



Digital Inclusion: An Analysis of Social Disadvantage and the Information Society



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Dr Ellen J. Helsper, Oxford Internet Institute (OII)
Department for Communities and Local Government

The findings and recommendations in this report are those of the authors and do not necessarily represent the views of the Department for Communities and Local Government.

Department for Communities and Local Government
Eland House
Bressenden Place
London
SW1E 5DU
Telephone: 020 7944 4400
Website: www.communities.gov.uk

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Foreword

Research on the links between the diffusion of Information and Communication Technologies (ICTs) and social and economic development has been undertaken for decades. Evidence of links between social and digital engagement, particularly with respect to the Internet, has been the focus of many studies conducted by academic as well as government institutions. These studies have shown consistently that individuals who have access to ICTs, from the telephone to the Internet, tend to have more schooling, higher incomes, and higher status occupations than do those who do not have access. This holds true within nations as well as cross-nationally, as evidenced by results from the World Internet Project (WIP)¹.

However, despite the evidence, there remains significant debate around the existence, nature and causality of these links. There are many who are digitally disengaged but socially advantaged through choice – so are the links between digital and social disengagement really significant? Is digital engagement primarily driven by one's socioeconomic status? Can ICTs help disadvantaged individuals improve their position in society? Or conversely, does exclusion from the information society hinder social mobility?

The answers to these questions are not simply an academic concern, but have implications for policy and practice. If access to digital resources can promote social inclusion, for example, it will be important for governments at all levels to support initiatives that promote digital inclusion.

Research on the nature of these relationships is limited largely due to the complexity of unravelling what digital and social inclusion actually mean, and how they can be measured. These definitional and measurement issues are a barrier to conceptualising and testing the nature of the links between social inclusion and digital engagement and therefore to understanding the implications for policy.

This study has tackled these issues and developed new models of digital and social exclusion. It offers a robust analytic framework that is applicable to different survey datasets and can be adapted to new and emerging technologies. The report presents how the models can be applied to existing datasets to explore the implications for future policy.

International and domestic policies in this area are often anchored in the assumption that ICTs enable more interaction across economic, social and cultural boundaries, making it possible to diminish inequalities within and between societies that are based on economic, socio-demographic and cultural differences. However, this assumption has not been robustly tested before now. It is hoped that this study will move the debate forward, and serve as a foundation for future research and digital inclusion policy development.

¹ WIP: www.worldinternetproject.net/

About the report

This report presents the results of a study by the Oxford Internet Institute (OII) into the empirical links between social disadvantage within the information society. The study was commissioned by the Department of Communities and Local Government and supported by the Office for National Statistics (ONS) and Office of Communications (Ofcom).

There is an emerging body of evidence that those who suffer social exclusion – combinations of social disadvantages such as poor skills, poor health and low income, are also likely to be excluded from the information society. This study was commissioned to explore the evidence and to undertake primary analysis on national survey datasets. The key research questions were as follows:

- Establish empirically the links between digital and social disadvantage.
- Characterise these links – what are the key social factors that contribute to digital engagement?
- Consider the implications for social policy – do the links between social and digital disadvantage matter? What are disadvantaged groups missing out on in the information society? What can be done to improve the situation?

This report provides a critical evaluation of the existing evidence on the nature and extent of the 'digital divide' and its overlap with social exclusion. New empirical evidence is also presented, backed by a comprehensive methodology that has been applied to three different independent, nationally representative surveys. There are three important outcomes of this report:

- A new empirical model of the links between social and digital disadvantage which will help guide future research and policy interventions in this area.
- Recommendations to enhance existing national technology surveys conducted by the Oxford Internet Institute (OII), the Office of Communications (Ofcom) and the UK Office for National Statistics (ONS). These enhancements will help to track digital inclusion progress in the future, and also account for new and emerging technologies.
- A short review of the implications of the results for social policy.

This report will serve to inform the Department for Communities and Local Government and the UK Minister for Digital Inclusion in the development of a new national action plan for Digital Inclusion in 2008.

Executive summary: Research findings and policy recommendations

Technological change permeates most areas of society and many different aspects of our lives. The increasing utilisation of information and communication technologies (ICTs), such as the Internet, across all sectors of society has led many to conceive of Britain and other advanced industrial economies as Information Societies. While it is difficult to imagine that anyone in a modern leading economy like Britain is not affected by new ICTs, not everyone is equally well served. Many individuals and households, for example, do not use the Internet. Does this matter? What difference does it make?

This study explores the social implications of exclusion from the information society by examining the best empirical data available for the UK in 2008. The findings indicate that technological forms of exclusion are a reality for significant segments of the population, and that, for some people, they reinforce and deepen existing disadvantages. Technology is so tightly woven into the fabric of society today that ICT deprivation can rightly be considered alongside, and strongly linked to, more traditional twentieth century social deprivations, such as low income, unemployment, poor education, ill health and social isolation. To consider ICT deprivation as somehow less important underestimates the pace, depth and scale of technological change, and overlooks the way that different disadvantages can combine to deepen exclusion.

Study approach

This study explored the relationship between digital and social disadvantage in the UK. It brought together three major datasets, based on multiple independent surveys conducted by the Oxford Internet Institute (OII), the UK Office for National Statistics (ONS), and the Office of Communications (Ofcom), enabling a replication of indices and analyses to validate the central findings. For each set of data, the team developed a set of indices of social and digital disadvantage, and then explored the strength and nature of the relationship between them.

Digital disadvantage was measured based on an index constructed from an individual's location of access, such as at home or elsewhere; quality of access, as measured by access to broadband; attitudes towards ICTs (predominantly the Internet), and the different types of activities undertaken using the Internet. Similarly, social disadvantage was measured based on an index constructed from health, employment, income, education and other social status measures. Various statistical techniques from simple correlation and association analysis to multivariate and principle component analysis have been conducted. The sections that follow provide a summary of the results and interpretation, and full supporting data and analyses.

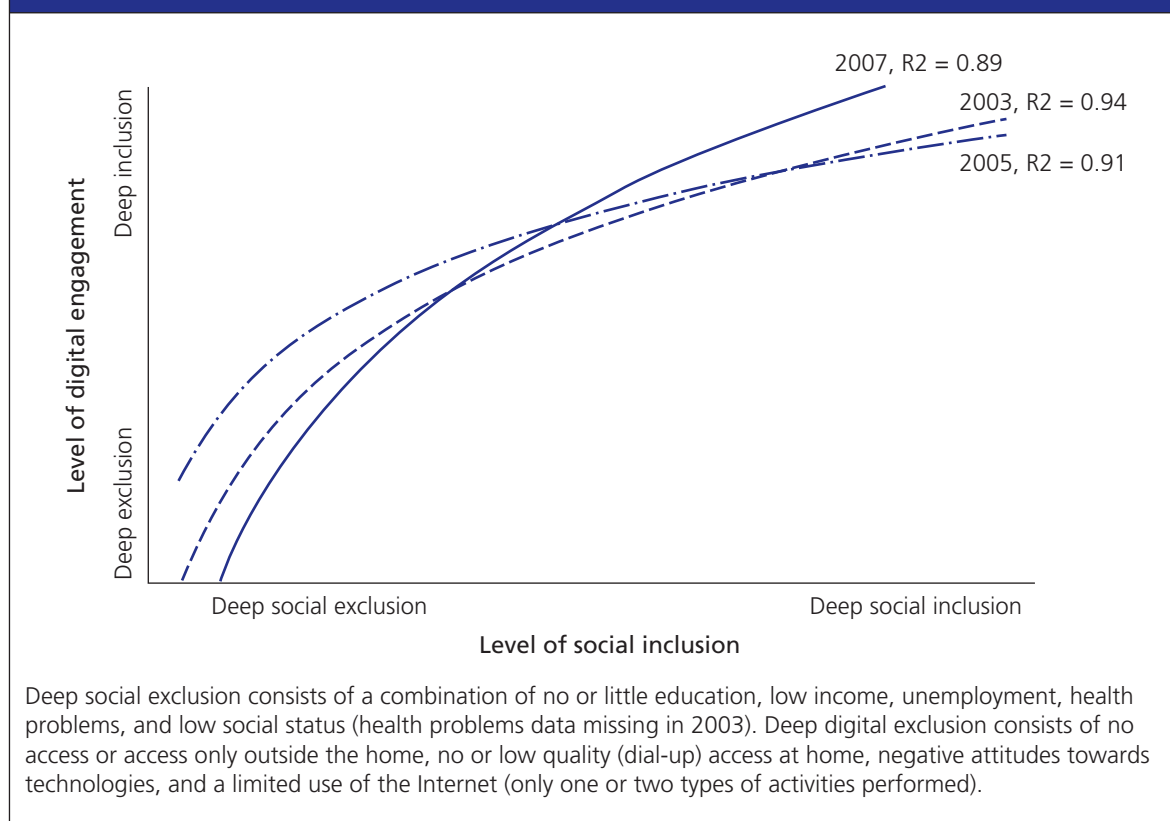
Linking digital and social disadvantage

Across all three datasets, there was a strong, statistically significant association between the social disadvantages an individual faces and their inability to access and use digital services. **Those who are most deprived socially are also least likely to have access to digital resources such as online services.** For example:

- One in 10 of the adult population (9%), amounting to four million people, suffer 'deep' social exclusion, a severe combination of social disadvantages, and have no meaningful engagement with Internet-based services.
- three out of four of those who suffer 'deep' social exclusion, have only limited engagement with Internet-based services. This extrapolates to about 13 per cent of the UK's population, or about six million adults.

Figure 1 illustrates how digital and social disadvantage are related on the two indices developed for this study.

Figure 1. Levels of digital and social exclusion.



Those who suffer deep social disadvantage are up to seven times more likely to be disengaged from the Internet than are those who are socially advantaged. An analysis over time indicates that this dual exclusion is not improving, although neither does it appear to be significantly deteriorating.

Overcoming digital inequalities

Across the three independent surveys (OII, Ofcom and ONS) there are clear exceptions to the general pattern, such as people who, despite their social backgrounds, were either unexpectedly engaged with or disengaged from the Internet.

(i) The unexpectedly engaged

Those who were socially disadvantaged and yet engaged with the Internet tended to be younger, single, were somewhat more likely to have a higher level of educational attainment, have children, and were not retired, separated or widowed. Furthermore, disadvantaged people from certain ethnic groups, particularly of Afro-Caribbean origins, tended to be more highly engaged with the Internet than expected purely on the basis of their social disadvantages. These results indicate that some individuals within socially disadvantaged groups are capable of overcoming barriers to digital engagement.

(ii) The unexpectedly disengaged

Analyses of the backgrounds of those who are more disengaged from the Internet than expected on the basis of their social advantages, show that these individuals tend to live in rural rather than urban areas, be older, unemployed and less likely to live in a household with children. Table 1 provides a summary of these groups.

Table 1	
Unexpectedly Engaged	Unexpectedly Disengaged
<p>Those who are generally socially disadvantaged but unexpectedly digitally engaged tend to:</p> <ul style="list-style-type: none"> • be younger • be single • have higher educational outcomes • have children • not be retired, separated or widowed • be from certain ethnic groups eg Afro-Caribbean 	<p>Those who are generally socially advantaged and unexpectedly digitally disengaged tend to:</p> <ul style="list-style-type: none"> • live in rural areas • be older • be unemployed • be less likely to live in a household with children

Improving some factors, such as educational achievement, employment and rural access can appear to influence whether a person is unexpectedly engaged or disengaged. This indicates that policies to support social inclusion can therefore support digital engagement.

However, an element of this is also down to people clearly making an informed 'digital choice' – this is particularly true of the unexpectedly engaged who, in contrast to their peers with similar social backgrounds, have chosen to use the Internet. Similarly, some who are unexpectedly disengaged may have made a conscious 'digital choice' not to use the Internet. There is evidence that digital choices are driven by cultural factors and the social context of individuals,² which influence the

² Dutton, W.H., Shepherd, A. and di Gennaro, C. (2007) 'Digital Divides and Choices Reconfiguring Access: National and Cross-National Patterns of Internet Diffusion and Use'. In B.Anderson, M.Brynin, J.Gershuny and Y.Raban (Eds) *Information and Communications Technologies in Society* (Routledge: London), pp. 31–45.

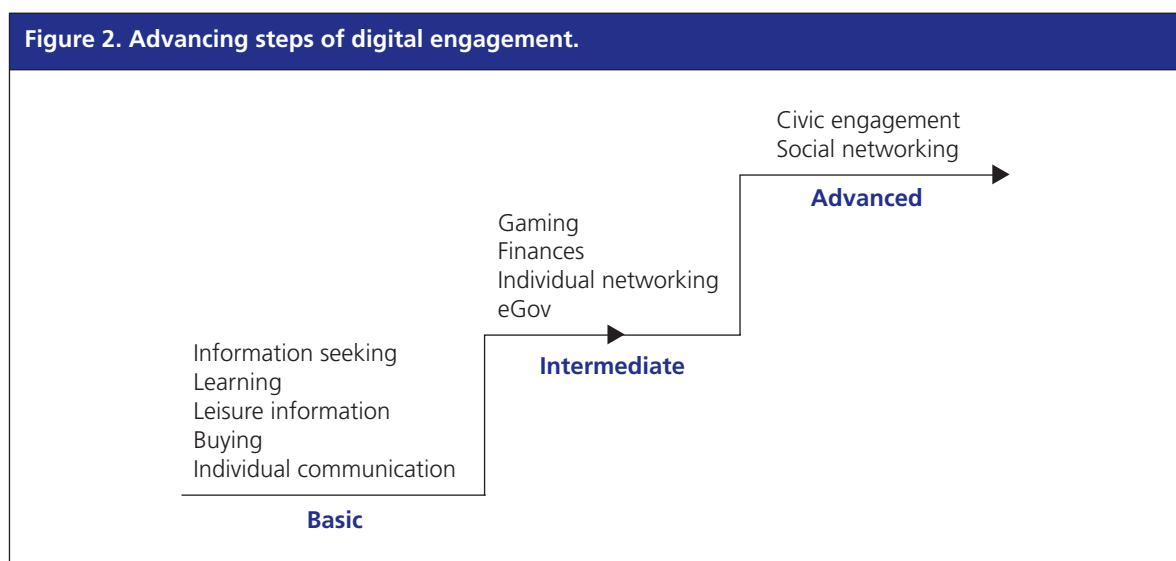
development of positive or negative attitudes towards technologies. Influencing digital choices is therefore not straightforward, and requires innovative and creative approaches to tackling attitudinal and cultural barriers.

Steps toward fuller digital engagement

Across the surveys a clear ladder of sophistication in the use of the Internet emerged from the analyses. As the number of Internet activities a person engages with increases, so does the likelihood of them undertaking more intermediate and advanced activities. Activities that once would have been thought of as advanced, such as online purchasing, are now thought of as basic and commonplace. Furthermore, more advanced activities are associated with home and broadband access rather than access in the community. Multivariate descriptive and factor analyses identified the following clusters of basic, intermediate and advanced activities:

- Basic or Practical uses of the Internet are conducted by 15% of the population (22% of Internet users) and include information seeking, person to person communication, and shopping.
- Intermediate users who, as well as basic activities, use the Internet for participatory activities. Including government services, online financial services and individual networking applications like mailing lists and discussion boards, which allow individuals to interact within existing networks. 45% of the population (67% of Internet users) can be considered to be intermediate users.
- Advanced or Networking uses of the Internet are conducted by 8% of the population (11% of Internet users) and include active civic participation such as signing petitions, and social networking applications like Facebook, which allow individuals to interact with people beyond their immediate networks.

Figure 2 shows these steps:

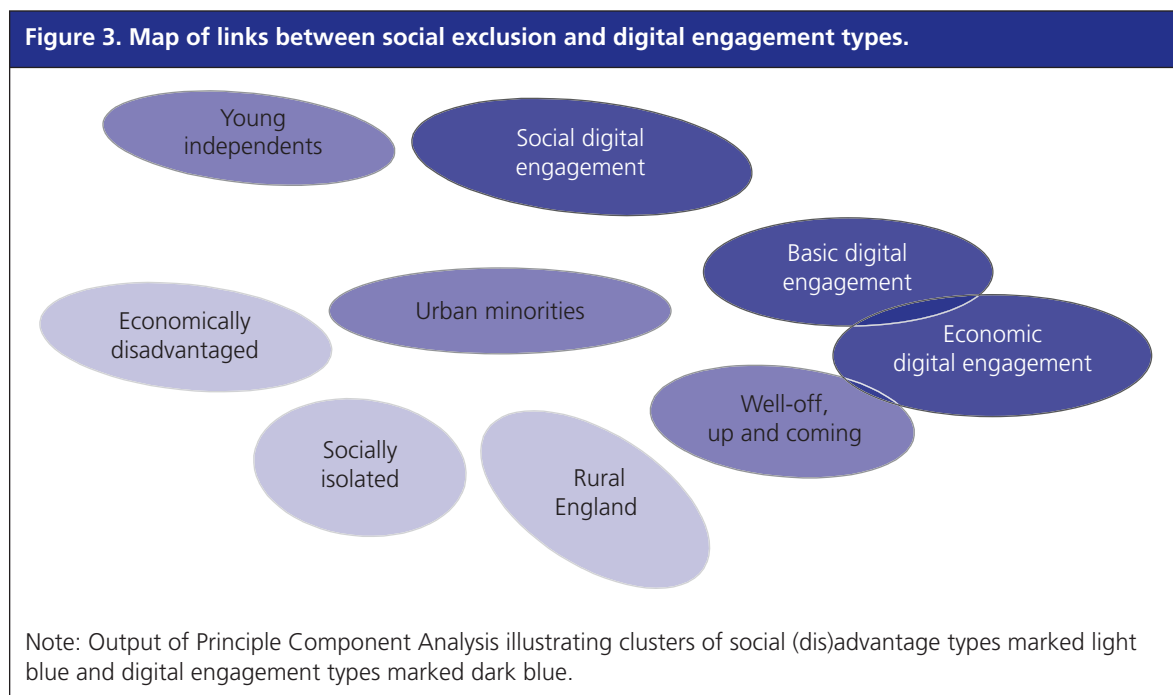


Barriers to fuller digital engagement

Analysis of social exclusion across the surveys indicated two important dimensions of social exclusion: social isolation and economic disadvantage. Both of these dimensions tend to be associated with a lack of basic/practical use of the Internet. However, these two dimensions are in addition linked to different forms of digital disadvantage:

- The socially isolated emerge as being particularly excluded from the advanced/networking resources of the Internet which have the potential to help them become less isolated.
- The economically disadvantaged are particularly excluded from intermediate/participation resources of the Internet, including government services, and financial resources, which provide enhanced access to the services they need.

