Finally,
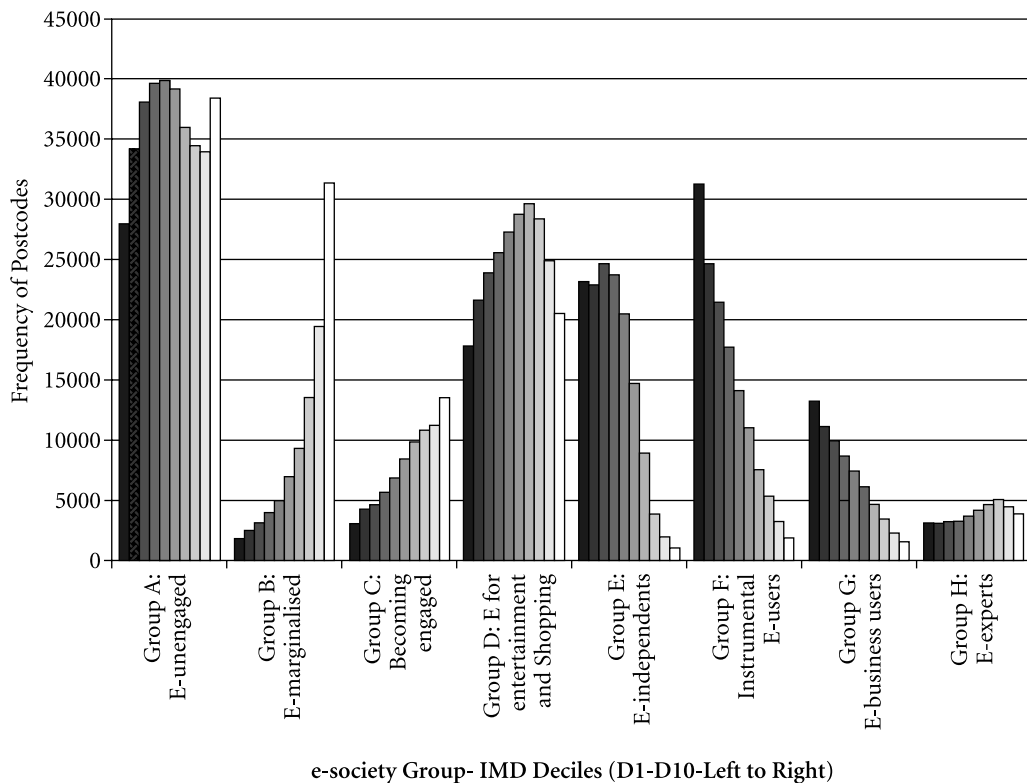
Figure 2.   Levels of ICT engagement across IMD deciles at e-society group level

type A01, shows no overall trend across IMD deciles (Figure 3(c)): the problems with this type as representing a 'catch all' category were noted earlier and by Longley and Singleton (forthcoming) and require more detailed analysis of the classification that lies beyond the scope of this paper.

Taken together, the stark variations in these results suggest a polarity amongst the digitally unengaged found in different e-society neighbourhood types. For some types, the outcome of digital unengagement appears to arise for reasons closely linked to the causes of material deprivation as conventionally understood; however, the cross-classification also identifies neighbourhoods that appear to be unengaged principally because of lack of motivation. The composition of A01 is of concern here and it remains for further research to investigate

its detailed composition and how it has developed in the period since the e-society classification was completed (Longley and Singleton, 2008).

In common with many deprivation studies, this analysis focuses only upon the summary measure of the 2004 Index, which is a summary of the separate domains pertaining to: income deprivation; employment deprivation; health deprivation and disability; education, skills and training deprivation; barriers to housing and services; living environment deprivation; and crime. Although high levels of correlation are often observed between these constituent measures, it is perfectly possible that the overall relationships between the summary measure of material deprivation and digital unengagement may not uniformly reflect patterning of these

Table 5. Cross tabulation of postcodes coded by e-society type and Super Output Areas coded by IMD decile

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Total
Type A01: Low technologists	6 798 (6.4)	9 845 (9.2)	11 931 (11.2)	12 677 (11.9)	13 422 (12.6)	13 369 (12.5)	11 975 (11.2)	10 775 (10.1)	8 893 (8.3)	7 092 (6.6)	106 777 (100)
Type A02: Cable suffices	2 579 (5.7)	3 544 (7.8)	4 383 (9.7)	4 874 (10.8)	5 130 (11.3)	5 244 (11.6)	5 281 (11.7)	4 965 (11)	4 643 (10.3)	4 573 (10.1)	45 216 (100)
Type A03: Technology as fantasy	12 574 (19.2)	12 229 (18.7)	11 046 (16.9)	9 963 (15.3)	7 930 (12.1)	5 750 (8.8)	3 296 (5)	1 476 (2.3)	720 (1.1)	343 (0.5)	65 327 (100)
Type A04: Mobile's the limit	2 882 (3.1)	4 785 (5.1)	6 415 (6.9)	7 776 (8.4)	8 913 (9.6)	10 309 (11.1)	10 861 (11.7)	12 023 (12.9)	13 279 (14.3)	15 857 (17)	93 100 (100)
Type A05: Too old to be bothered	2 077 (16.1)	2 210 (17.1)	2 189 (17)	1 993 (15.5)	1 608 (12.5)	1 196 (9.3)	779 (6)	476 (3.7)	231 (1.8)	135 (1)	12 894 (100)
Type A06: Elderly marginalised	1 115 (2.9)	1 584 (4.1)	2 098 (5.5)	2 365 (6.2)	2 858 (7.5)	3 264 (8.5)	3 769 (9.8)	4 722 (12.3)	6 165 (16.1)	10 324 (27)	38 264 (100)
Type B07: The Net; what's that?	821 (9.4)	943 (10.8)	953 (10.9)	933 (10.7)	813 (9.3)	736 (8.4)	735 (8.4)	716 (8.2)	827 (9.5)	1 263 (14.5)	8 740 (100)
Type B08: Mobile explorers	757 (2.7)	1 030 (3.6)	1 245 (4.4)	1 561 (5.5)	1 823 (6.4)	2 363 (8.3)	2 816 (9.9)	3 783 (13.3)	5 226 (18.4)	7 818 (27.5)	28 422 (100)
Type B09: Cable TV heartland	248 (0.4)	500 (0.8)	926 (1.5)	1 454 (2.4)	2 381 (4)	3 855 (6.4)	5 821 (9.7)	9 035 (15.1)	13 317 (22.3)	22 247 (37.2)	59 784 (100)
Type C10: E-bookers and communicators	2 194 (5.4)	2 866 (7.1)	3 072 (7.6)	3 379 (8.4)	3 903 (9.6)	4 473 (11.1)	5 245 (13)	5 355 (13.2)	5 173 (12.8)	4 791 (11.8)	40 451 (100)
Type C11: Peer-group adopters	882 (2.3)	1 398 (3.7)	1 653 (4.3)	2 281 (6)	2 998 (7.8)	3 994 (10.4)	4 645 (12.1)	5 532 (14.5)	6 107 (16)	8 745 (22.9)	38 235 (100)
Type D12: Small-time net shoppers	16 277 (10.1)	19 123 (11.8)	20 383 (12.6)	20 622 (12.8)	20 702 (12.8)	19 996 (12.4)	17 517 (10.8)	13 363 (8.3)	8 374 (5.2)	5 103 (3.2)	161 460 (100)