Figure 3 illustrates the findings based on a principal components analysis which mapped different types of digital engagement and different types of social inclusion and exclusion in a two dimensional space.



Additional analyses reinforce the finding that those **who suffer specific social disadvantages are least likely to benefit from the very applications of technology that could help them tackle their disadvantage:**

- A poor education is a barrier to accessing education and learning resources on the Internet.
- Being elderly (and more likely to be isolated, with constrained social networks) reduces the likelihood of benefiting from social applications of the Internet.

- Having a disability (and potentially being less mobile) reduces the likelihood of accessing the Internet in general (which reduces the need for mobility).
- Being unemployed (and therefore more likely to be financially constrained) reduces the likelihood of benefiting from online buying (which could save money).
- Being retired, unemployed and having fewer educational achievements (and potentially being more dependent on government services and support) reduces the choice and the likelihood of benefiting from electronic government services (which can be more convenient and responsive than traditional services).

A greater number of socio-economic factors influence people's use of more advanced applications such as social networking than those that influence basic applications such as information seeking. The barriers to digital engagement consequently increase as the application becomes more advanced.

ICT-poor environments

Social isolation and economic disadvantage also emerge as being linked to lack of engagement with other technologies. An analysis of ONS survey data which includes questions on electronic government found that:

- The socially isolated tend to have more limited access to more sophisticated technical devices and services. They are more likely to have simple, non-Internet enabled mobiles, non-interactive TV and, if they do have Internet access, are more likely to still use simple dial-up access. Usage and sophistication of use of the Internet is low. Furthermore, there is low use and low willingness to use government services online.
- The economically disadvantaged also have limited access to technology. The technology they are most likely to have is a TV or a DVD player. However, in contrast to the socially isolated they are more likely to try and seek out access to Internet-based services in libraries or places of education. They are also likely to make use of the limited resources that they do have. For example, there is evidence that the economically disadvantaged are likely to shop using their TV and even send email using digital TV. When asked, the economically disadvantaged do express some willingness to access government services electronically, for example using text messaging.
- Those suffering the deepest social disadvantage, where economic disadvantage and social isolation coincide, are likely to be limited to an analogue TV or have no technology at all. There is little use of the Internet and low willingness among this group to access government services online or via other electronic channels.

Conclusions and policy recommendations

The general implications of this study with special relevance to policy making and research practice are:

1. Policies to support social inclusion can make a difference to engagement with technology.

Tackling poor educational attainment can increase engagement with the Internet, as it is a strong differentiator among the socially disadvantaged but unexpectedly engaged. Improving other factors, such as employment and rural access may also help to influence the socially advantaged but digitally disengaged. The presence of children is a big differentiating factor motivating people to become engaged with the Internet. This indicates that well-targeted programmes that provide home access to technology for disadvantaged pupils could have a significant impact if the programmes also reach out to parents.

2. Online government initiatives are not reaching the most excluded.

This is not just about access. Government-related activities on the Internet such as to increase participation and electronic access to services are undertaken mostly by more sophisticated ICT users. Designers of government services need to understand that the socially and economically disadvantaged people who could benefit most by accessing their services will be the least likely to (be able to) use electronic means. This emphasises the need for multi-channel approaches that provide alternative ways of accessing services; mediated access to online services where there are no alternative non-electronic channels, and building people's confidence and ability so that they have the choice to use them independently in the future.

3. Consideration of other available digital channels is particularly important for service designers to engage some socially disadvantaged groups.

There seems to be some willingness to engage with other forms of technology among these groups, particularly via SMS and TV.

4. The potential for the Internet to address social isolation and economic disadvantage is largely untapped.

The Internet is clearly not yet being put to work effectively to tackle these elements of social exclusion. Two areas particularly stand out for further work:

- The role of social networking applications to tackle social isolation.
- Government services and online financial services to support the economically disadvantaged.

Initiatives that directly bridge the gaps that exist between social applications of the Internet and communities that could benefit most from these applications should be a priority. For example, innovative social networking applications for the isolated and vulnerable elderly, engaging educational services for those with poor educational achievement; or financial applications (eg access to online shopping and selling, second hand markets like Freecycle, debt advice and benefits) for those who are economically disadvantaged.

5. Access quality, locations of access and attitudes towards technologies remain important barriers and enablers that government and partners can influence.

There is a continued need to support people and communities in accessing technology and in acquiring the literacy skills required to consume and produce digital media both at home and in the workplace.

6. Government and its partners need to focus on tackling key barriers and enablers for the most disadvantaged.

Key barriers and enablers emerging from this analysis include:

- Extending home access – it is clear that more advanced activities are associated with home access rather than access in the community. So while access in the community is important – extending home access should be a priority.
- Access quality is also associated with more advanced applications – so improving access quality through next generation broadband policy can be an enabler to digital engagement.

7. Government and its partners need to address digital choices, as well as divides.

Well-designed initiatives can address negative attitudes toward technologies and the Internet. The problems of access are cultural as well as economic – even when basic access to the Internet is solved there will be other barriers for socially excluded groups accessing the digital resources from which they could benefit.

Concluding remarks

This study has predominantly focused on the Internet, although the model and analyses proposed in this report are applicable and can be extended across other platforms such as TV and mobile phones. It is clear from the analysis that a multi-platform approach to digital engagement will be more effective than a pure focus on the Internet. However, **simply providing access to these platforms is not enough – digital disengagement is a complex compound problem involving cultural, social and attitudinal factors and in some cases informed ‘digital choice’**. For service delivery, the mode of delivery ultimately matters less than the quality and cost-effectiveness. However, technology is playing a key role in improving the effectiveness and efficiency of services, and those who are able to access these services through electronic channels have a greater choice and a greater range of benefits available to them.

This study has shown that digital disengagement is persistent and related to social disadvantage. The implications of these findings indicate that digital disengagement is not simply an academic issue of little relevance to social policy – technology and social disadvantages are inextricably linked. This means that social policy goals will be increasingly difficult to realise as mainstream society continues to embrace the changes in our information society while those on the margins are left further behind – disengaged digitally, economically, and socially.

1. Introduction

Literature and research questions: introduction

Research approaches to digital exclusion have become increasingly nuanced in the last five years and much less focused on the polarised 'user' versus 'non-user' distinctions of the past. Warschauer (2004), Van Dijk (2005) and Selwyn (2004) warned about the negative consequences of such a simplification of the issues around digital exclusion and it appears, from a review of recent research and policy interventions, that both policy makers and academics increasingly appreciate that the issues are much more complex and multilayered.

In policy communities, in the UK and internationally, discussions about digital exclusion are more often taking place within the context of social exclusion and the implications for disadvantaged individuals and communities. Early research suggesting links between digital and social exclusion has clearly increased the political spotlight on inequalities around access and use of new technologies, especially the Internet. The potential implications of inaction, combined with the benefits that addressing differences in access to ICTs could bring to vulnerable groups, have now made this a political priority.

Although there is increasing recognition of the links between social and digital exclusion, this is by no means universally accepted. Furthermore, there is scepticism, particularly among social policy and practitioner communities, as to whether these links really matter and whether action is justified. Research questions regularly asked in this context are:

(1) Does access to, and use of, technologies (ICTs) support social mobility and lead to smaller differences between social groups?

Those who answer this question positively risk being accused of 'techno-utopianism', ie of overestimating the (positive) power of technologies to change ingrained social structures. There have so far been no comprehensive studies that demonstrate that access to technologies diminishes inequalities at an aggregate level within nations.

A second more critical question is often therefore posed:

(2) Is access and use of ICTs necessary for individuals to maintain their status in societies where access to ICTs is widespread?

Advocates of this position argue that patterns in society are replicated online, but that a lack of access and use will make groups that are already disadvantaged in society fall even further behind. Therefore access to, and use of, ICTs is necessary to maintain the status quo and prevent further inequality.

This leads to a third question:

(3) Is the relationship between access and use of ICTs and social inclusion or exclusion circumstantial?

This question presupposes that digital exclusion does not aggravate or maintain the level of social exclusion of an individual, in other words they are both sides of the same coin without one influencing the other. This line of reasoning leads to the conclusion that there is no causal relationship between social and digital exclusion.

All the above questions (representing 'positive', 'neutralising', and 'no-effects' assumptions about digital inclusion) remain largely hypothetical for a number of reasons.

First, there is very little longitudinal research using panel studies that can demonstrate changes in people's social status after the acquisition of, or more intense use of, ICTs. Anderson (2005) is one of the few researchers to have addressed this issue through a longitudinal study, however, he showed that other factors outweigh the importance of ICTs in influencing quality of life.

Secondly, interventions that introduce ICTs (by educators, policy makers, NGOs, etc.) are often poorly recorded and evaluated (Loader and Keeble, 2004). While academic research has progressed towards recording different levels of engagement with technology instead of approaching the issues from a pure 'user'–'non-user' perspective, the evaluation of interventions has not progressed in a similar fashion.

Thirdly, there is very little theoretical development regarding the exact nature of the links between digital and social exclusion. While social exclusion definitions have been written up and discussed intensively by sociologists and economists, they are rarely linked to similar measures for digital exclusion.

2. Conceptualising and measuring the links between social exclusion and digital engagement

This section of the report develops and presents a framework that can be used to investigate the links between social exclusion and digital engagement for a range of different ICT platforms. The framework developed is ‘ideal’ and constructed without considering the practical restrictions of existing survey databases. In later sections of this report the framework is adjusted for use in analyses that draw on existing UK surveys.

First, we review the existing literature and conceptualisations of digital and social exclusion. This is followed by a discussion of the construction of the theoretical framework.

Conceptualising social exclusion

Indicators of social exclusion tend to focus on those important aspects of an individual’s life that are associated with their health, wellbeing and general quality of life. They are closely associated with socio-economic status and often indicate a lack of material and/or social resources. Some indicators are based on combinations of measures. For example, the Office for National Statistics describes several socio-economic classification systems that use indicators based on income, education and occupation³.

Nevertheless, the sociological literature on inequalities has developed a diverse set of views on what exclusion means. Following Bourdieu’s (1986) work, these different aspects of exclusion have been labelled as ‘capitals’. These “*various species of capital are resources that provide different forms of power*” (p.23, Sallaz and Zavisca, 2007) and can be divided into five broad categories:⁴ economic, social, cultural, political or civic, and personal (Anthias, 2001; Chapman et al., 1998; Commins, 1993; Durieux, 2003; Phipps, 2000). We have adopted this ‘capitals’ model for our framework – although we have renamed them ‘resources’ to model the capability of ICT to build ‘capitals’ through access to relevant electronic resources.

A more recent approach to conceptualising different types of social exclusion is Nussbaum and Sen’s (1993) framework of capabilities. The focus in this approach is on individuals having the capability, defined as the ‘free’ or ‘real’ choice, to

³ See: www.statistics.gov.uk/methods_quality/ns_sec/continuity.asp

⁴ Although there are good arguments for a broader or narrower set of categories, these categories encompass all the different aspects of people’s lives from macro socio-economic to micro individual-psychological characteristics. This report therefore uses this classification to model different levels of social exclusion on which digital exclusion might be influential.

participate in society in the ways they wish to (Nussbaum, 2000). Governments under this approach should create 'substantial freedom' which, in the context of ICTs, means that they need to create an environment in which people can use their capability to make informed choices about using or not using the Internet. Sen (2004) refuses to provide a fixed list of capabilities needed to function in society – he argues that there is a need to define capabilities according to particular contexts. In this report we have therefore defined and specified capabilities for both social and digital contexts.

A brief overview of the literature in relation to economic, cultural, social and personal resources follows. This is brief, but sufficient to cover all the basic elements that make up the framework proposed later in this report.

Economic resources

Traditionally, indicators of exclusion were heavily based on Marx and Bourdieu's ideas of economic capital. These were defined as comprising income, labour prospects and education opportunities. These economic 'resources' can be found in most current measures of economic exclusion.

The Index of Multiple Deprivation (DCLG, 2004)⁵ is one of the indices often used to measure exclusion at a community level, covering economic factors such as education, work and income. Miliband (2006) classified social inequality into three types: wide, concentrated and deep exclusion. Wide exclusion refers to a large number of people excluded on a single or small number of indicator(s) (Bradbrook et al., 2007). Concentrated exclusion refers to a geographic concentration of disadvantage (which in the UK is often in rural and inner-city areas). Deep exclusion refers to disadvantage on multiple and overlapping dimensions.

Specific indicators that should be part of multidimensional indices of exclusion are: unemployment, discrimination, poor skills, low income, poor housing, high crime and family breakdown according to the Cabinet Office Social Exclusion Task Force (SETF, 2007).⁶ Disadvantage is further linked to teenage pregnancy and illness. While most of these are not permanent or stable conditions, they are often carried from one generation to the next, to create cycles of exclusion where parental socio-economic circumstances play a large part in determining the socio-economic situation of their children when they grow up.

Aggregate measures of 'exclusion' such as the Index of Multiple deprivation (see also the ACORN, Socio-Economic Status (SES) indicator, and the Bristol Social Exclusion Matrix) have been created to measure general exclusion over life stages. While all these indices include more than the three pillars of economic capital (ie. income, labour and education), they still tend to focus on economic status at the expense of other measures associated with quality of life.

⁵ Department of Communities and Local Government (2004). *The English Indices of Deprivation 2004*. Retrieved from: www.communities.gov.uk/archived/general-content/communities/indicesofdeprivation/216309/

⁶ SETF (2007) Social Exclusion Task Force. Retrieved from: www.cabinetoffice.gov.uk/social_exclusion_task_force/

Cultural resources

Cultural capital was famously proposed by Bourdieu in 1984 as an important aspect of inequality in society, and as distinct from economic capital. The original definition of cultural capital referred to *“people’s cultural practices, knowledge, and demeanors learned through exposure to role models in the family and other environments”* (p.5, Portes, 1998). Current definitions identify cultural capital as the shared norms that guide behaviour within a group and which, due to their shared nature, give meaning to belonging to a certain group (Durieux, 2003; Kingston, 2001; Selwyn 2004a).

Cultural resources are interpreted in this report as world knowledge and the interpretation of information that is learned through socialisation. This includes norms about what certain groups of people are ‘supposed’ to behave like and what their aspirations should be. Room (1999) has labelled people whose particular cultural resources exclude them from society as ‘negative subcultures’. Cultural resources thus do not necessarily have to be positive in nature when it comes to ICTs, that is, individuals can be socialised to understand ICTs as something negative – as something that is not part of their group’s culture.

Social resources

Social capital is defined as the involvement in and attachment to networks within a society that give a person access to useful information and opportunities (Coleman, 1990). Thus, social resources can be defined as *“the benefits accruing to individuals by virtue of participation in groups and on the deliberate construction of sociability for the purpose of creating this resource”* (p.3, Portes, 1998) These social networks can be based on common interests, activities, family ties or other bonds that join a group of people together.

Based on Granovetter’s (1983) study of offline social networks, researchers have started identifying different types of social resources as being of either emotional or instrumental support (Hinson et al., 1997; Lin, 2001; O’Reilly, 1988) and as weak or strong (Haythornwaite, 2002; Kavanaugh et al., 2005).

Social resources differ from cultural resources in that they are more flexible and can be severed or established throughout the lifetime and are not associated to specific types of socialisation. People have little choice in their gender or ethnicity (both indicators of cultural resources), they can however, opt in or out of emotional and interest networks.

Political or civic resources

More formally organised types of social resources can increase political or civic capital (Giddens, 1998; Putnam, 1995). Bennett (2003) argues traditionally that political resources could be defined as the way in which political order is established *“through mutual identification with leaders, ideologies and memberships in conventional ... political groups”* (p.147). She goes on to propose that ICTs might change the way in which people participate politically. Since political and civic resources involve participation in organised networks, political capital is often seen as a specific type of social capital.

Political resources are defined in this report as the opportunities that people have to participate in political and civic processes. These include voting rights, advocacy group membership, whether the person has a position of power within the local community, and whether this person can influence unknown others in relation to a certain interest that lies outside the personal interest sphere.

Personal resources

Personal resources are related to the characteristics of an individual, for example, emotional or physical well-being. Psychologists have used personality and health indicators to judge how prepared people are to cope with different situations in everyday life. The Big Five (Saulsman and Page, 2004), the Loneliness (Hughes et al., 2004; Russel, 1996), and the MMPI scales (Tellegen et al., 2003) are only three of the many indices that researchers use to understand a person's character. In relation to learning and acting in new environments, self-efficacy beliefs have been shown to be important even more than skills developed through formal training (Bandura et al., 1996).

When based on personality characteristics, disengagement from society often leads to a disregard for social norms and a need to rebel against a system that is perceived to have rejected or failed that person. Farrington (1992) links this to a sense of failure and feelings of alienation, which subsequently leads to anti-social behaviour and addiction. This lack of personal capital has been related to a breakdown of family relationships, chaotic physical living environments and neighbourhoods, substance abuse and truancy.

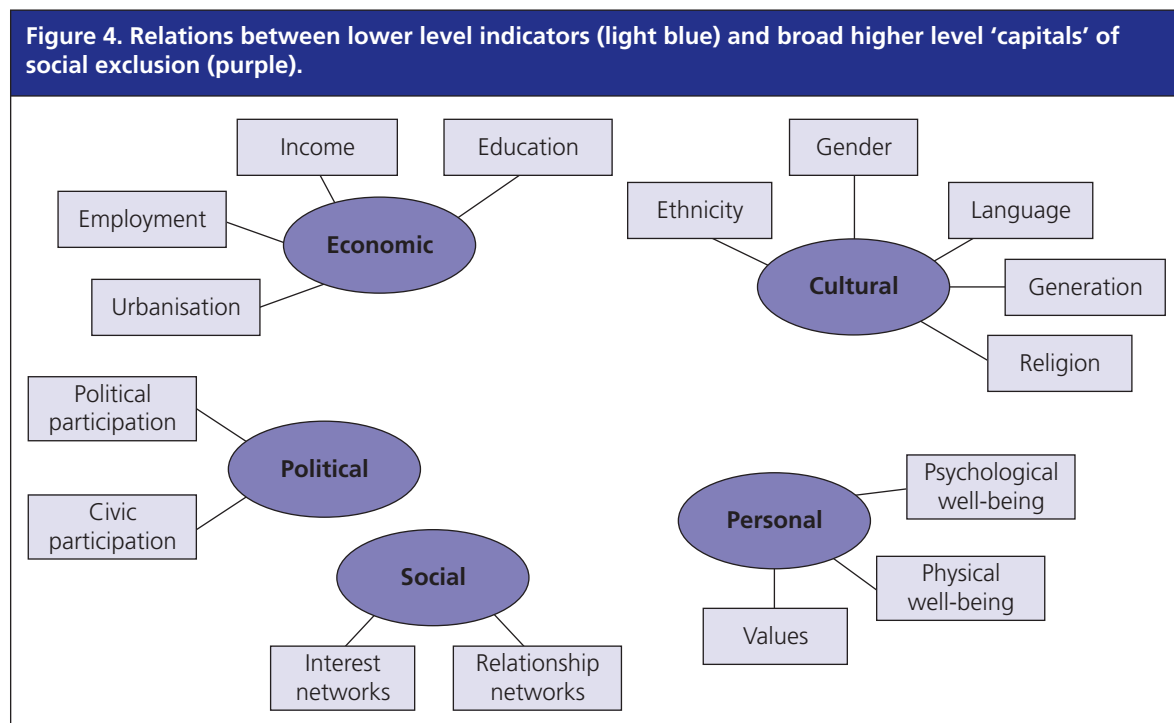
Five social inclusion resources: discussion

Most of the resources presented are not stable throughout the lifetime of a person; socio-economic mobility is without doubt possible and ICTs could be a facilitator of this type of mobility. Smaller changes in social and personal capitals can occur because people change their position and thus status in society by identifying with new groups in different contexts. Context can also change how socially included a person is (Abrams, Hogg and Marques, 2005). On an individual level, social inclusion research often focuses on social and educational skills, attitudes and psychological well being. Individual factors such as context and personal experiences fall outside the scope of most policy research, but can nevertheless be very important in determining how included or excluded people are from society.

There are typically limits and barriers to the speed and extent of social mobility. This is especially true for economic and cultural capital; an individual does not have much choice in increasing their income or, for example, changing their gender over night. However, they are free to emphasise different capitals in different situations; for example in certain circumstances they might want to stress being middle-class, in others they might want to emphasise being of a majority or minority ethnic group. In general, economic and cultural capitals are considered less manageable while social and personal capitals can be influenced by outside factors and can change over a lifetime.

The five capitals of social exclusion that have been introduced form the basis for the analytical and research framework to be presented later in this report. They are clearly a simplification of the immense body of literature on social exclusion that exists. In addition, it is difficult to separate the different types of social exclusion because they are often strongly linked, for example, personal well being is related to economic as well as social resources. Furthermore, underlying these five 'higher level' constructs are a myriad of 'lower level' indicators that can be used to measure different aspects of economic, cultural, social, political and personal capital. However, by focusing on these five higher level resources it is possible to compare research projects that use different lower level measures – as long as all five higher level resources are included in some way in the dataset. Applying this approach to social as well as digital exclusion further facilitates the study of resource-based links between social exclusion and engaging with technologies; therefore improving the way in which digital interventions are evaluated.

In summary, the five overarching resources (economic, cultural, political, social and personal) form a robust academic basis for an aggregate model of social exclusion that can be measured through a number of lower level indicators depending on the survey data available. An example of how this model of social exclusion can be constructed using Oxford Internet Survey (OxIS) data is depicted in Figure 4. But this same model has also been applied to ONS and Ofcom surveys during the course of this study.



Conceptualising digital inclusion

A review of different studies indicates that graduated approaches to measuring digital inclusion are being increasingly used to explore the issues. However, these

graduations are all too often focused on different levels of access. They can also be too theoretical, which makes it difficult to operationalise the findings. If research is to more effectively steer policy, and provide actionable results, it is clear that researchers need to conceptualise digital inclusion not only around levels of access to ICTs, but also motivation, knowledge and skills.

Bradbrook and Fisher (2004) advocate the '5 Cs' of digital inclusion: connectivity (access), capability (skill), content, confidence (self-efficacy) and continuity. The latter, continuity, is related to Dutton's idea of the Internet and other ICTs as part of the infrastructure of everyday life – not only is the technology widely available, it is becoming part of such an ingrained part of everyday life that it is more and more difficult to see the 'digital world' as separate from the 'real world'.

Anderson describes how digital inclusion often fails to incorporate this idea of continuity especially in groups that are vulnerable to social exclusion. People tend to 'dip in and out' of technologies such as the Internet, depending on their everyday circumstances. This means that at certain points in their lives they are digitally included and at others are excluded. The OxIS surveys (Dutton and Helsper, 2007) show clearly that the differences between fully engaged users, the flexible in-out users, and those who have never used the Internet, are important to understand when examining the processes that lead to exclusion. Furthermore, it is important to include those people without direct access to ICTs in this type of research, since there is evidence that many non-users have a proxy-user, that is, someone who can use the technology for them if they need to access some information or a service.

Against this context, digital inclusion can be defined and measured in a number of different ways. For this study, digital resources have been identified through a literature review in the same way that social resources have been identified in the previous section. These digital resources have been grouped into four broad categories: ICT access, skills, attitudes and extent of engagement with technologies, and used to create an index of inclusion. Van Dijk (2005) proposes a similar classification of digital resources, but the way in which this classification is operationalised is slightly different. For this study, the four different resources are placed in a framework that looks at digital disengagement as determined by either exclusion, factors and barriers that are not easy for an individual to overcome quickly themselves (eg low income and poor infrastructure availability), or by 'digital choice', that is, the person chooses not to use technologies even though they have the capabilities to do so.

ICT access

Although policy and theoretical discussions in relation to digital inclusion have moved on from a focus on pure ICT access provision, it remains unclear which characteristics of access, eg speed, quality and location, play the most important roles in engagement and also how best to measure these. Most of the focus in terms of access is currently on where and how people access the Internet via PCs and therefore most of the research literature focuses on this. Nevertheless, the same issues of quality and quantity of access can be applied to understanding access to other types of ICTs such as digital TV, mobile phones and games consoles. This study has defined and measured an 'ICT access' index in terms of quality, location and platform sub-measures.

Location

People have more freedom to use ICTs, such as the Internet, in their own home than in other locations. Access at home enables individuals to become acquainted with the technology on their own terms and allows for efficient informal learning to take place (Buckingham, 2005; Kalichman et al., 2002; Livingstone, 2003a). Home access, instead of just access anywhere, is now therefore used by most researchers as an indicator of high quality access (see Helsper, under review; Mumtaz, 2001). Access at school is also important. Helsper (2007) argued that for young people, private, personalised access to computers and the Internet at school will aid those who do not have access to these ICTs at home to develop digital skills and to explore the Internet in a fashion that is learning oriented. Mobile access in the community using WiFi or mobile cards in laptops is also on the increase. For this study we use the number of locations from which a person has access to the Internet as an indicator within our digital inclusion index. Home access, however, is given increased weight for the reasons already given. So an individual with access across multiple locations, including at home, would be measured as being more digitally included than individuals with only access in the community.

Quality

Broadband access is considered to lead to a higher quality experience and broader use of the Internet than dial-up Internet access. However, developments in access and infrastructure are rapid, and recent studies (Ofcom, 2006) have indicated that wireless or mobile access is a good indicator of access quality since it is available across different locations and provides a high speed connection. Our ICT access index therefore includes indicators of infrastructure technology used by individuals, with greater weight given to broadband and wireless than dial-up. In other words, individuals with access to broadband would be seen to have a higher quality of access than those with dial-up and therefore to be more 'digitally included'.

Platforms

New platforms are emerging that allow for access to a wider variety of digital content for example, digital television, telehealth set top boxes, games consoles and smart energy meters. A range of platforms should therefore be included in studies that aim to measure digital inclusion. The wider the variety of platforms, the wider the diversity of content that is available to a person. In media studies literature this feature is often therefore described as the media richness of a household (Livingstone, 1998).

Skills

Beyond access to ICTs, certain skills are required to use them. Digital exclusion based on skills is considered to result from a lack training and direct hands-on experience.

Livingstone, Bober and Helsper (2005) have argued that the best measures of skill level are those that test expertise on a variety of tasks and aspects of ICT use. Skill types can be divided into four broad categories; technical, social, critical and creative skills. This classification is based on media literacy research that suggests that skills should be measured beyond the basic technical level and in relation to the ability to work with communication technologies for social purposes. Content

creation and production skills are also seen as increasingly important, to enable individuals to respond to the content they consume and participate more effectively in the information society. Content production is particularly part of expert users' repertoires; experts are particularly familiar with the ways in which digital content is created. Some say these creative skills are necessary to develop true critical skills. This last aspect of ICT skills supports the critical evaluation of the trust-worthiness and accuracy of digital content (Ofcom, 2006).

Transferable skills

This combination of specific ICT-related skills is strongly linked to general 'non-ICT' based capabilities that are often labelled as 'transferable skills' (Bridges, 1993). These are skills that people have learned in one context but which they are able to apply in a variety of other contexts and are thus not tied to specific tasks. In relation to digital engagement, one can argue that general life skills (eg. critical evaluation of sources, self-efficacy, social skills and creative skills) will allow people to participate more fully in a digital context as well.

In education and workforce research, a series of studies has developed measures for transferable skills (Baker, 1989; CBI, 1989). Bridges (1993) gave a good overview of developments in relation to transferable and core skills, the latter related to specific contexts and activities.

A review of the existing research on digital engagement shows that little work has been done on identifying measures of general 'non-ICT' based capabilities that help individuals participate in an ICT-based society. In fact, transferable skills that are not specifically related to online activities are notable for their absence and this represents an important gap in current digital inclusion research. For example, general problem solving, numeracy or literacy skills are rarely included in studies of digital engagement. However, a lack in these types of transferable skills might be an important barrier to engaging with technology, particularly for those people who are socially excluded.

Specific research around the links between transferable skills and ICT engagement, perhaps around the four higher level skills categories of technical, social, creative and critical skills, should allow researchers to predict different types of uses of ICTs to a greater extent.

Self-efficacy

There are a number of studies that use the general concept of self-efficacy to measure the ability of a person to handle technologies. ICT self-efficacy relates to a person's evaluation of their own ability to work with ICTs. However, this is more likely to be linked to a person's general access and attitudes towards technologies and less likely to be related to specific types of engagement. Internet self-efficacy has been described by Eastin and LaRose (2000) as:

"... the belief that one can successfully perform a distinct set of behaviours required to establish, maintain and utilize effectively the Internet over and above basic computer skills" (p.2).

In general, those people with higher self-efficacy scores have a greater chance of completing a task successfully than those who have low levels of self-efficacy, independent of their actual skill level (Bandura, 1996, 2003; Torkzadeh and Van Dyke, 2002). Besides influencing success in using the Internet, self-efficacy levels might also influence the motivation to go and use it. Those with low levels of self-efficacy are less likely to use the Internet in the future (Eastin and LaRose, 2000).

Haddon (2000) uses the term self-exclusion to describe processes of ICT rejection that are based on low perceptions of personal skill (not necessarily based on real skill levels) and negative attitudes towards technologies in general. Members of some social groups might be disadvantaged not because they do not have access or skills, but because they *feel* they do not have the skills to go online or because they imagine the Internet to be of little use (Anderson, 2005; Cushman and Klecun, 2006; Dutton and Shepherd, 2006; Selwyn, 2003, 2004a,b; Wajcman, 1991, 2000, 2004). These feelings might not be based on actual experiences with the technologies.

Attitudes

Attitude formation in relation to the usefulness and dangers of the Internet has been found to go beyond individuals' perceptions of the influence of ICTs on their personal experiences. There is, from a review of the literature, no clear consensus emerging on classifying and measuring different types of attitudes in relation to ICTs. In this study we have chosen three categories: general attitudes towards ICTs, attitudes towards regulation, and attitudes about the centrality or importance of ICTs.

General ICT attitudes

The terms 'ICT anxiety' and 'ICT attitudes' have been used to describe people's evaluation of the effect that ICTs have on society and on an individual's quality of life (Durndell and Haag 2002; Harris 1999; Yang and Lester 2003). The concept of ICT anxiety particularly represents the apprehensions a person has regarding the use of ICTs. Some ICT anxiety indicators are similar to self-efficacy measures, but more generally they relate to attitudes about ICTs, impact on social interactions or on personal freedom and safety.

Regulation

A number studies have investigated the attitudes of people towards the regulation of the Internet, data protection and privacy, and towards the influence of ICTs on an individual's participation in society. This interest in attitudes towards regulation is often linked to people's concerns about problematic or harmful digital content that might be available through different ICT platforms.

Research has focused on people's attitudes towards the role of the government, educators, parents, service or content providers and children in regulating exposure to different types of content considered problematic for vulnerable individuals (Millwood-Hargrave and Livingstone, 2006). On the other side of this debate are questions about people's attitudes towards freedom of speech and the importance of ICTs in providing a platform for dissent and public debate.

These attitudes towards regulation of digital content inform people's perceptions of what the most important opportunities and risks are in engaging with ICTs and can therefore shape the ways in which they engage or not.

Importance of ICTs

A further strand of research has asked what the importance is of ICTs in everyday life and how central they are to the ability to function in an increasingly information-based society.

There is evidence that some attitudes to the importance of the Internet to everyday life are grounded in cultural and social factors such as gender and ethnicity (Boneva, Kraut and Frohlich, 2001; Cummings and Kraut, 2002; Jackson et al., 2001; Spooner, 2001; Spooner and Rainie, 2000, 2001; Whitely, 1997). Feminist scholars have shown how certain social groups develop ideas of appropriate use of ICTs that are entwined with their group identity. This could explain why certain socio-cultural groups think that a technology is not made for them, that it is not appropriate for them to use or that they are not good at using it (Gill and Grint, 1995). Selwyn's (2004b) work indeed suggests that a lack of interest in a technology can hide not only a lack of confidence in one's own skills but also a feeling that it is not directed at one's peer group.

Digital engagement

Access to ICTs is a necessary but not sufficient condition for successful engagement with technology. Similarly, high skill levels and positive attitudes are not, on their own, sufficient to guarantee full, broad digital engagement. There are two main approaches to measuring digital engagement: it can be measured through a qualitative lens, focusing on the nature or content of engagement, or it can be approached quantitatively through an evaluation of the number of things that people do using the technology.

The argument is made by different scholars that no general definition of what it means to be digitally engaged can be preconceived, and that research should therefore incorporate people's own estimates of how digitally included they are (see Anderson, 2005; Anderson and Tracey, 2001; Cushman and Klecun, 2006; Haddon, 2000; Selwyn, 2004a, 2006b).

Nature of engagement

There is often a range of ways in which people can engage with any one technology – the mobile phone, for example, can be used to communicate with others, to find information, listen to music or to play games. Since the Internet is currently the most versatile medium in terms of the different types of engagement that are possible, most of the research that has tried to classify digital engagement is based on the Internet.

The Internet itself is a concept with unclear boundaries and many scholars have used the term in different ways. When one uses a narrow definition of the Internet as meaning just 'websites', there are still many different types of websites offering many forms of engagement. Given that the Internet has a wider range of different

functions than traditional media, such as television and radio, the Internet offers a new range of uses to individuals (eg Didi and LaRose, 2006; Slevin, 2000). Anderson and Tracey (2001) have argued that the Internet cannot be studied as a single unit, and view it as a "*delivery mechanism for a range of services that are continually evolving and are used differently by different people*" (p. 462). Clear-cut distinctions between commonly used categories of Internet use, such as entertainment, information, services, communication and participation (eg Papacharissi and Rubin, 2000), cannot always be established in empirical research. It is still important to analyse the Internet as offering resources in these different areas and not focus just on users and non-users but also on breadth and nature of use.

Digital engagement is especially difficult to measure consistently because technology is changing so rapidly. Web 2.0 applications, which serve as platforms for interactive multi-media file sharing and social networking sites, are the latest development (O'Reilly, 2005). A classification of different types of engagement is also useful in a model of digital engagement that is concerned with multiple platforms and technologies. The traditional classification of ICT use can be more or less distilled down to communication, networking, entertainment, leisure, information, learning, economic participation, political participation, civic engagement and creativity. The broad classification adopted in this study, based on a literature review, is a subset of the broader list: information, entertainment, communication, participatory, and commercial forms of engagement.

When using ICTs, certain types of engagement have been considered to be more socially desirable (ie information seeking and civic interest) than others (ie pornography and gambling) by policy makers and educators (see also Livingstone and Millwood-Hargrave, 2006). This indicates that some types of engagement would be better indicators of inclusion and 'proper' use than others. Digital inclusion research tends to ignore use of undesirable applications as indicators of inclusion and instead focus on those that are assumed to bring greater social advantage.