(Continued)

(**Table 5.** *Continued*)

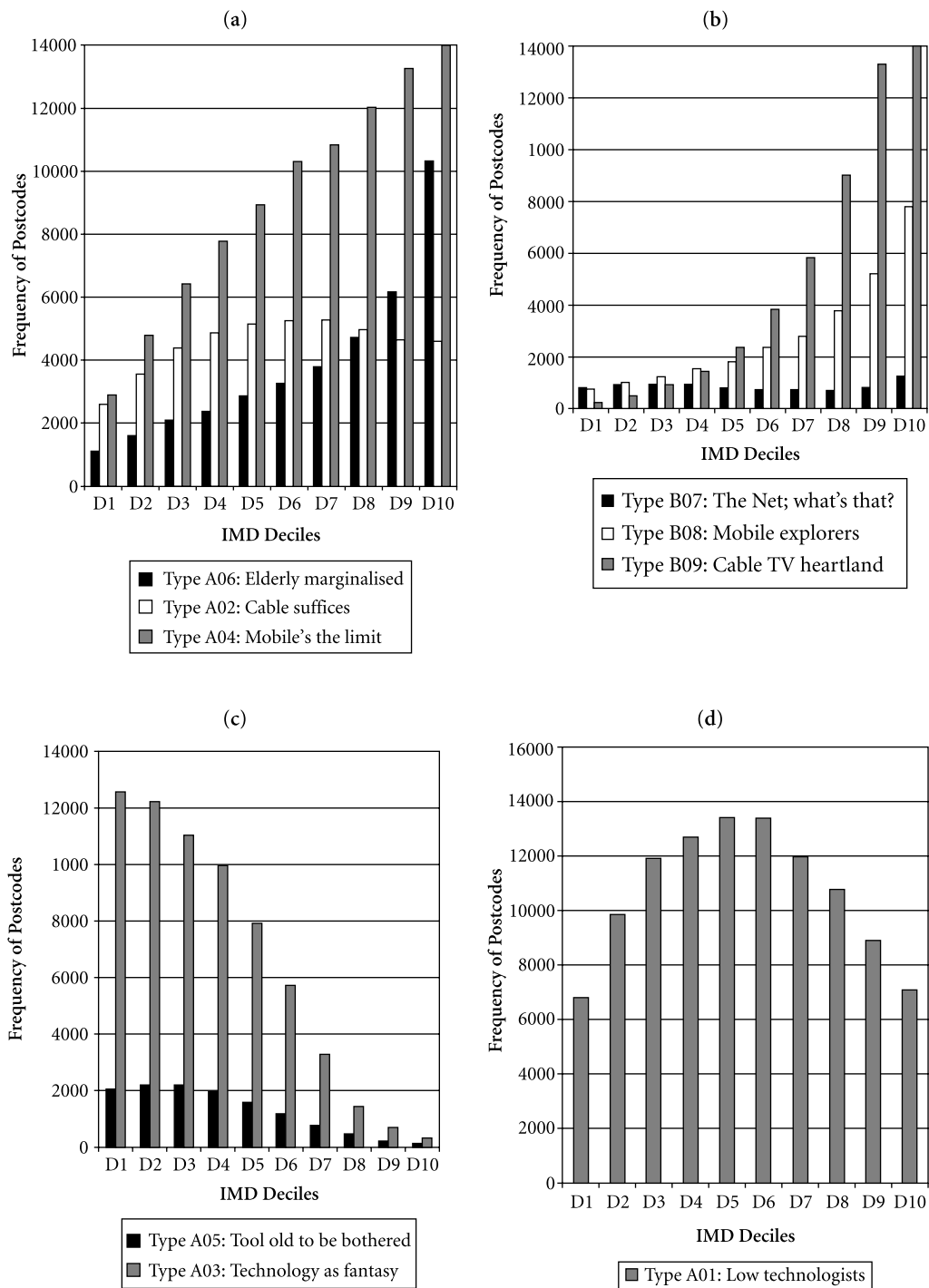|	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Total
Type D13: E for entertainment	1 541	2 455	3 520	4 992	6 619	8 767	12 120	14 986	16 487	15 377	86 864
	(1.8)	(2.8)	(4.1)	(5.7)	(7.6)	(10.1)	(14)	(17.3)	(19)	(17.7)	(100)
Type E14: Rational utilitarians	7 428	9 798	13 065	13 761	12 896	8 981	5 088	1 645	740	461	73 863
	(10.1)	(13.3)	(17.7)	(18.6)	(17.5)	(12.2)	(6.9)	(2.2)	(1)	(0.6)	(100)
Type E15: Committed learners	5 483	4 297	3 713	3 013	2 321	1 723	1 163	627	391	256	22 987
	(23.9)	(18.7)	(16.2)	(13.1)	(10.1)	(7.5)	(5.1)	(2.7)	(1.7)	(1.1)	(100)
Type E16: Light users	10 244	8 772	7 871	6 916	5 313	4 009	2 748	1 619	812	393	48 697
	(21)	(18)	(16.2)	(14.2)	(10.9)	(8.2)	(5.6)	(3.3)	(1.7)	(0.8)	(100)
Type F17: Computer magazine readers	14 756	10 003	7 739	5 862	4 245	2 702	1 534	709	348	147	48 045
	(30.7)	(20.8)	(16.1)	(12.2)	(8.8)	(5.6)	(3.2)	(1.5)	(0.7)	(0.3)	(100)
Type F18: E for financial management	584	714	713	652	567	527	464	375	279	169	50 44
	(11.6)	(14.2)	(14.1)	(12.9)	(11.2)	(10.4)	(9.2)	(7.4)	(5.5)	(3.4)	(100)
Type F19: On-line apparel purchasers	8 840	7 713	7 414	6502	5 628	4 877	3 521	2 474	1 588	1 030	49 587
	(17.8)	(15.6)	(15)	(13.1)	(11.3)	(9.8)	(7.1)	(5)	(3.2)	(2.1)	(100)
Type F20: E-exploring for fun	7 104	6 200	5 584	4703	3 724	2 948	2 001	1 781	1 111	507	35 663
	(19.9)	(17.4)	(15.7)	(13.2)	(10.4)	(8.3)	(5.6)	(5)	(3.1)	(1.4)	(100)
Type G21: Electronic orderers	13 244	11 128	9 996	8675	7 414	6 165	4 670	3 439	2 297	1 563	68 591
	(19.3)	(16.2)	(14.6)	(12.6)	(10.8)	(9)	(6.8)	(5)	(3.3)	(2.3)	(100)
Type H22: E-committed	2 123	2 335	2 608	2667	3 079	3 526	4 100	4 466	3 910	3 609	32 423
	(6.5)	(7.2)	(8)	(8.2)	(9.5)	(10.9)	(12.6)	(13.8)	(12.1)	(11.1)	(100)
Type H23: E-professionals	969	710	636	620	642	623	590	618	555	314	6 277
	(15.4)	(11.3)	(10.1)	(9.9)	(10.2)	(9.9)	(9.4)	(9.8)	(8.8)	(5)	(100)