This latter approach requires researchers and policy makers to make a moral judgement as to which types of engagement are more valuable. This also implies that a person who engages heavily with ICTs, for example by being an expert gamer, could nevertheless be considered less digitally included than others by virtue of the absence of desirable types of engagement. This study rejects this moralistic approach and assumes that any type of engagement contributes towards digital inclusion, and leads to a broader integration of technologies into other aspects of everyday life.

Extent of engagement

All these types of engagement can be undertaken across different technologies. For example, information, entertainment and communication are all possible through digital TVs, mobile phones and computers connected to the Internet. Breadth of engagement can therefore be measured across a range of activities and technologies. In this study we have measured breadth of engagement as a sum of the different activities via ICT. Creating such a scale and standardising the results makes it possible to compare different datasets both over time and across different studies.

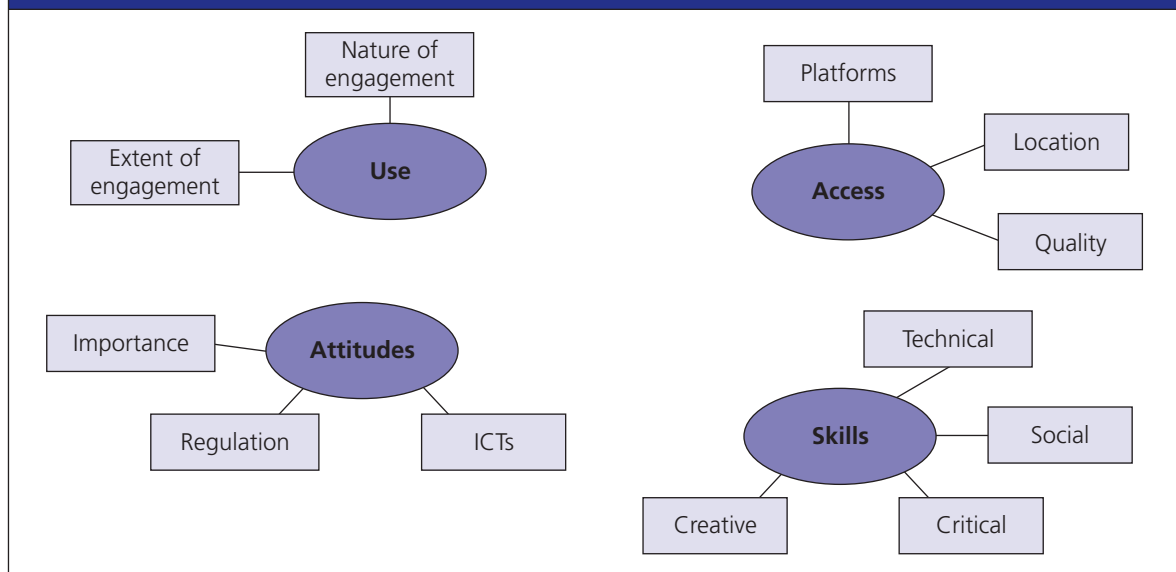
Further measures of extent of engagement relate to the time people spent using different ICTs and the number of years they have been actively using these types of ICTs.

Four categories of digital inclusion: discussion

Technology is changing rapidly and therefore digital inclusion is also dynamic, that is, what was considered advanced three years ago can be considered 'basic' digital inclusion now. This means that the categories and measurement framework for digital engagement need to stand the test of time and be able to deal with these changes. The four categories that have been presented are therefore contextual in a similar way to the categories of social exclusion. We have also focused on higher level, aggregate measures for each category. These aggregate measures are formed from lower level indicators (eg quality and location of access). However, these lower level indicators have not been clearly defined in terms of specific questions that need to be asked to measure them. This report argues that any study or intervention that aims to understand digital inclusion needs to inquire at the very least into the four broader categories and their immediate lower level indicators. If all these indicators are measured then studies can be compared and interventions can be evaluated, independently of how the specific lower level indicators are compiled through surveys.

Figure 6 summaries how the aggregate measures for the four categories have been mapped onto lower level indicators.

Figure 5. Relations between lower level indicators (light blue) of broad higher level categories of digital inclusion (purple).



For each of the four categories (use, access, skills and attitudes) a separate scale can be constructed and used for comparative analyses. Similarly, for different datasets separate scales should be designed for the lower level measures (eg nature and extent of use) and while these scales might contain data derived from different

questions, on an aggregate level they should be measuring the same overarching category. This framework and measurement approach provides a robust basis for an ideal measure of multiple digital deprivations, in contrast to current indices of digital exclusion which focus mainly on 'access' deprivation.

As was the case for the five social exclusion categories, the digital engagement categories are interrelated. However, in contrast to the way in which the social exclusion framework was developed, it is proposed that they do not all influence each other in parallel. Three of these categories (access, skills and attitudes) are considered to be mediators between social inclusion and digital engagement. The next chapter specifies the ways in which this mediation is supposed to take place, by constructing a comprehensive framework of the links between social inclusion and digital engagement.

3. Research framework

The preceding sections indicate that digital inclusion should not be wholly focused on ICT access, skills and attitudes – the application and nature of engagement matters significantly. It is simplistic to argue that what people eventually do, or do not do, with ICTs is their own business, as long as they have the skills and access to do so. This would be like arguing that as long as people have access to schools, are intelligent enough to learn and have a positive attitude towards education, then they will be all right even if they do not actually go to school. It is clear that having the right conditions in place relating to access, skills and attitudes will not alone diminish social exclusion if these are not being put to use. Studying the actual use of technology to access ‘digital resources’ is therefore essential to understanding the links between digital and social exclusion.

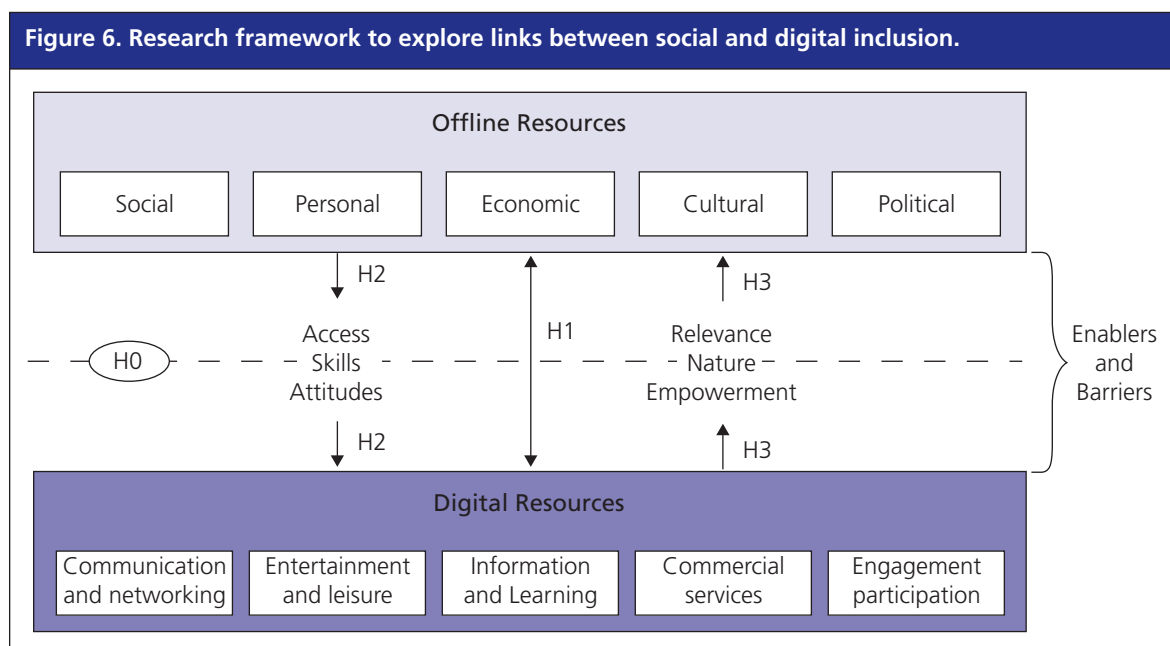
In developing a framework it is possible to hypothesise that ICT access, skills and attitudes are outcomes of a process of social exclusion – in other words, digital exclusion is a consequence of social exclusion. Other studies have adopted this approach, however, we propose a framework that treats access, skills and attitudes as barriers or enablers of a relationship between social inclusion and digital engagement. In other words, our framework tests whether the level of ICT access, skills and the types of attitudes a person has either facilitates or inhibits the influence of social inclusion on digital engagement.

The proposed framework also enables us to explore whether certain types of social inclusion indicator influence similar types of digital inclusion indicators and vice versa. Previous research had supported this suggestion for individual indicators but this has not really been tested across the range of social and digital resources on an aggregate level. Characterising different types of social and digital inclusion is an important aim of this study.

Testing whether digital engagement leads to greater social inclusion is more difficult and is best tested using longitudinal data. Previous longitudinal studies have suggested that the digital inclusion factors that enable or inhibit social inclusion are: relevance, nature of the experience, and empowerment. In practice, this means that only when digital experiences are relevant to everyday situations, if they are positive in nature and only if the person feels that online actions lead to the reactions/actions of others, will digital inclusion influence social inclusion.

The research framework that captures and summarises what has been presented in preceding sections is presented in Figure 6. This diagram also presents the hypotheses to be tested.

Depicted at the top of Figure 6 are the ‘social capitals’: previously presented in our review of literature. These have been referred to as ‘offline’ resources in the diagram. The lower block in the diagram illustrates ‘digital resources’, previously presented as indicators of the breadth and quality of use of technology.



In between the two blocks in Figure 6 are those factors emerging from our literature review as barriers or enablers to the mutual influence of offline and digital resources on each other. These include ICT access, skills and attitudes. Additionally, the framework captures the points previously presented that for digital resources to influence offline resources, experiences using ICT need to be relevant to the person's daily life, need to give the person a sense of empowerment in that area, and need to be positive in nature.

Research questions and hypotheses

A number of hypotheses, presented in Figure 6, can be formulated and tested with the analysis framework to meet the objectives of this study. The first fundamental hypothesis to be tested is the basic assumption of 'no effects' – in other words 'Is there any significant effect of access and use of ICTs on social inclusion or exclusion or vice versa'. In Figure 6 this hypothesis is represented as H0:

H0: There is no link between social exclusion and digital disengagement.

However, considering that there is some existing evidence of links, what is required is to better understand and characterise the relationship between digital and social engagement, and this is represented in Figure 6 by H1, a more nuanced hypothesis:

H1: Social and digital inclusion are positively linked only for specific types of social and digital exclusion.

This hypothesis reflects the following question: 'Which specific links exist between different types of social exclusion and specific types of digital engagement?' It tests, for example, whether specific social resources are exclusively linked to relevant digital resources, eg a low level of education may be related to a lack of digital learning but not impact digital entertainment. Evidence found in support of this hypothesis implies

that providing access on its own is insufficient and that even if people engage on a basic level with the Internet they are not likely to use the technologies in ways that would be most beneficial to their specific social disadvantages.

If the links between specific digital and social inclusion indicators are found, a further question is: 'What mediates or influences this relationship beyond basic access to technologies? Digital initiatives for socially excluded groups could be more effective if they are targeted at the most influential mediating factors. Hypotheses in relation to this question are presented on Figure 6 as H2 and H3:

H2: The link between social and digital exclusion can be fully explained by differences in basic barriers to ICT use (access, skills and attitude).

and:

H3: Any effect of digital engagement on social inclusion is explained by differences in enablers of ICT use effects (relevance, empowerment and nature of experiences with ICTs).

H2 tests whether the influence of social inclusion indicators on digital engagement indicators can be fully explained by differences in certain basic barriers and enablers (access, skills and attitudes). Two conclusions would follow from confirmation of this hypothesis. First, that social inclusion influences barriers to technology but not directly the actual type of use of technology. Second, and similarly, amongst ICT users these barrier or enabler variables are what determine digital engagement and not the level of social inclusion. If this hypothesis is supported, then the policy solution of providing universal access and skills training should solve gaps in digital inclusion without the need for further intervention.

H3 tests whether digital engagement only increases social inclusion, that is, if the experiences with ICTs are relevant, empowering and positive in nature. In other words, is digital inclusion only expected to have an effect on social inclusion under these very specific conditions?

These four hypotheses are designed to answer the key questions as regards to whether there is a link between social exclusion and digital disengagement and, if such a link is found, what the limits and nature of this link are. The next section presents the analytical approach adopted to test these hypotheses.

4. Methodology

The research framework presented in the previous section is 'ideal' and theoretical. It is robustly grounded in a comprehensive analysis of literature and existing research. However it is idealistic because the development of the framework has been largely independent of, and unrestricted by, the details of what data are available to test the framework. That said, the framework has been intentionally designed at a level that can be applied to a range of different surveys. It therefore provides different organisations a way to collaborate, compare and contrast the links between digital and social exclusion using their different datasets and relating to different digital platforms (eg Internet via a PC, mobile phone, television etc). Even if organisations use different lower level measures (eg income, education etc) the framework allows 'higher level' aggregate measures (eg of social exclusion, digital engagement etc) to be compared and links analysed. There are limits to this and researchers realistically need to ensure that they have an aggregate measure for each different element in the model for cross-survey comparisons to be useful.

This study is based on cohort survey data collected in the UK. The most comprehensive datasets about ICTs in the UK are gathered by the Oxford Internet Institute (OII), the Office of Communications (Ofcom) and the Office for National Statistics (ONS). The OII's dataset, based on its biennial Oxford Internet Surveys (OxIS), is longitudinal as well as providing significant depth around Internet use. Both the ONS and Ofcom run tracking surveys that monitor the use and development of ICT use on a yearly and quarterly basis, respectively. All the datasets are based on representative samples of the UK population.

Analytical approach

For the analysis and research framework, we have constructed new comparable aggregate level measures within each survey dataset in addition to using existing aggregate measures such as the ACORN⁷ and area deprivation indices⁸ based on postcodes of survey respondents. One of the challenges with using survey data is that they are based on cohorts and it is more difficult to determine causality in the way that interventions or experiments can. We have therefore adopted a multilayered approach to our analysis of the hypotheses presented in the previous section, deploying a combination of simple descriptive, relationship and causal analyses.

Simple descriptive analyses

These show the level of digital inclusion of individuals with different social resources. This type of simple analysis is suitable for testing Hypothesis 0 (H0).

⁷ www.caci.co.uk/acorn/

⁸ www.communities.gov.uk/communities/neighbourhoodrenewal/deprivation/deprivation07/

Relationship analyses

Relationship analyses are suited to exploring which types of social and digital inclusion resources cluster together and are statistically associated. These techniques can be used to test H1, H2, and, to some extent, H3. Relevant multivariate statistical techniques include factor analyses, principal component, and linear regression:

- Factor analysis can be used to determine if any underlying constructs exist in a series of measures. This technique is often used to construct aggregate measures based on a series of questions in a survey. The application of this technique is necessary to establish the types of digital engagement that exist: a prerequisite for testing H1.
- Principal component analyses can be used to determine how social and digital exclusion are patterned in a two- or three-dimensional space. This technique has been used extensively in this study to map a range of social exclusion and digital engagement factors, and to understand which groups of offline resources are most closely related to which digital resources. This technique has been used to test H1.
- Linear regression enables us to understand which factors are most important in predicting (a) social exclusion and (b) digital engagement, while controlling for other factors. This technique is suited to testing H1, H2, and, to a certain extent, H3.

Of these analysis techniques, linear regression is particularly powerful for this study as it examines the effect that one variable (eg offline cultural resources) has on another (eg digital information resources), independently of the effects of other variables. One could therefore, for example, uncover what the unique effect is of education on digital engagement, controlling for the effect of (for example) poverty. This can offer a means of predicting who, based on their offline resources, is likely to be digitally engaged. Or conversely we could try to predict: who, based on their digital resources, is likely to be socially included? Linear regressions also offer the possibility of testing H2 since they can show if social exclusion variables continue to have an effect on digital engagement, even if effects of access, attitudes and skills variables are already accounted for.

'Causal' analyses

The techniques described test the strength of relationships and associations between variables but do not provide evidence of causality. Causal analysis of digital inclusion effects would be best conducted through an evaluation of a specific intervention rather than by analysing national level surveys. However, there are some techniques to help to indicate causality. Using survey data there is the possibility of exploring the characteristics of outliers in more detail. For example, for this study we have examined those participants in surveys who are socially but not digitally included ('the unexpectedly excluded') to understand how they are different from those that show the expected pattern of combined digital and social inclusion. Similarly, it is possible to examine those who are digitally engaged but socially excluded ('the unexpectedly included') and understand how they are different from those who are excluded both digitally and socially. This makes it possible to understand which factors might mediate any relationship between social exclusion and digital disengagement.

Analytic focus on the Internet

The rise of the Internet, its applications and research surrounding this medium have been the driving force behind most current research around exclusion and ICT. This is understandable because in comparison to other ICTs, the Internet seems to have an almost unlimited range of applications. The Internet is at the heart of the convergence of traditionally separated media and other technologies such as digital television and games consoles are increasingly providing access. The Internet promotes the integration of activities and applications across different platforms and technologies.

The Internet is therefore an important focus for policy makers. It can potentially educate, entertain, inform, democratise, provide commercial and public services, and it can be used to create and maintain professional and personal networks. The analysis of this study therefore focuses on the Internet. However, the analytical framework can be applied to other technologies.