Figure 3. Distribution of e-society groups A and B across IMD summary score deciles

constituent measures. It is thus appropriate not only to disaggregate the e-society groups into their constituent types, but also to examine the profile of each type across the different IMD domains. The breakdown of the 23 e-society types across the most deprived decile of each of the constituent domains of the IMD, plus the summary measure, is shown in Table 6.

When the figures for the 'digitally unengaged' types in group 1 are summed (shown in row 7 of Table 5), it is very apparent that the

Table 6. The distribution of postcodes coded by all e-society types (and group A totals) within SOAs classified by IMD domains

	IMD	Crime	Education	Employment	Health	Housing	Income	Living
Type A01: Low technologists	6.3	5.7	9.4	8.0	7.7	5.0	5.5	5.2
Type A02: Cable suffices	4.1	3.3	6.0	4.7	4.5	0.8	3.8	2.6
Type A03: Technology as fantasy	0.3	0.8	0.4	0.6	0.5	7.5	0.3	0.6
Type A04: Mobile's the limit	14.1	10.5	15.9	15.7	15.6	4.3	13.1	8.2
Type A05: Too old to be bothered	0.1	0.4	0.1	0.2	0.1	1.3	0.1	0.4
Type A06: Elderly marginalised	9.2	7.0	7.8	9.4	9.1	2.4	8.9	5.8
Total group A	**34.1**	**29.7**	**39.7**	**38.6**	**37.5**	**22.3**	**31.7**	**22.8**
Type B07: The Net; what's that?	1.1	1.0	0.9	1.1	1.1	1.0	1.2	0.9
Type B08: Mobile explorers	7.0	5.6	6.3	6.0	5.8	2.9	8.0	3.9
Type B09: Cable TV heartland	19.8	14.9	16.3	16.5	16.7	4.2	21.7	16.0
Total group B	**27.9**	**21.5**	**23.5**	**23.6**	**23.6**	**8.1**	**30.9**	**20.8**
Total groups A and B	**62.0**	**49.2**	**63.1**	**62.2**	**61.1**	**29.4**	**62.6**	**43.6**
Type C10: E-bookers and communicators	4.3	6.3	2.0	3.8	3.8	4.7	4.5	7.3
Type C11: Peer-group adopters	7.8	8.3	4.7	7.1	7.3	2.3	7.4	9.3
Type D12: Small-time net shoppers	4.6	8.5	5.2	5.2	5.5	7.2	4.4	9.3
Type D13: E for entertainment	13.7	11.1	20.4	13.7	13.3	2.5	14.0	10.8
Type E14: Rational utilitarians	0.4	0.8	0.5	0.7	0.6	21.4	0.3	0.6
Type E15: Committed learners	0.2	0.5	0.2	0.3	0.3	1.9	0.2	0.4
Type E16: Light users	0.4	1.0	0.5	0.5	0.5	3.0	0.3	0.8
Type F17: Computer magazine readers	0.1	0.7	0.1	0.2	0.2	4.9	0.1	0.5
Type F18: E for financial management	0.2	0.4	0.1	0.1	0.1	0.8	0.2	0.6
Type F19: On-line apparel purchasers	0.9	1.7	1.0	1.1	1.1	4.8	1.0	1.5
Type F20: E-exploring for fun	0.5	1.6	0.2	0.4	0.5	6.4	0.5	3.0
Type G21: Electronic orderers	1.4	3.1	1.1	1.6	1.7	5.3	1.4	3.0
Type H22: E-committed	3.2	5.9	1.0	3.0	3.5	4.2	2.8	7.8
Type H23: E-professionals	0.3	0.9	0.0	0.2	0.3	1.2	0.2	1.4

coincidence of deprivation and lack of digital engagement is far more pronounced in some deprivation domains than in others. High (38–40 per cent) percentages of the lowest decile of deprivation are found in the education, employment and health domains; moderate (30–34 per cent) percentages are found for the crime and income domains; and lower (22–23 per cent) percentages are found for the housing and living environment domains. The high percentages in the first of these aggregations (education, employment and health) arise throughout the types in the 'e-unengaged' group, with a small number of exceptions (for example, the elderly marginalised are underrepresented in the education deprivation domain). The high figures in these domains should be of particular concern to digital inclusion policy, in that improved education, employment and health are obvious levers to empower the residents of deprived communities to improve their personal circumstances.