5. Findings

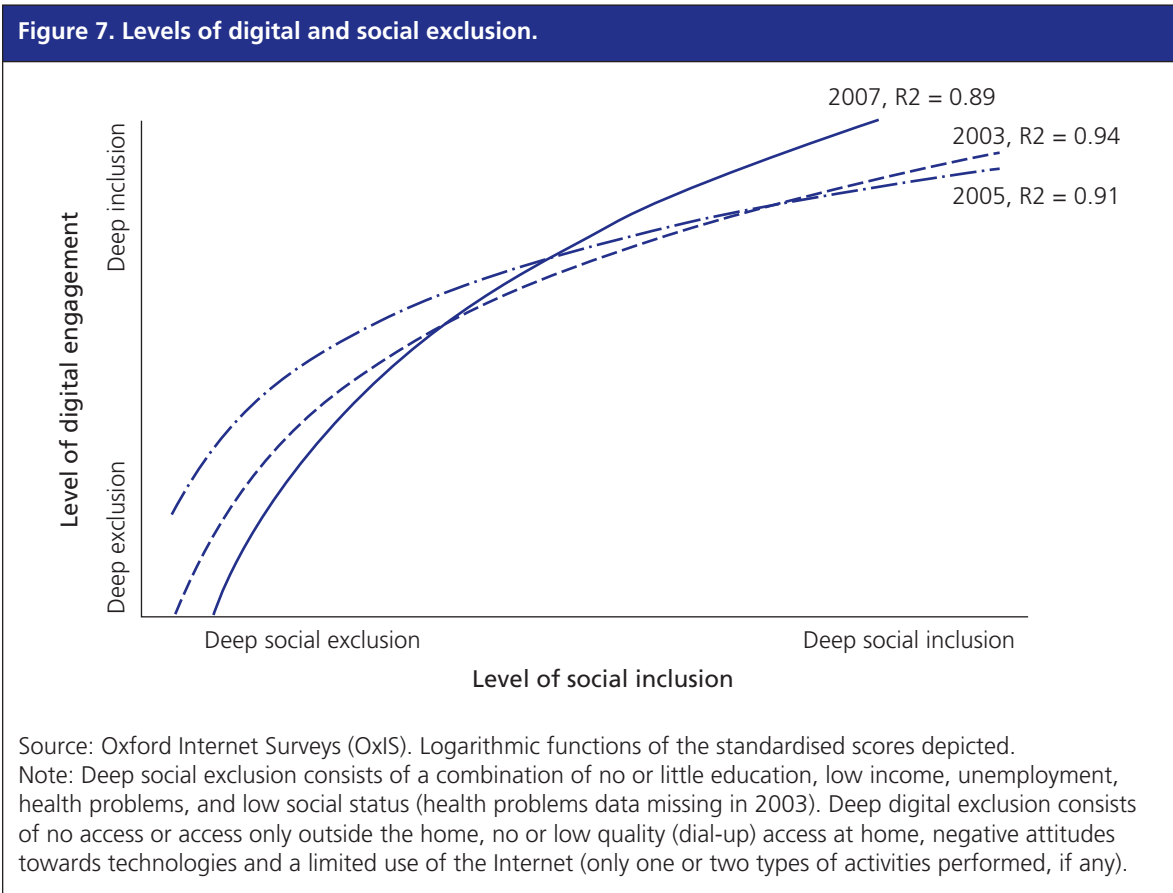
This study has explored the relationship between digital and social exclusion in the UK. It brought together three major datasets, based on multiple independent surveys conducted by the Oxford Internet Institute, the UK Office for National Statistics and the Office of Communications (Ofcom), enabling a replication of indices and analyses to validate the central findings. For each survey, the team developed a set of indices of social and digital disadvantage, and then explored the strength and nature of the relationship between them.

Indices of digital engagement and individual social inclusion

Across all three datasets, there was a strong, statistically significant association between the social disadvantages an individual faces and their inability to access and use digital services. This is best exemplified by the link between the two aggregate level indices created for this project based on the framework previously presented:

- The Index of Multiple Digital Deprivation (IMDD) was developed using digital measures in the measurement framework including access, attitudes and digital resources. Specifically, this index was constructed from an individual's location of access (such as whether at home or elsewhere), quality of access (as measured by access to broadband), attitudes towards ICTs, and the different types of activities undertaken using technologies such as the Internet.
- The Index of Multiple Individual Deprivation (IMID) was developed using the 'offline resources' specified in the framework. Specifically, IMID was measured based on an index constructed from health, employment, income, education and other social status measures (see Annex 1: Classification of Constructs Within Ideal Model). These indices were standardised to make comparison between the years and datasets possible.

Figure 7 illustrates how digital and social disadvantage co-vary on the two indices developed for this study. The figure illustrates the standardised scores of the IMID and IMDD indices for the OxiS surveys of 2003, 2005 and 2007. It is clear from the diagram that those who are most deprived socially are also least likely to be digitally engaged. This relationship has not changed significantly since 2003: if anything, the curve has become steeper in 2007 which implies that the differences between those who suffer a range of social disadvantages and those who are advantaged has become more severe.



By breaking up these two indices into three general categories of ‘deep exclusion’, ‘broad exclusion’ and ‘deep inclusion’, it is possible to identify those who are unexpectedly digitally included or excluded. Tables 2 and 3 provide estimates of the percentages of the population that fall within each category for OxIS and ONS datasets, respectively.

Table 2. Distribution of deep social exclusion and digital engagement (OxIS).

Level of Digital Deprivation (IMDD)	Level of Social Deprivation (IMID)			
	Deep exclusion	Broad exclusion	Deep inclusion	
Deep exclusion	9%	18%	5% ^b	32%
Broad exclusion	4%	11%	9%	23%
Deep engagement	4% ^a	15%	26%	45%
	17%	44%	39%	100%

^a Unexpectedly included.
^b Unexpectedly excluded.
 Source: OxIS 2007.

Table 3. Distribution of deep social exclusion and digital engagement (ONS).			
Level of Digital Deprivation (IMDD)	Level of Social Deprivation (IMID)		
	Deep exclusion	Deep inclusion	
Deep exclusion	9%	2% ^b	27%
Deep inclusion	2% ^a	17%	38%
	16%	27%	100%

^a Unexpectedly included.
^b Unexpectedly excluded.
Note. This table only depicts those who are deeply excluded or included socially and digitally. Those who had broad levels of exclusion on either of these indicators comprise 70% of the ONS database. This difference with Table 2 is due to a greater variance in the OxIS database as regards higher levels of digital engagement.
Source: ONS 2007.

Table 2 shows that:

- Around three out of four of those who suffer 'deep' social exclusion, a severe combination of social disadvantages, (17% of the population), have limited engagement with Internet-based services (deep exclusion 9% and broad exclusion 4%). This extrapolates to about 13 percent of the UK's population, or about six million adults.

Tables 2 and 3 show that:

- One in 10 of the population (9%), amounting to four million people, suffer 'deep' social exclusion and have no meaningful engagement with Internet-based services.

Those who suffer deep social exclusion are up to eight times more likely to be disengaged with the Internet than those who are socially advantaged. That is, in Table 2, while 53% of those who are deeply socially excluded (ie 9% of the population), are severely disengaged from technologies, only 13% of those who are socially included are severely disengaged. The ONS data show very similar distributions (see Table 3), 56% of those who are deeply socially excluded are severely disengaged with technologies while only 7% of those who are socially included are severely disengaged.

Thus, based on OxIS, we would conclude that digital disengagement amongst the socially excluded is four times more likely than amongst those who are socially included and, based on ONS data, we would conclude that they are eight times more likely to be disengaged.

In conclusion:

H0: There is no link between social exclusion and digital disengagement

This hypothesis can be rejected based on the above analyses. There is a strong, clear, statistically significant, link between social exclusion and digital disengagement.

Digital inclusion and exclusion: examining unexpected cases

Across the three independent surveys there are clear exceptions to the general pattern of association between social exclusion and digital disengagement. There are clear cases of individuals who, despite their social background, are either unexpectedly engaged with or disengaged from the Internet. The unexpected cases are highlighted in Tables 2 and 3.

When examining these exceptions it is important to understand how personal choice relates to inclusion and exclusion. Digital inclusion clearly involves a 'digital choice' to become included and participate in the information society. What is less clear is how choice relates to exclusion. Those who are socially included but digitally excluded have potentially made an informed choice not to participate in the information society, despite having the wherewithal to do so. This is sometimes referred to as 'voluntary exclusion', although it is not appropriate to conclude that all the digitally excluded who are socially included have made an informed choice – some could clearly lack eg the skills, attitudes and access, necessary to engage as well. Those who are socially excluded are less likely to be able to make a 'digital choice' to participate and their exclusion is more likely the result of external factors rather than an internal/ personal decision process.

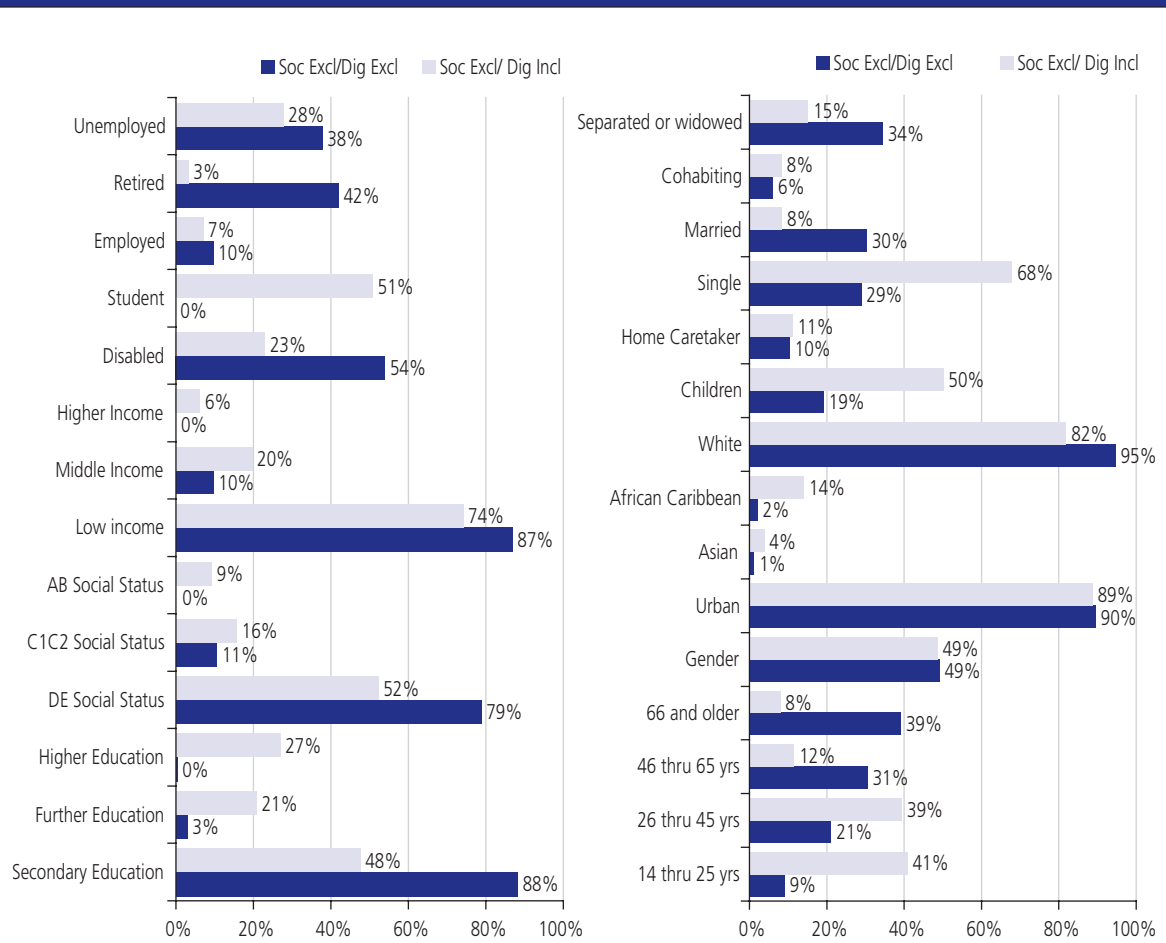
In summary, those who are unexpectedly digitally included or excluded are more likely to have made a 'digital choice' while those who are expectedly digitally disengaged are more likely to have been excluded as a result of external factors. There is some research evidence to indicate that digital choices are probably driven by cultural factors and the social context of individuals that influence the development of positive or negative attitudes towards technologies.

Figure 8 illustrates that those who are socially disadvantaged and yet engaged with technology tend to be younger, single, more likely to have a higher level of educational attainment, have children in the household, and are unlikely to be retired, separated or widowed. Furthermore, disadvantaged people from certain ethnic groups, particularly those of Afro-Caribbean origins, tend to be more highly engaged with the Internet than expected. These results indicate that some individuals within socially excluded groups are capable of overcoming barriers to digital inclusion.

Figure 9 shows that those who are more disengaged with technology than expected on the basis of their social background, 'the unexpectedly digitally excluded', tend to live in rural rather than urban areas, be older, unemployed and less likely to live in a household with children.

Figure 10 illustrates that the unexpected cases have different attitudes towards ICTs. The unexpectedly excluded are more negative and ambivalent, while the unexpectedly included are more positive and less ambivalent. It is clear that these attitudes contribute to the 'digital choices' that people make. If progress is to be made to bring the direct benefits of technology to those who are currently digitally excluded then a concerted effort is needed to tackle the attitudinal and cultural barriers that exist particularly in disadvantaged individuals.

Figure 8. Unexpected cases of digital inclusion.



Soc Excl/Dig Excl: is socially excluded, therefore expectedly digitally excluded.
 Soc Excl/Dig Incl: is socially excluded, but is unexpectedly digitally included.

Figure 9. Unexpected cases of digital exclusion.

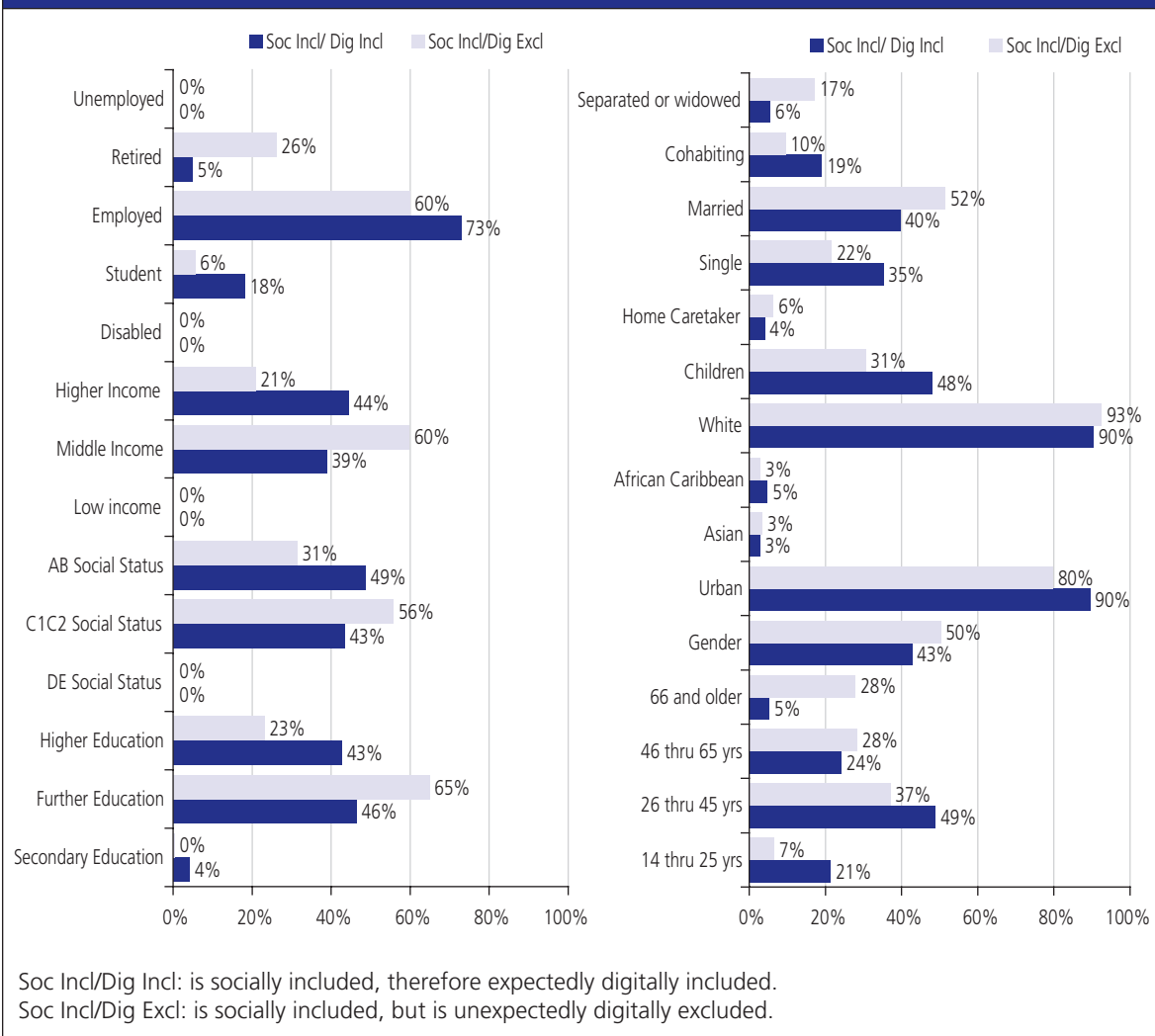
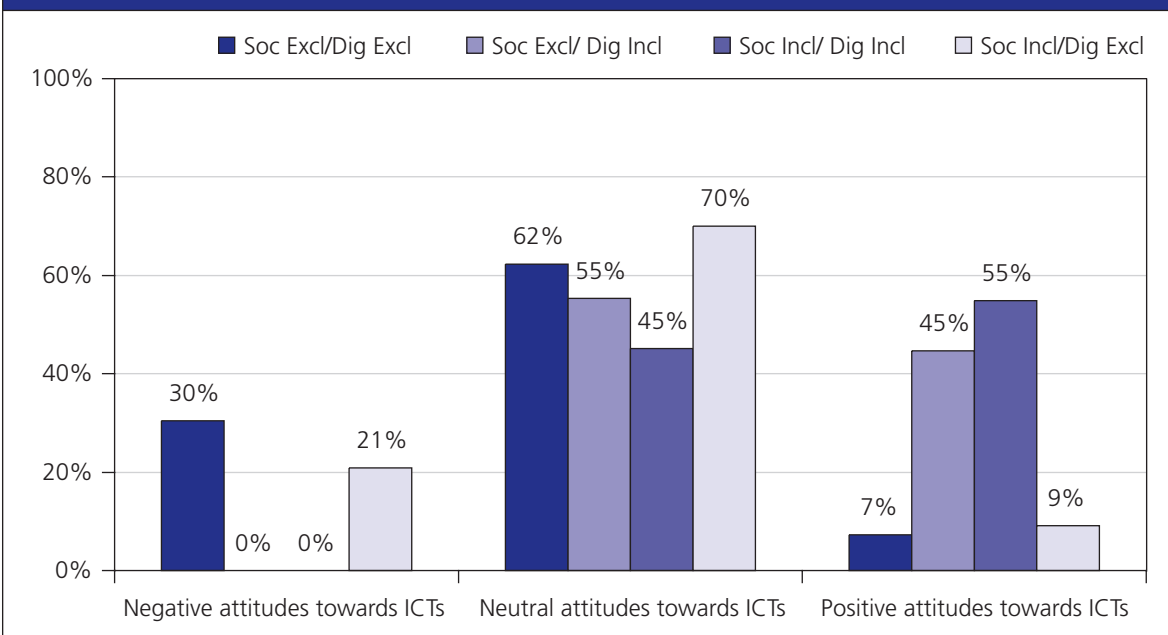


Figure 10. Attitudes towards ICTs among the unexpected cases.