The second of these aggregations (that is, of the crime and income domains) generally mirrors the summary IMD percentages, although the 'Mobile's the limit' type is underrepresented in the crime domain of deprivation. The lower percentages in the third of these aggregations occur principally because of low representation of the 'Mobile's the limit' and 'Elderly marginalised' categories in the housing and living conditions domains, which may in part reflect the low preponderance of elderly people in such neighbourhoods. However, the 'Technology as fantasy' type is very heavily concentrated in the housing deprivation domain.

Although it is not the intention of this paper to formulate detailed policy recommendations for digital inclusion policy, the results of this analysis do broadly indicate a number of different interventions that might be considered to address the causes of low levels of e-engagement. For example, type A02 neighbourhoods might become more digitally and socially engaged through e-learning initiatives and the implementation of health care reforms, including services such as NHS Direct. Secondly, type A03 neighbourhoods might become engaged through technology applications linked to housing, given the heavy concentration of this type in this domain of deprivation. Initiatives might include the deployment of electronic tenant services to find properties, pay rent or report maintenance problems. These neighbourhoods have low uptake of cable services and may be amenable to initiatives involving distribution of set-top boxes or private-sector initiatives. Thirdly, type A04 neighbourhoods are heavily represented in the education, employment and health domains of deprivation. Their limited engagement with ICTs, specifically using mobile phones, suggests that they might be invited to subscribe to messaging services relating to job alerts, the availability of preventive health services (for example, 'flu injections) and so forth. Fourthly, type A05 neighbourhoods are more in evidence because of lack of engagement with ICTs than because of high levels of material deprivation. It therefore seems likely that engagement to further policy initiatives may be best fostered through private-sector initiatives. Fifthly, type A06 neighbourhoods appear more likely to be beset by problems of public service delivery than poor physical environments. Relevant policy initiatives might include: crime and safety applications that report anti-social behaviour or crime via digiTV; education applications based in ICT suites in day centres; or health applications such as Telecare. Sixthly, type B07, B08 and B09 neighbourhoods might become more engaged in ICT usage through marketing initiatives that package essentially passive technologies such as cable television with more active applications, such as broadband Internet.

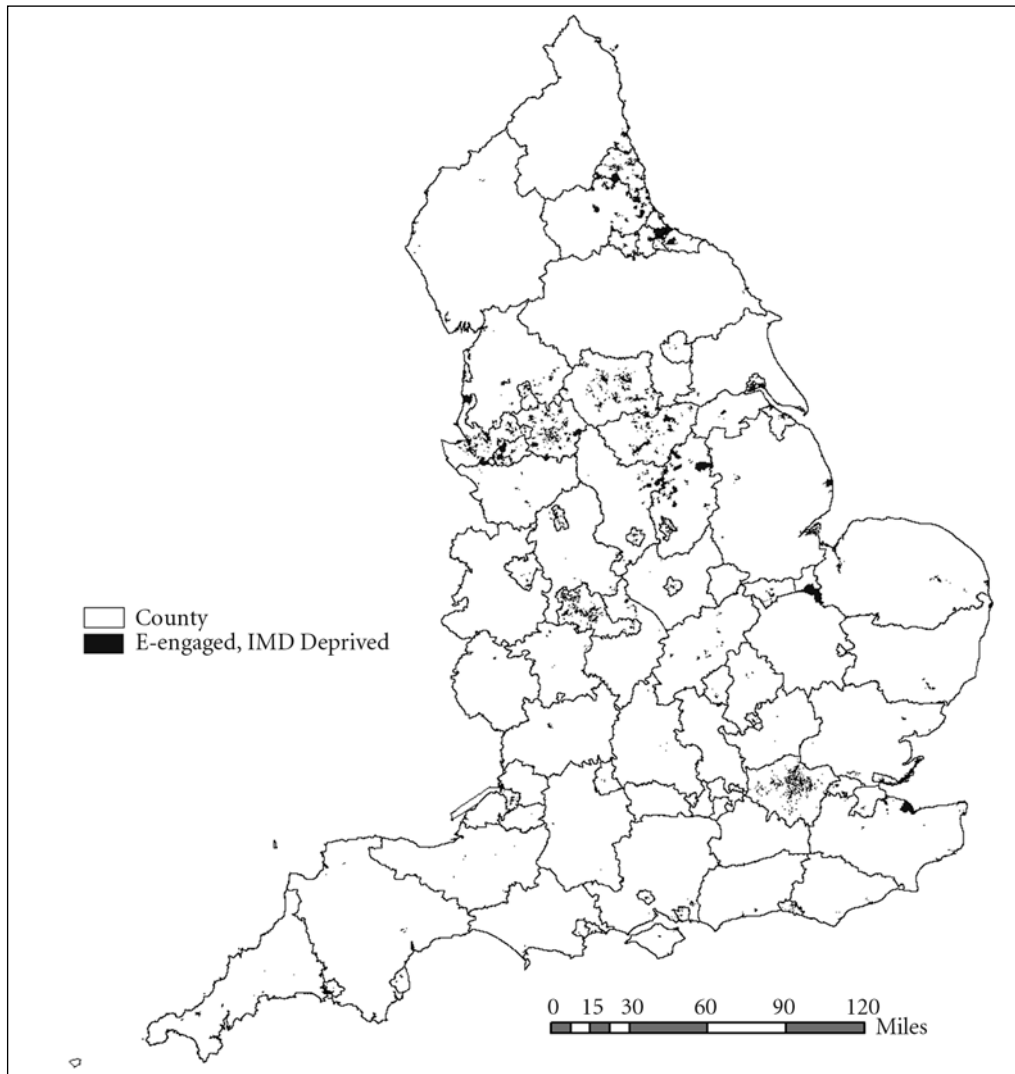Figure 4 begins to put these findings into a spatial context, by identifying the Super

Figure 4.   Areas falling into the lowest quintile of the IMD, but that are 'E-engaged'

Output Areas in which material deprivation and digital unengagement do not coincide. It is apparent from these figures that the two phenomena are principally focused upon urban areas. Figure 4 presents the areas that fall into the lowest quintile of the IMD but which are not classed as falling into groups A or B of the e-society classification. Broadly speaking, this illustrates the predominantly urban picture of the material deprivation summary measure, with greatest representation in North West and North East England, and

heavy representation in the old conurbations. Although our intention here is only to present a broad national picture, Figures 5 and 6 illustrate the potential of our comparison for urban policy analysis in the Tyne and Wear and Merseyside conurbations. Using this information it is possible to identify the areas of Teeside where initiatives in e-government and service delivery (such as health, housing or on-line reporting of damage to the living environment) might be effective. Both local maps show some evidence that there are

Figure 5. Local areas falling into the lowest quintile of the IMD, but that are 'E-engaged': Tyne and Wear
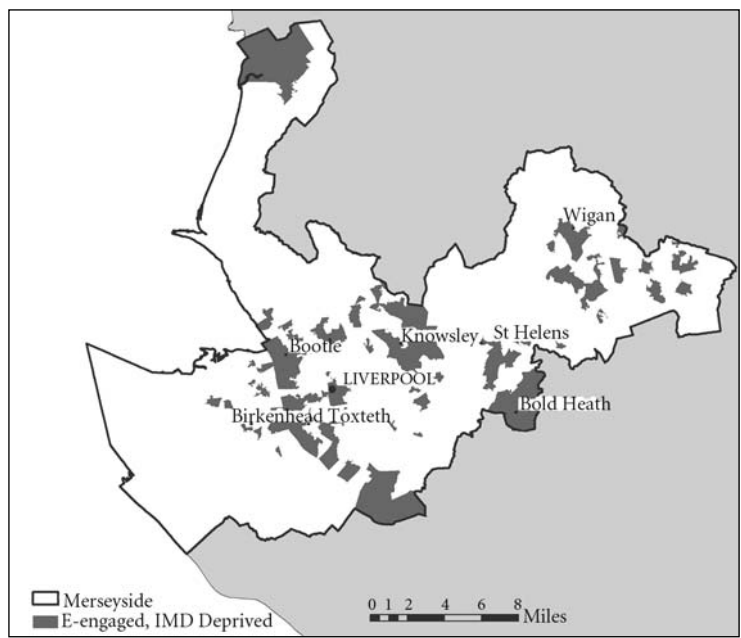

Figure 6. Local areas falling into the lowest quintile of the IMD, but that are 'E-engaged': Merseyside

digitally engaged 'wedges' of areas of material deprivation.

Figure 7 presents the England-wide picture of areas that are unengaged with the e-society, but which are not deprived in material terms. This shows a less spatially concentrated pattern and significant but scattered areas of 'unengagement' in rural and coastal locations. However, 'unengagement' is not predominantly a rural phenomenon *per se*. Many of the greatest concentrations of 'unengagement' are in seaside locations associated with retirement and are not immediately associated with the lowest incomes. Thus

spatial targeting of digital inclusion initiatives may be worthwhile for many local authorities and it seems to be the case that e-services may provide an important tool in rural areas. These points are apparent when examining the spatial pattern of 'unengagement' in the Pennines and along part of the south coast of England (Figures 8 and 9 respectively).

Figure 10 maps the areas that fall into e-society group A as well as the most deprived quintile according to the IMD. Overlaying digital unengagement with material deprivation reveals a 'north-south divide', with remarkably few areas identified in London.
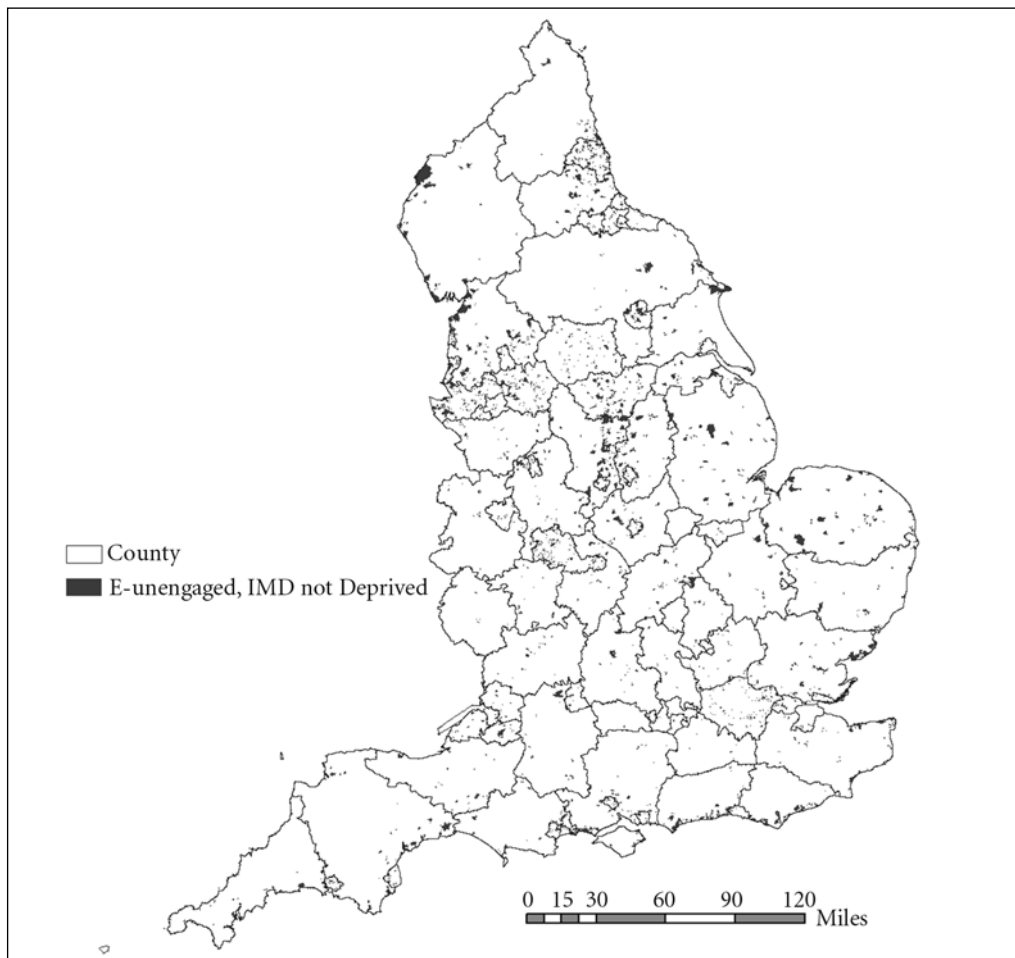