Levels of digital engagement

Based on a factor analysis of OxIS 2007 data, 11 different types of engagement with the Internet have been identified and analysed. These are: information, learning, gaming, leisure, communication, individual networking, social networking, shopping, finances, e-government, and civic participation (see Annex 2: Classification of Variables Used for Analyses).

Figure 11. Activities undertaken as digital engagement deepens.

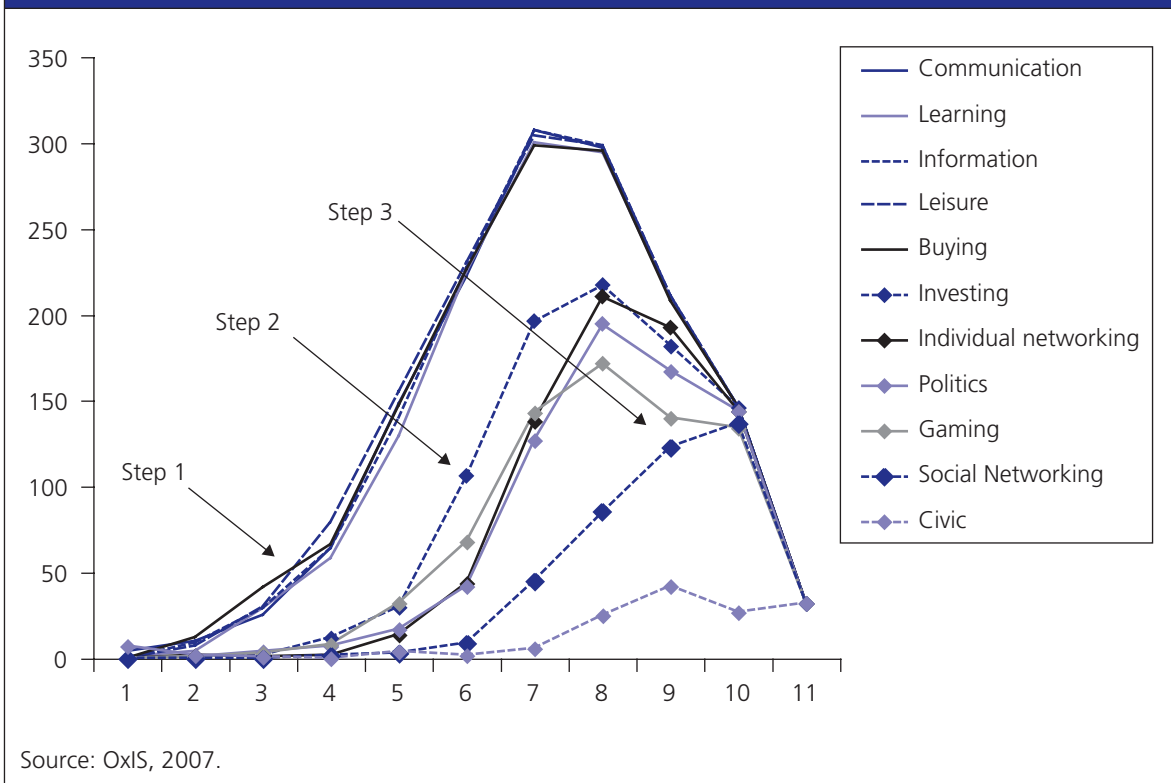


Figure 11 maps these 11 types of engagement against breadth of Internet use. It shows how many Internet users undertake a specific type of activity based on the total number of activities that the Internet user engages with. The results as shown in Figure 11 are replicated in the ONS and Ofcom studies. A clear ladder of sophistication in Internet usage emerges around three clusters of activities. As the number of activities a person engages with on the Internet increases, so does the likelihood of them undertaking more intermediate and advanced clusters of activities. Interestingly, activities that once would have been thought of as advanced, such as online purchasing, are now clearly mainstream.

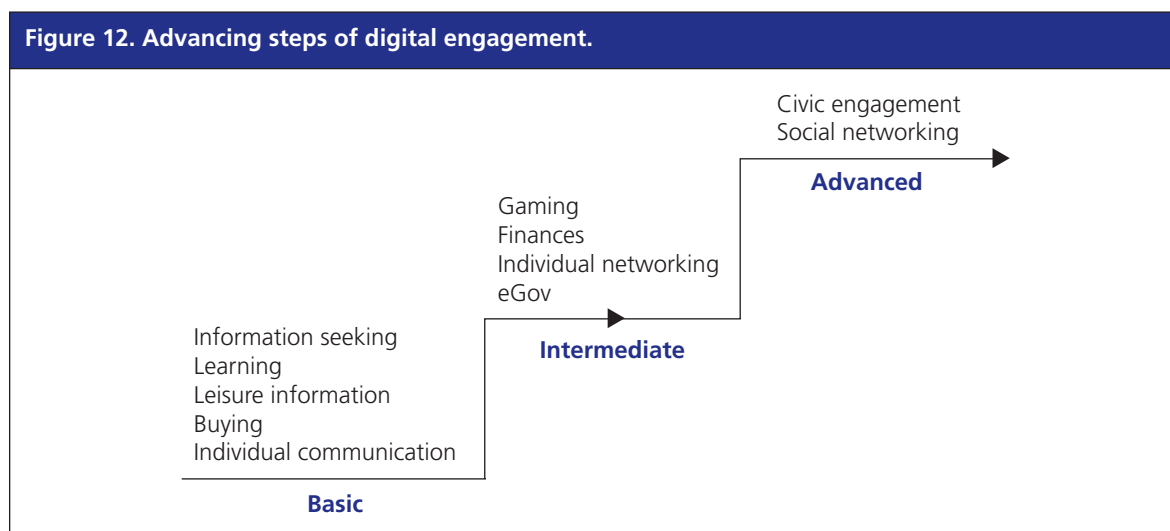


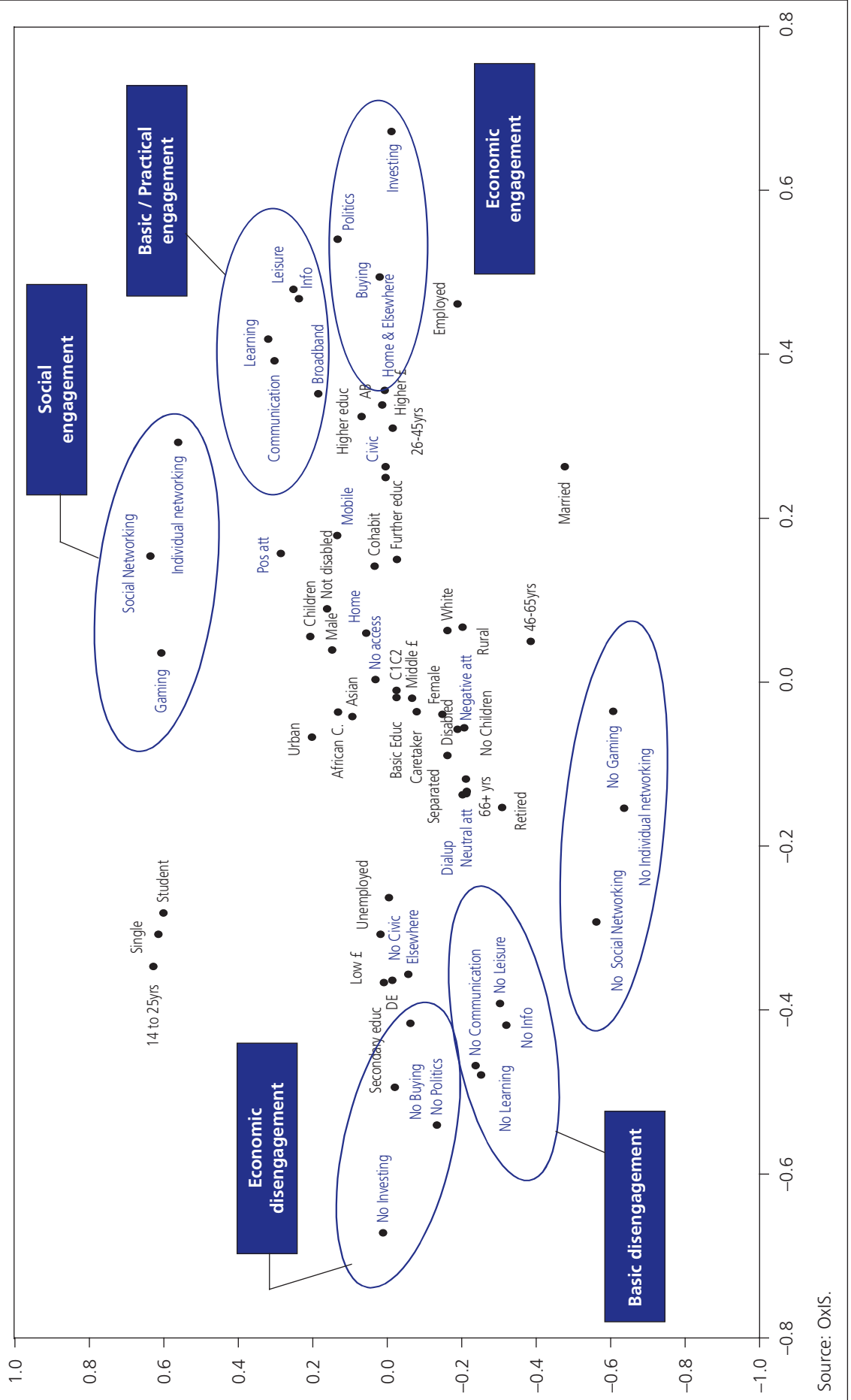
Figure 12 presents the clusters of activities emerging from the analysis in three steps of sophistication. These are the basic, intermediate and advanced activities that people undertake as their engagement with the Internet deepens:

- Basic users of the Internet make up 15% of the population (22% of Internet users), undertaking practical activities such as information seeking, person-to-person communication, and online shopping.
- Intermediate users make up 45% of the population (67% of Internet users). As well as basic activities, they use the Internet for participatory activities, including government services, online financial services and individual networking applications like mailing lists and discussion boards, which allow individuals to interact within existing networks.
- Advanced or Networking users of the Internet make up 8% of the population (11% of Internet users). These users undertake civic participatory activities such as signing petitions, and use social networking applications (eg Facebook), which allow them to interact with people beyond their immediate networks.

Patterns of links between social exclusion and digital engagement

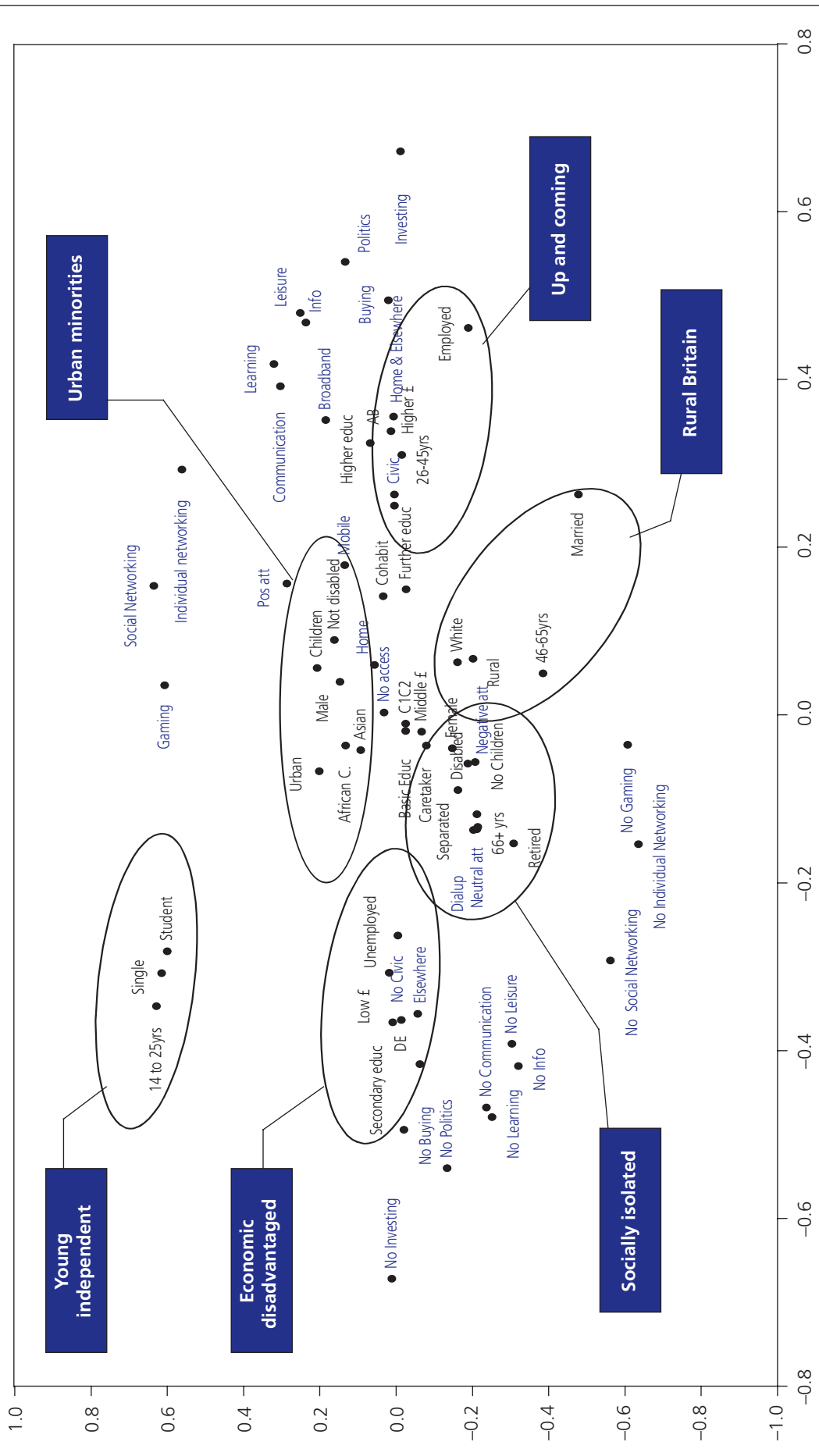
The principal component analyses of social and digital exclusion across the surveys indicated three similar dimensions of digital engagement presented in the preceding section. Figure 13 shows the covariance of social exclusion and digital engagement indicators, and groups the digital engagement activities into three categories: (i) basic/practical engagement, (ii) economic engagement, and (iii) social types of engagement.

Figure 13. Distribution of types of digital engagement.



Source: OxiS.

Figure 14. Distribution of clustered social-economic indicators.



Source: OxiS.