Figure 7.   Areas that are not 'E-engaged', but which do not fall into the lowest quintile of the IMD
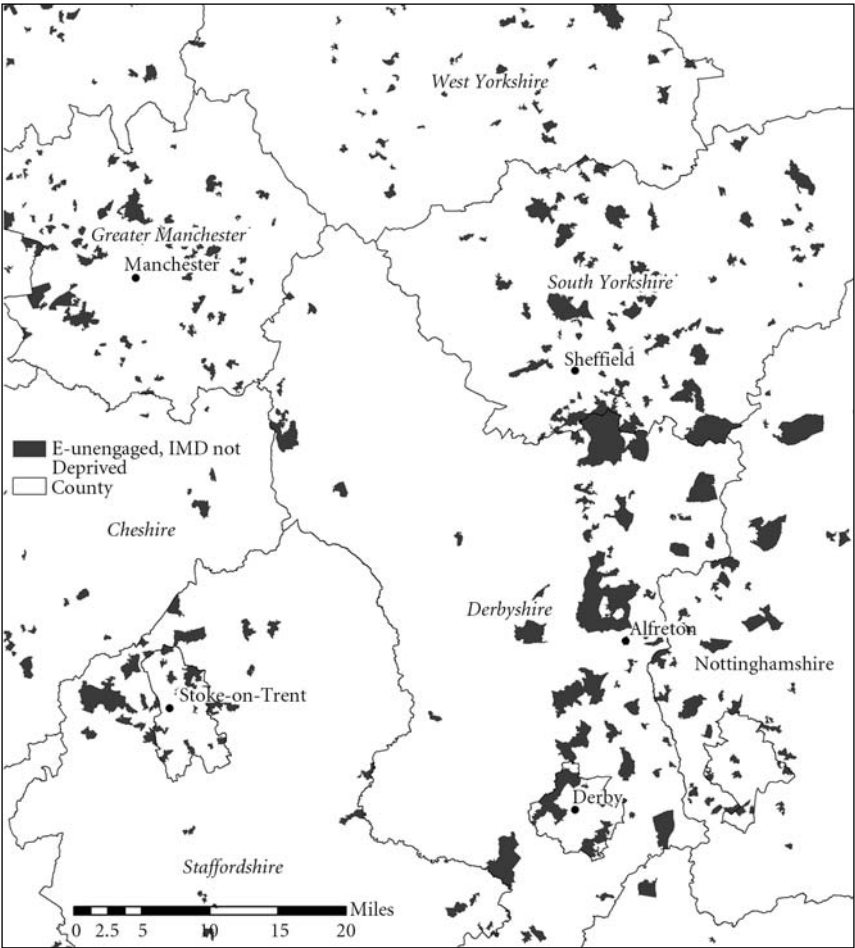
Figure 8. Local areas that are not 'E-engaged', but which do not fall into the lowest quintile of the IMD: the Pennines
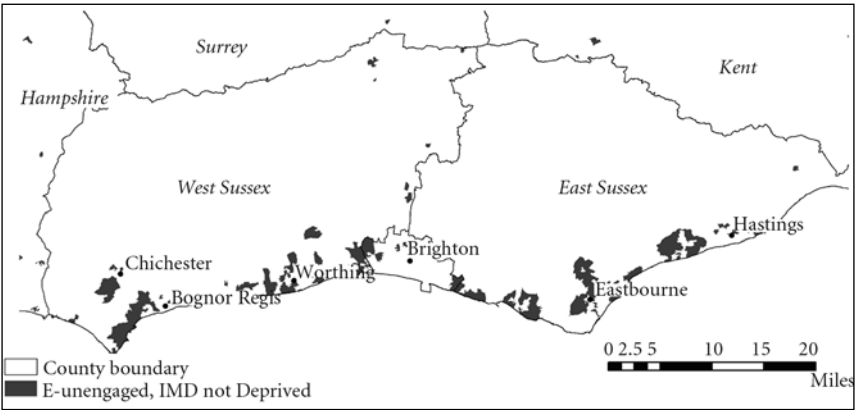

Figure 9. Local areas that are not 'E-engaged', but which do not fall into the lowest quintile of the IMD: the South Coast
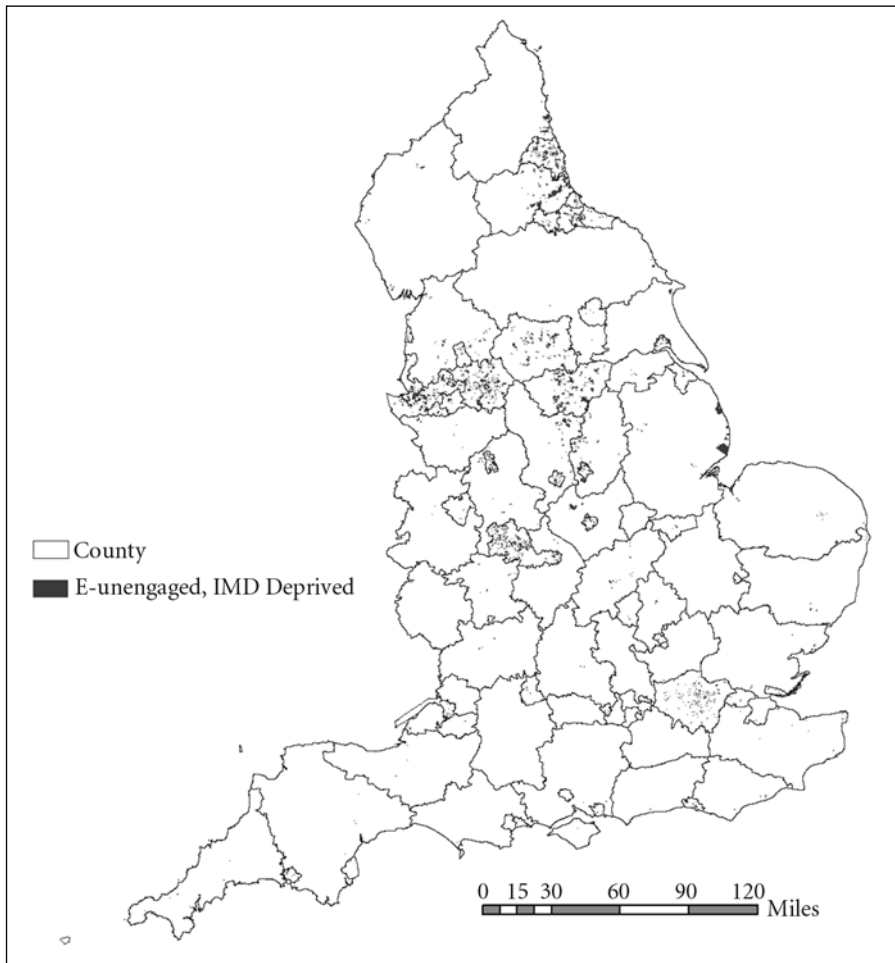
Figure 10.   Areas that are not 'E-engaged' and which also fall into the lowest quintile of the IMD

In general terms, this suggests that local and regional authorities working in some northern areas are likely to find it helpful to think of digital exclusion as an adjunct to material deprivation, while in most all of England south of a line from the Wash to the Severn, digital exclusion may be best addressed independently of policies designed to alleviate material deprivation. The most deprived areas in material terms are still concentrated in parts of some of the conurbations that were worst ravaged by deindustrialisation in the 1980s (Byrne, 1995).

The composite picture is presented in Figure 11. We believe that this is the first time that the incidence of 'e-unengagement' and material deprivation has been compared in such detail. A detailed locality map is shown in Figure 12. Together, these maps raise a number of issues that merit further investigation. It is clearly apparent that the areas where digital unengagement and material deprivation coincide by no means dominate the national map. Moreover, the intersection of these two phenomena is by no means exclusively concentrated in the major
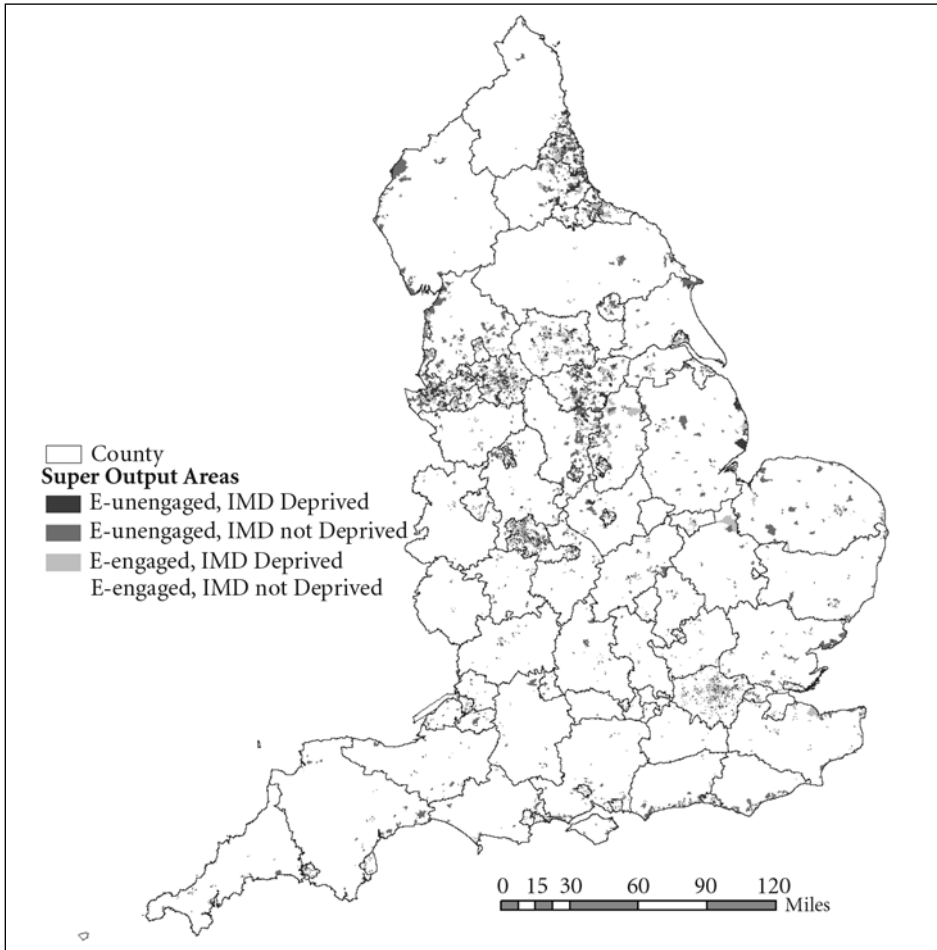
Figure 11.   Composite map of material deprivation and the digitally unengaged

conurbations. Areas which are not engaged in use of ICTs occur in some (but not all) National Parks and a number of other very rural areas, but also in seaside retirement areas. There is merit in investigating these trends in greater detail, perhaps in consultation with local authorities. There is a view that conventional measures of deprivation tend to highlight urban rather than rural areas, and one technique employed by commercial geodemographic classification builders to accommodate this is to treat rural areas separately in the cluster analysis (Harris *et al*., 2005).