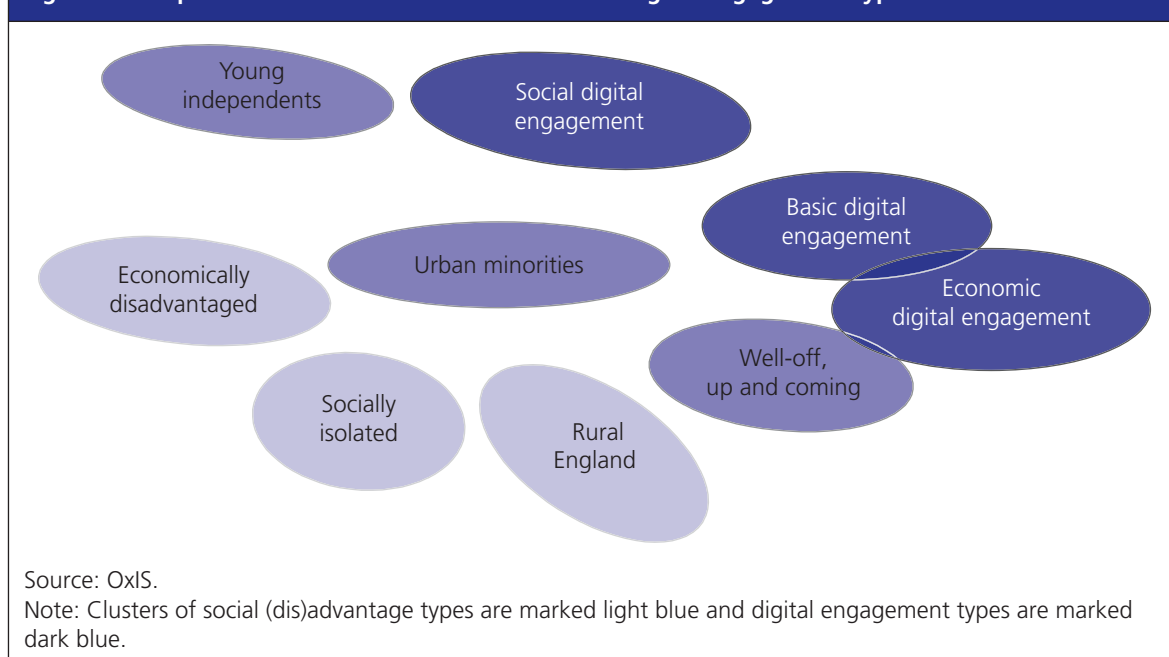
These three categories of digital engagement emerging from a different analysis methodology illustrate a good degree of overlap with the steps of engagement previously identified in Figure 12. However, more important in Figure 13 is their proximity to different social-economic indicators. In Annex 2 (Classification of Variables Used for Analyses) a description is given of how the different socio-economic indicators were constructed.

The principle component analysis has been further developed in Figure 14 and illustrates the socio-economic indicators grouped into six clusters representing population segments:

- The economic disadvantaged: Lowest income group, no more than secondary education, unemployed, DE social class.
- The socially isolated: Separated, 66+ yrs, Disabled, No Children, Retired and slightly closer to being female caretakers as well.
- Rural Britain: White, Rural, 46–55yrs, Married, with average incomes.
- Up and coming: Higher education, 26–45yrs, Employed, AB, Closest to cohabiting.
- The Urban Minorities: Urban, African Caribbean, Asian, Male, with Children and not disabled.
- The young and independent: Single, 14–25 yr old students.

The distributions of digital engagement and socio-economic inclusion indicators illustrated in Figures 13 and 14 emphasise two dimensions of social exclusion as relevant to digital disengagement: social isolation and economic disadvantage. Figure 15 depicts these relationships clearly.

Figure 15. Map of links between social exclusion and digital engagement types.



Both economic disadvantage and social isolation are associated with a lack of basic use of the Internet. This is represented in Figure 15 by the large distance between these clusters of social exclusion and the basic types of digital engagement. However Figure 15 additionally shows that:

- The socially isolated emerge as being particularly excluded from the networking resources of the Internet, the very resources which could help them become less isolated.
- The economically disadvantaged are particularly excluded from participation applications of the Internet, which includes government and financial services, the very resources that could help them access the services they need.

The principle component analysis allows us to answer the question about which links exist between different types of social exclusion and specific types of digital engagement.

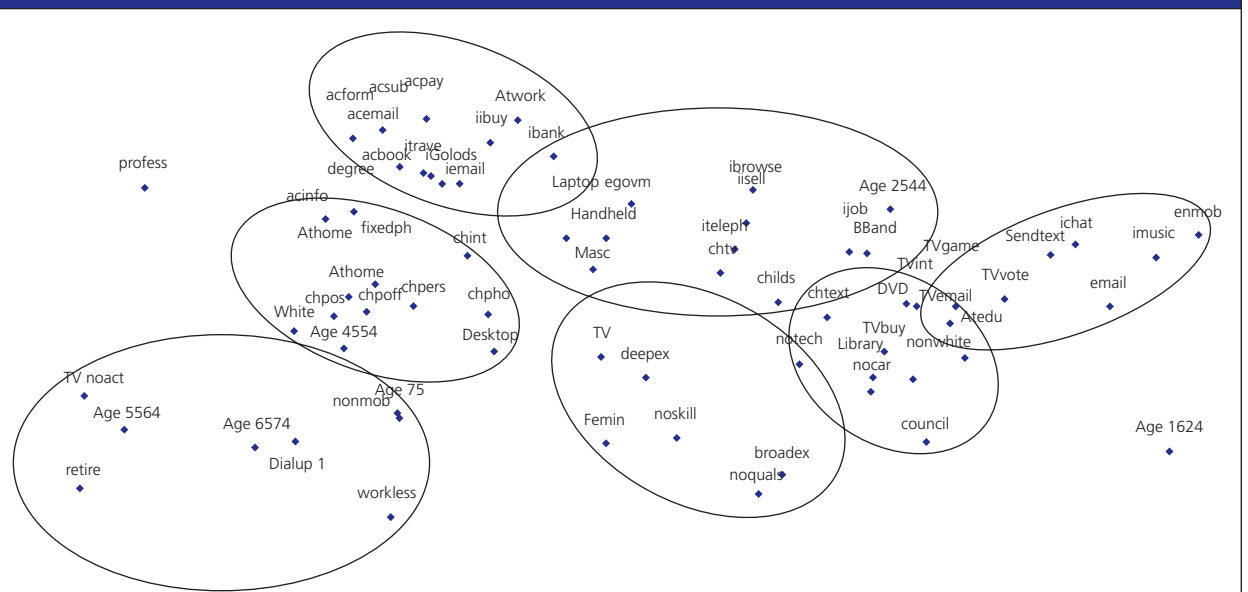
H1: Social and digital inclusion are positively linked only for specific types of social and digital exclusion.

This hypothesis can be supported based on our principle component analysis. It seems that offline social isolation makes engagement with the social aspects of the Internet very unlikely. Similarly, economic disadvantage makes engagement with the financial and government services offered through the Internet very unlikely. In summary, individuals with specific disadvantages appear to be excluded from the very applications of technology that could help them most.

ICT-poor environments

The previous sections have focused in the Internet, however Figure 16 illustrates a principle component analysis based on ONS survey data, which illustrates additional technologies and also presents channel preferences for dealing with government. The results have similarly been clustered into groups of segments and are presented more clearly in Figure 17.

Figure 16. Distribution of clustered social-economic indicators.



Source: Digital Inclusion Team PCA analysis of ONS dataset, 2005–06.

Figure 17. Map of links between social exclusion and digital engagement.

BASIC USERS

- good access at work
- laptop
- high willingness to use egov
- high basic use – practical email, banking, buying, travel
- educated
- working professionals

INTERMEDIATE USERS

- advanced access
- broadband and handhelds
- internet via TV
- more advanced use selling, egov, VoIP, jobs
- young and parents

SOCIAL USER

- Social and Entertainment Use chat, text, voting and music
- Young and students

MID-AGE LOW USERS

- reasonable access
- home Internet
- computer
- willingness to use
- low usage
- traditional channels

ELDERLY SOCIALLY ISOLATED

- digitally constrained
- dialup / simple mobiles
- non-interactive TV
- no usage
- low willingness to use egov

MULTIPLE/ DEEP EXCLUSIONS

- limited Technology – TV or nothing
- no usage
- low willingness to use egov
- lack IT skills
- economic exclusion
- social isolation

ECONOMICALLY DISADVANTAGED

- limited Technology TV/DVD
- seek out access libraries, education
- makes use of resources eg TV TV purchases and TV email
- some willingness to use egov eg text
- council house
- no car
- young

Source: Digital Inclusion Team PCA analysis of ONS dataset, 2005–06.

There are many similarities with the PCA analysis in preceding sections, not least the fact that social isolation and economic disadvantage also emerge as sub-characteristics of social exclusion which are strongly linked to lack of engagement with the Internet. The additional findings emerging from this analysis are:

- The socially isolated tend to have more limited access to more sophisticated technical devices and services. They are more likely to have simple, non-Internet enabled mobiles, non-interactive TV and, if they do have Internet access, are more likely to still use simple dial-up access. Usage and sophistication of use of the Internet is low. Furthermore there is low use and enthusiasm for government services online.
- The economically disadvantaged also have limited access to technology. The technology they are most likely to have is a TV or a DVD player. However, in contrast to the socially isolated they are more likely to try and seek out access to Internet-based services in libraries or places of education. They also likely to make use of the limited resources that they do have. For example, there is evidence that the economically disadvantaged are likely to shop using their TV and even send email using digital TV. There is some willingness to access government services electronically by the economically disadvantaged, particularly using text messaging.
- Those suffering the deepest exclusion, where economic disadvantage and social isolation coincide, are likely to be limited to an analogue TV or have no technology at all. There is little intention among this group to access government services online or via other electronic channels.

Explaining engagement with digital resources

Additional analysis through linear regressions on all three databases reinforces the finding that those who suffer specific social disadvantages are least likely to benefit from the very applications of technology that could help them tackle their disadvantage (see Tables 4 and 5).

- A poor education is a barrier to accessing education and learning resources on the Internet.
- Being elderly (and more likely to be isolated, with constrained social networks) reduces the likelihood of benefiting from social applications of the Internet.
- Having a disability (and potentially being less mobile) reduces the likelihood of accessing the Internet in general (which reduces the need for mobility).
- Being unemployed (and therefore more likely to be financially constrained) reduces the likelihood of benefiting from online buying (which could save money).
- Being retired, unemployed and having fewer educational achievements (and potentially being more dependent on government services and support) reduces the choice and the likelihood of benefiting from electronic government services (which can be more convenient and responsive than traditional services).

Many digital interventions focus on providing access or basic ICT skills training, therefore it is important to understand whether providing access and training suffices to make socially disadvantaged people engage fully with ICTs. Linear regressions can aid in this type of analysis. Table 4 shows the relationships found between the social characteristics of Internet users and their engagement with different digital resources, controlling for the effect that ICT access, skills and attitudes might have on digital engagement. The coefficients are reported in Annex 3 (Logistics Regression Coefficients of Different Types of Uses). Statistically significant relationships are shaded and the nature of the association is represented – positive or negative.

Table 4. Logistic regressions for different types of uses (Internet users only).

	Information	Learning	Play	Leisure	Social Networking	Individual Networking	Communication	Buying	Finance	Politics	Civic
Education	+	+		+	+	+	+	+	+	+	+
SES of individual									+		+
Age/Generation		+	-		-	-	-			+	
Gender (Female)			-		-					-	
Urban		+	+								
Income			-								
Children in the Household										+	
Physical health							+				+
Employment status	+			+				+	+		
Student									-		
Employed				+				+			
Retired	-								-		
Unemployed	-										
Home Caretaker											
Ethnicity								+			
Asian											
African Caribbean											
White											
Other ethnic group								+			
Marital Status					+				+		

continued

Table 4. Logistic regressions for different types of uses (Internet users only).

	Information	Learning	Play	Leisure	Social Networking	Individual Networking	Communication	Buying	Finance	Politics	Civic
Single									-		
Married					-						
Cohabiting											
Separated/widowed											
IMD				+	+						+
Area Income			-	-							
Area Employment					+						
Area Health											
Area Education			+		-						
Area Crime							+				
Access location				+		+	+		+		
Outside the home				-		-			-		
At home only							+				
Home and elsewhere											
Access quality					+			+		+	
Dial-up								-			
Broadband					+					-	
Wireless											
ICT attitudes		+	+	+	+		+	+	+		

Source: OxIS.
Note. See Annex 3 for individual coefficients.

Some important points to note in Table 4:

- for all different types of digital engagement, high quality and multi-sited (home and elsewhere) access to the Internet was a requisite, but not sufficient to explain any type of engagement.
- For Internet users, positive attitudes increased their chance to engage with the Internet for almost all types of digital engagement, which points towards the continued importance of digital choice even when people engage on a basic level with technology.

- The linear regressions also confirmed that having access at home (as measured by access location) was important. The findings of the linear regressions in combination with the principal component analyses presented in Figures 13 and 14 suggest that in Britain having access anywhere is not enough for socially disadvantaged individuals to engage with the Internet. Home access makes engagement almost certain even if this engagement is only basic.
- Broadband access (as measured through access quality) is now one of the requirements to engage with the Internet even at a basic level of shopping. OxlS 2007 shows that 85% of all home Internet connections are in fact broadband connections.
- The number of barriers to digital engagement is higher for those activities that were earlier identified as advanced or networking uses of the Internet. In other words, a greater number of socio-economic factors influences if people use networking applications than if people use the Internet merely for basic communication. Similarly, online civic and political participation are influenced by education, SES, gender, generation, children in the household, physical health and area deprivation, while information searching is explained by only two factors (ie education and employment status).

To be able to predict within the population who engages with ICTs in different ways, this same linear regression analysis was conducted for the whole population and the results are presented in Table 5. The coefficients for these linear regressions are given in Annex 4.

As expected, Table 5 shows that for any type of digital engagement to take place, access is vital. Interventions which provide access to the technology are still an important aspect of increasing digital engagement. However, Table 5 also shows that dial-up access is not enough for most types of engagement.

Even when access is provided, positive attitudes towards ICTs increase the likelihood that people will engage with the Internet in a number of ways. This indicates that while digital exclusion based on external forces is part of the explanation of digital disengagement, there is also an element of digital choice.

Notwithstanding the importance of access and positive dispositions towards ICTs in motivating people to engage with the Internet at a basic level, economic, cultural and social factors still influence how people engage with technology. This means that even when access is provided, then educational level, age, employment status, marital status and gender continue to influence what people do online. The patterns that we find for these links with digital disengagement are therefore similar to patterns of disadvantage in other areas of life. Those who are missing out in general in relation to quality of life are also missing out in relation to engagement with technologies. Cultural and social factors especially need to be better understood for interventions to become effective in dealing with digital disengagement.

These linear regressions allow us to draw the final conclusion based on analyses of the available databases.

Table 5. Logistic regressions for different types of uses (non-users included).

	Information	Learning	Play	Leisure	Social Networking	Individual Networking	Communication	Buying	Finance	Politics	Civic
Education	+	+		+	+	+	+	+	+	+	+
SES of individual					+				+		
Age/Generation			-		-		-			+	
Gender			-		-					-	
Urban		+	+								
Income			-	+							
Children										+	
Physical health											+
Employment status	+	+		+				+	+	+	
Student									-		
Employed											
Retired	-								-		
Unemployed											
Home Caretaker											
Ethnicity											
Asian											
African Caribbean											
White											
Other ethnic group											
Marital Status				+	+	+	+		+		
Single											
Married				-	-	-					
Cohabiting											
Separated/widowed											
IMD											+
Area Income			-	-							
Area Employment						-					-

Table 5. Logistic regressions for different types of uses (non-users included).

	Information	Learning	Play	Leisure	Social Networking	Individual Networking	Communication	Buying	Finance	Politics	Civic
Area Health										+	
Area Education										-	
Area Crime			-				+				
Access location	+	+	+	+	+	+	+	+	+	+	
No access	-	-	-	-	-	-	-	-	-	-	
Outside the home									-		
At home only							+				
Home and elsewhere											
Access quality		+	+	+	+	+	+	+		+	+
Dial-up		-		-		-		-			-
Broadband					-		-			-	
Wireless											+
ICT attitudes	+	+	+	+	+	+	+	+	+		

Source: OxIS.
Note. See Annex 4 for individual coefficients.

H2: The link between social and digital exclusion can be fully explained by differences in basic barriers to ICT use (access, skills and attitude).

Hypothesis 2 could not be supported by analyses of OxIS, ONS and Ofcom databases, which means that interventions that focus on providing access to or on improving people's perceptions of ICTs will not result in full engagement of all individuals with the Internet. Other social factors will continue to shape how people engagement with technology and what digital resources they access.

7. Conclusions

Methodological conclusions

A review of the literature showed that there is agreement amongst academics that a change in approach is necessary so that future research and interventions can take a more nuanced view of social exclusion as well as digital engagement. We have developed a research framework based on a comprehensive literature review that takes a more sophisticated and nuanced view of digital and social exclusion. This framework has distinguished between economic, cultural, social, and personal forms of social exclusion. Similarly, besides including traditional indicators of digital exclusion such as a lack of access, skills and negative attitudes towards ICTs, our understanding of digital engagement has incorporated a broad spectrum of activities: information and learning, entertainment and leisure, communication and networking, economic and financial participation, and civic and political participation.

The framework proposed in this report is flexible enough to adapt to a changing ICT landscape since it can incorporate a number of different technologies and is broad enough to include a range of different types of engagement. This is important because, just like social exclusion, digital disengagement is a relative concept depending on time and context; what was considered 'advanced' digital engagement a few years ago is now part of a 'basic' set of engagement activities. New types of engagement will continue to spring to life that need to be fit into the broader 'basket' of what it means to be digitally included.

An advantage of using higher level, aggregate constructs like the ones proposed in this report, is that they can be used to compare the findings across a number of different datasets even if these include different lower level measures. This has been tested successfully across three different surveys.

There are areas that current surveys could improve in order to enhance the analysis presented in this report. Current surveys are mainly lacking in two key areas:

- The measurement of digital skills and associated measures of transferable skills, ie. those skills that help those who are currently not engaged with ICTs to engage in a meaningful way once access has been provided to them.
- A lack of understanding of the causal factors that lead digital engagement to reduce social exclusion. This study has confirmed that high quality access, digital skills and a positive disposition towards ICTs facilitate basic engagement with ICTs among groups that are disadvantaged. However, it is not possible using the survey data available for this study to demonstrate that digital engagement subsequently improves an individual's social situation. For evidence of this evaluation studies of specific interventions are required.

Policy conclusions and implications

By using the model as proposed in this report we were able to conduct a comprehensive set of analysis that leads to a number of recommendations for researchers and policy makers. These can be specified as follows.

- Improving one or two social disadvantages can make a big difference to engagement with technology.

Tackling poor educational attainment can increase engagement with the Internet, as it is a strong differentiator among the socially disadvantaged but unexpectedly engaged. Similarly the presence of children is a big differentiating factor motivating people to become engaged with the Internet. This indicates that well-targeted programmes such as Computers for Pupils and the Home Access Taskforce could have a significant impact if they also reach out to parents.