4. Conclusion

There is increasing awareness that the failure of individuals, households and communities to engage with new information and communications technologies has negative consequences in both the private (for example, purchasing behaviour) and public (for example, accessing services) domains. It is unfortunate that conventional data infrastructure such as the UK Census of Population offer no direct insight into the patterns of engagement with ICTs or the spatial scales at which these might be manifest.
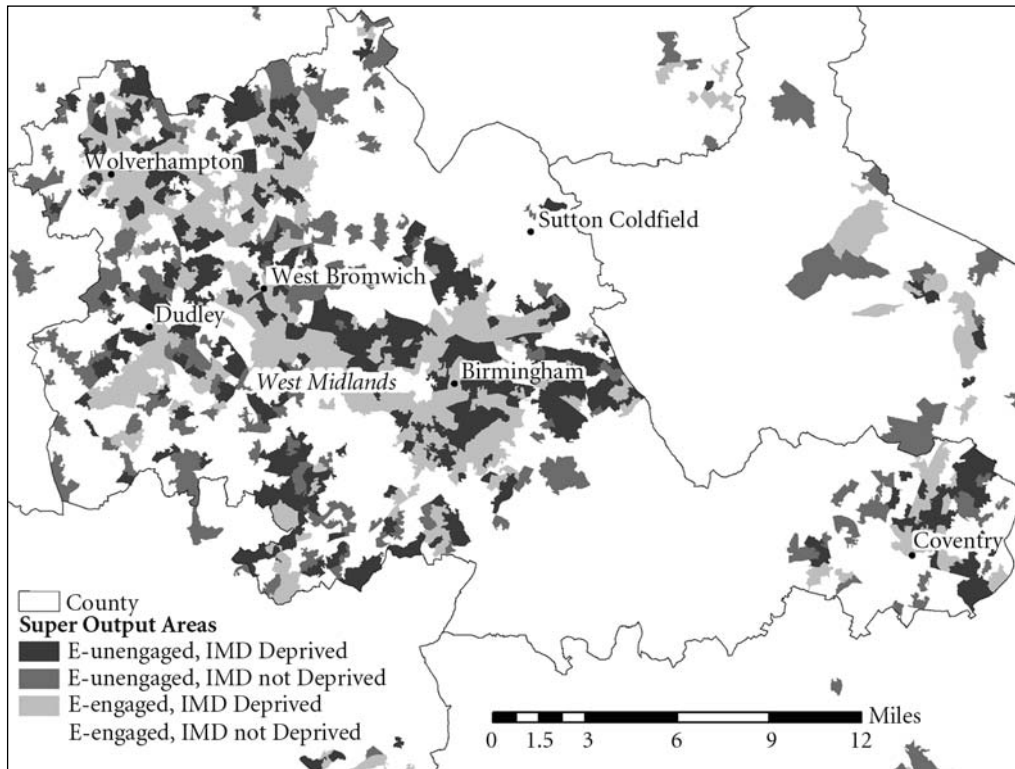
Figure 12. Composite map of material deprivation and the digitally unengaged: West Midlands

The 'e-society' classification used here offers one way beyond this *impasse*, through integration of a range of private- and public-sector data sources into summary measures of individual, household and neighbourhood engagement. The classification used here is subject to all of the usual caveats of geo-demographic systems—specifically those associated with potential ecological fallacy and the pejorative nature of the labels that help users to understand the characteristics of the systems. However, ecological fallacy issues potentially plague any application based upon areally aggregated data and it is our broader contention that bespoke classifications such as this offer a valuable way of profiling neighbourhoods for policy action. This is in part because bespoke classifications are more clearly and directly specified, and

thus are less reliant upon implied inferences from some of the cocktail of variables characterising general classifications.

The contribution of this paper has been to use this novel dataset to demonstrate that the nation-wide patterns of digital exclusion and material deprivation are linked, and that high levels of material deprivation are generally associated with low levels of engagement with ICTs and vice versa. The England-wide picture illustrates that the pattern of 'digital unengagement' is less heavily concentrated upon urban conurbations than on areas of material deprivation. It is also clear that many of the neighbourhoods that are 'digitally unengaged' are not materially deprived. 'Digital unengagement' is an outcome that turns out to have a number of different causes: unengagement with likely causal links with

material deprivation; lack of motivation to use information and communication technologies under prevailing circumstances; and other causes that are likely only to have become apparent in the period following completion of the UCL e-society classification. This has implications for the range of policy initiatives (for example, see Burrows *et al.*, 2005; Devins *et al.*, 2002)—public and private—that might be adopted to address the negative implications of 'digital unengagement' for society as a whole.

Approximately 1.15 million people in England fall into the bottom decile of the IMD and group A of the e-society classification. As with material deprivation, there are distinctive regional and local geographies to lack of e-engagement. The two are coincident in parts of northern England and our locality maps demonstrate that areas of low e-engagement are often adjacent to areas that are materially deprived. However, elsewhere, notably in coastal and rural areas, the geographies are quite different. This has implications for the way in which policy initiatives are implemented at both the regional and the local levels. The nature and extent of 'digital unengagement' also vary across the different domains of material deprivation. There is a range of ways in which policy initiatives might be developed in the light of these findings, most obviously with regard to the education, employment and health domains of deprivation which are very strongly related to digital unengagement.

Acknowledgement

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