- Online government initiatives are not reaching the most excluded.

Government related activities on the Internet, such as to increase participation and access to services electronically, are undertaken mostly by the more sophisticated ICT users. Designers of government services need to understand that the socially and economically disadvantaged people who could benefit most by accessing their services will be the least likely to use electronic means to engage with them.

- Multiple channels are important for service designers to engage socially disadvantaged groups.

There seems to be some willingness to engage with other forms of technology among these groups, particularly via SMS and TV.

- The potential for the Internet to address social isolation and economic disadvantage is largely untapped.

The Internet is clearly not yet being put to work effectively to tackle these elements of social exclusion. Two areas particularly stand out for further work:

- (i) The role of social networking applications to tackle social isolation.
- (ii) Government services and online financial services to support the economically disadvantaged.

Public initiatives might encourage innovative social networking applications for isolated and vulnerable elderly, educational services for those with poor educational achievement, financial benefits for those economically disadvantaged, or advanced applications in community ICT centres.

- Access quality, locations of access and attitudes towards technologies remain important barriers and enablers that government policy can influence.

There is a continued need to support people in accessing and acquiring the skills to use technology.

- Government and partners need to focus on tackling the market failure that has prevented those who most need access from using digital resources.

These failures can be addressed by tackling basic access and attitude barriers, for example:

- (i) Extending home access – it is clear that more advanced activities are associated with home access rather than access in the community. So while access in the community is important – extending home access should be a priority
 - (ii) Improving access quality through next generation broadband policy.
- Government needs to address digital choices, as well as divides.

Activities can address negative attitudes toward technologies and the Internet. The problems of access are cultural as well as economic. Even when basic access to the Internet is solved there will be many barriers for socially excluded groups accessing the digital resources they need. This report has proposed that digital choice as opposed to digital exclusion should be informed by examining those individuals that are using technologies despite facing severe economical, social or personal disadvantage.

Concluding remark

This report reviewed theory and research in relation to the links between social disadvantage and digital disengagement. The empirical research that was part of this report has shown that digital disengagement is persistent and significantly related to social exclusion. The implications of these findings indicate that digital disengagement is not simply an academic issue, nor is it a 'technical issue' of little relevance to social policy. Technological and social disadvantages are inextricably linked. This means that social policy goals will be increasingly difficult to realise without an improvement in terms of digital engagement for those who are socially disadvantaged.

Mainstream society continues to embrace the changes in our information society and if policy and research do not reach out to understand and address these links between social disadvantage and digital disengagement, then those on the margins will be left further behind, disengaged digitally, economically, and socially.

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Annex 1: Classification of constructs within ideal model

Concept	Level 1	Level 2	Level 3	DESCRIPTION
Social resources	Economic	Social status	Socio Economic Status (Acorn)	Grouped into upto 12,000; 12,500 to 25,000; 25,000 to 37,500; 37,500 to 50,000, over 50,000 per year
		Income		Grouped into None, Primary, Secondary, Sixth form, Technical College, Further Education, Undergraduate, Graduate, Postgraduate, Other
		Employment status		Grouped into Employed, Unemployed, Retired, Home caretaker, Student, Other
		Urbanisation		Rural or Urban living environment
		Area deprivation		Index of Multiple deprivation (based on postcode data)
	Cultural	Ethnicity	Grouped into Asian/African Caribbean/White/Other	
		Gender	Male/Female	
		Religion	Grouped into Catholic, Anglican, Islam, Other Christian, Other non-Christian, Other religious, Not religious	
		Age/Generation	Age of the person	
		Language	Ability to read a newspaper in a different language	
	Political	Political Interest	Level of interest in politics (None to A lot)	
		Public sphere	Level of participation in debates in public arenas (pubs, clubs, parks etc)	
		Political participation	Number of political actions undertaken (contacting politicians, membership of political parties, voting)	
		Civic participation	Number of civic actions undertaken (protests, signing petitions, buying ethnically, etc)	
		Ideology (left-right)	Grouped into Conservative, Labour, Liberal, Other left, Other right	
		Political attitude	Agreement with statements about equality in society (human rights, animal rights, etc)	
	Social	Marital Status	Single, Married, Cohabiting, Divorced, Widowed	
		Children	Whether have children	
		Organised networks	Participation in any club or association which is concerned with sports, charity, schools or hospitals, your neighbourhood, trade union, music or arts, or other community activity	
		Personal networks	Frequency and intensity of contact with friends/family	
		Relationship strength	Marital and friendship satisfaction	
		Social Efficacy	Feeling confident in interactions with others (extroversion, sociability)	
		Neighbourhood cohesion	Community cohesion (feeling part of community, feeling community support)	
	Personal	Mental health	Mental health problems	
		Physical health	Physical health problems	
		Personality	Character (Big Five in psychology)	
		Self-efficacy	How confident do you feel in life in general (economic, intellectual and emotional confidence)	

Concept	Level 1	Level 2	Level 3	Description
Link between social resources and digital engagement	Access	Type	Quality	Access Quality (0= No Access, 1=Dial-up, 2=Broadband, 3=Wireless/Mobile)
		Location	Source	Number of different platforms that person has access to
			Quantity	Count of all locations through which has access to (Internet) content
			Privacy	Scale of privacy in using the technology (home-work-school-library-Internet cafe)
	ICT Skills	General	Ability to use Internet	Self-efficacy /Self-rated ability to use ICTs (1=Beginner – 4 =Expert)
		Social	Privacy	Person's ability to protect personal information from unsolicited use by others
			Trust	Awareness of privacy risks on different media/applications
			Etiquette	Trust in people met online
			Comfort	Ability to distinguish appropriate and inappropriate online behaviour
			Proxy	People's confidence in interacting with others
	Technical		Level of help needed to use technologies (0=Gives up, 1 =Asks family member, 2= Asks expert, 3=Figures out themselves)	
		Protection	Ability to install technical fixes to inappropriate content	
		Production	Ability to install technical fixes to abusive messages or programmes	
			Ability to programme	
			Ability to fix technical tools when they break or construct them from scratch	
	Critical insight	Source	Trust in sources available online	
		Persuasion	Ability to distinguish between (commercial/organisational) propaganda and objective/independent information	
		Interpretation	Judgement of accuracy of information available on ICTs	
	Creative	Design	Created ICT content (text, photo, audio, moving images, audio-visual package)	
		Audience	Awareness of who content is created for/Audience	
		Brand	Establishing continuous output and audience	
Attitudes	Regulation	Responsibility	Perceptions of amount of responsibility in content regulation (parents, educators, government, individual, content providers)	
		Awareness	Awareness of regulation that is in place	
	Centrality	Personal	Influence of ICTs for persons everyday life (social, leisure and work)	
		Societal	Influence of ICTs on society (moral, health, economic and others)	
	Relevance	Engagement	The reasons to engage with ICTs	
		Disengagement	The reasons to disengage from ICTs	

Concept	Level 1	Level 2	Level 3	Description
Digital Engagement	Quantity	Frequency Breadth		How frequently use Internet for a number of different things Number of different activities that has been undertaken through ICTs (information, learning, communication, social networking, individual networking, play, leisure activities, shopping, financial, civic, and political)
	Nature	Information Entertainment Communication	Information Learning and Education Play Leisure Individual communication Individual networking Social networking	Looking for information about news, surfing, health Education, fact checking, employment opportunities Gaming, Music, Movies, Theatre Hobbies, Travel Email, instant messaging (with friends), text messaging Discussion lists, conference calls Facebook, Bebo, YouTube,
		Economic	Shopping Finances	Buying products or services, comparing products or services Banking, Investing
		Participatory	Civic Political	Signing petitions, voting (non-political), ethical buying, participation in discussions Contacting politicians, membership political parties, voting (political)
	Nature	Social Commercial Technical		Exposure to abusive communication through ICTs Exposure to negative commercial experience (credit card fraud, spam, unsolicited advertising) Exposure to technical glitches (technological crashes, viruses)
	Empowerment	Political Community Social Economic Personal		In/Decrease of political resources (influence on government) through use of ICTs In/Decrease of civic resources (influence on pressure groups, NGOs and community) through use of ICTs In/Decrease of social resources (interaction with others) through use of ICTs In/Decrease of economic resources (employment, income, education) through use of ICTs In/Decrease of psychological resources (Mental and Physical health) through use of ICTs
	Relevance	Personal Societal		Number of useful contents and services to everyday life Number of useful contents and services in society
	Link from Digital to Social			

Annex 2: Classification of variables used for analyses

Variable name	Variable description	Notes
Educ	Education	1= Basic 2=Secondary 3=Further 4=Higher
Educ1	Basic Education	No official qualifications
Educ2	Secondary Education	A-level, GCSE
Educ3	Further Education	Degree (any qualification beyond secondary school not university)
Educ4	Higher Education	University education
Soc_Ind	Social Status (Based on occupation head of household)	1=DE 2=C1C2 3=AB
Soc_Ind1	DE Social Status	
Soc_Ind2	C1C2 Social Status	
Soc_Ind3	AB Social Status	
Urban	Urbanisation	1=Rural 2=Urban
Urban2	Urbanisation	1=Urban 2=Rural
Employ	Employment	1=Student 2=Employed 3=Retired 4=Unemployed 5=Caretaker
Employ1	Student	
Employ2	Employed	
Employ3	Retired	
Employ4	Unemployed	
Employ5	Home Caretaker	
Income	Income	1=Low 2=Middle 3=High
Income1	Low income	<£12,500
Income2	Middle Income	£12,500 – £37,500
Income3	Higher Income	>£37,500
Age	Age/Generation	
Age1	14 thru 25 yrs	
Age2	26 thru 45 yrs	
Age3	46 thru 65 yrs	
Age4	66 and older	
Gender	Female	(Male=1 Female=2)
Gender2	Male	(Female=1 Male=2)
Ethnicity	Ethnicity	1=Asian 2=African Caribbean 3=White 4=Other
Ethnicity1	Asian	
Ethnicity2	African Caribbean	
Ethnicity3	White	
Ethnicity4	Other ethnic group	
MarStat	Marital Status	1=Single 2=Married 3=Separated/Widowed 4=Cohabiting
Marstat1	Single	
Marstat2	Married	
Marstat3	Separated or widowed	
Marstat4	Cohabiting	Not in Ofcom Dbase

Variable name	Variable description	Notes
Child	Children	(No children=1 Has children=2)
Child2	No Children	(Has children=1 No children=2)
PhysAb	Disabled	(Not disabled=1 Disabled=2)
PhysAb2	Not disabled	(Disabled=1 Not disabled=2)
AccessQual	Access Quality	0=No access 1=Dial-up 2=Broadband 3=Wireless/Broadband
Mobileaccess	Mobile/Wireless access	0= No mobile wireless access 1=Mobile/Wireless access
Broadband	Broadband access	0= No mobile wireless access 1=Mobile/Wireless access
Dial-up	Dial-up access	0= No mobile wireless access 1=Mobile/Wireless access
AccesLoc	Location	0= No use 1=Access outside the home only 2=Home access only 3= Home and elsewhere access
AccesLoc0	No access	1=No use anywhere
AccesLoc1	Access elsewhere (outside the home)	0= No access elsewhere only 1=Access outside home only
AccesLoc2	Home access only	0= No home access only 1=Home access only
AccesLoc3	Home and elsewhere access	0= No home and elsewhere access 1=Home and elsewhere access
AttICT	Attitudes towards ICTs	1 extremely negative – 5 extremely positive
AttICT1	Negative attitudes towards ICTs	Not in ONS Dbase
AttICT2	Neutral attitudes towards ICTs	
AttICT3	Positive attitudes towards ICTs	
Breadth	Breadth of use: The number of things people do online (scale 0 to 11)	Sum (InfoInf, Infolearn, CommSoc, CommInd, CommInd, ComSerBuy, ComSerInv, Play, Leisure, Egov, Civic)
Info	Information and Learning	1=information or learning in the last year
Enter	Entertainment	1=gaming or leisure activities in the last year
Comm	Communication	1= individual communication, individual or social networking
CommServ	Commercial Services	1=online buying or finances in the last year
Participation	Participatory uses	1=civic or political participation in the last year
Info1	No information	
Enter1	No entertainment	
Comm1	No communication	
CommServ1	No Commercial	
Participation1	No participatory uses	
InfoInf	Information	1=Information seeking
Infolearn	Learning	1=Learning (formal and informal)
Entertainment	Gaming and play	1=Entertainment (gaming, music and video)
Leisure	Leisure activities	1=Leisure (Hobby and events info)
CommInSoc	Individual networking	1=Individual communication (person to person)
CommSoc	Social networking	1=Social networking (personal to unknown groups)
CommInd	Individual communication	1=Individual networking (person to known groups)
ComSerBuy	Buying (Shopping and price comparison)	1=Buying (shopping and comparing products)
ComSerInv	Investing (Banking, Stocks)	1=Finance (investing, online banking)
eGov	Political participation	1=Political participation (contacting MPs, filing tax, signing up for political party)
Civic	Civic participation	1=Civic participation (signing petitions, buying ethically)
InfoInf1	No information	

Variable name	Variable description	Notes
Infolearn1	No learning	
Play1	No gaming and play	
Leisure1	No leisure activities	
CommSoc1	No social networking	Not in ONS and Ofcom databases
CommIn1	No individual communication	
ComSerBuy1	No buying	Not in ONS and Ofcom databases
ComSerInv1	No investing	Not in ONS and Ofcom databases
eGov1	No Political participation	

Variable name	Variable description	Notes
Civic1	No Civic participation	
IMID_ind	Count of individual level exclusion	Sum (Educ1 Educ2 SocStat1 Employ4 Income1 PhysAb). Except for students there sum of SocInd1 Income1 PhysAb – ONS database excludes SocStat
IMID_ind1	Heavily excluded	(3 or more points on individual exclusion)
IMID_ind2	Somewhat excluded	(1 or 2 points on individual exclusion)
IMID_ind3	Not excluded	(0 points on individual exclusion)
IMIDD	Index of multiple individual digital inclusion (range 1 thru 22)	(Breadth+AttICT+AccessQual+AccesLoc) – Ons excluded AttICT
MIDIx	Categorical Index of multiple individual digital inclusion	(Heavy exclusion=2 (1 thru 4 on MIDI) Low/Medium inclusion=2 (5 thru 8 on MIDI) High/Medium inclusion=3 (9 thru 14 on MIDI) Heavy inclusion=3 (>=15 on MIDI)
MDID	Digital and Social deprivation combined.	(Excl/Excl=1 Soc Excl/Dig Incl=2 Incl/Incl=3 Soc Incl/ Dig Excl=4)

Annex 3: Logistics regressions of different types of uses – Users only (OxIS database)

	Information				Learning				Gaming/Play				Leisure			
	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)
Education	0.57	0.20	8.25	1.00	**	1.77	0.72	0.19	14.85	1.00	**	2.06	0.14	0.10	2.16	1.00
SES of individual	0.37	0.23	2.48	1.00	0.12	1.44	0.17	0.21	0.64	1.00	0.42	1.19	-0.20	0.13	2.25	1.00
Age/Generation	0.08	0.13	0.43	1.00	0.51	1.09	-0.14	0.11	1.53	1.00	0.22	0.87	-0.28	0.07	18.47	1.00
Gender	-0.13	0.27	0.23	1.00	0.63	0.88	0.14	0.25	0.30	1.00	0.58	1.15	-0.87	0.15	34.93	1.00
Urbanisation	0.56	0.46	1.52	1.00	0.22	1.76	0.56	0.39	2.04	1.00	0.15	1.75	0.75	0.28	7.37	1.00
Income	-0.21	0.26	0.65	1.00	0.42	0.81	-0.01	0.24	0.00	1.00	0.95	0.99	-0.41	0.14	8.63	1.00
Children	-0.08	0.30	0.08	1.00	0.78	0.92	-0.28	0.27	1.04	1.00	0.31	0.76	0.18	0.16	1.36	1.00
Disability	1.02	0.54	3.55	1.00	0.06	2.77	1.28	0.52	6.18	1.00	*	3.60	-0.23	0.30	0.61	1.00
Employment status			22.18	4.00	**				11.68	4.00	*				3.30	4.00
Student	-0.89	0.78	1.29	1.00	0.26	0.41	0.56	0.71	0.62	1.00	0.43	1.76	0.37	0.40	0.88	1.00
Employed	-0.46	0.57	0.67	1.00	0.41	0.63	0.52	0.41	1.62	1.00	0.20	1.68	-0.05	0.28	0.03	1.00
Retired	-2.28	0.70	10.49	1.00	**	0.10	-0.56	0.56	0.99	1.00	0.32	0.57	-0.05	0.41	0.01	1.00
Unemployed	-1.76	0.68	6.61	1.00	*	0.17	-0.61	0.55	1.22	1.00	0.27	0.55	-0.37	0.40	0.86	1.00
Home Caretaker																
Ethnicity			2.47	3.00	0.48				3.97	3.00	0.26				1.33	3.00
Asian	-19.06	12174.20	0.00	1.00	1.00	0.00	-18.69	12550.60	0.00	1.00	1.00	0.00	-0.54	0.89	0.36	1.00
African Caribbean	-16.86	12174.20	0.00	1.00	1.00	0.00	-16.40	12550.60	0.00	1.00	1.00	0.00	-0.89	0.84	1.13	1.00
White	-18.94	12174.20	0.00	1.00	1.00	0.00	-18.65	12550.60	0.00	1.00	1.00	0.00	-0.69	0.78	0.78	1.00
Other ethnic group																
Marital Status			2.84	3.00	0.42				0.48	3.00	0.92				6.55	3.00
Single	0.10	0.47	0.04	1.00	0.83	1.10	0.01	0.41	0.00	1.00	0.97	1.01	0.13	0.22	0.37	1.00
Married	-0.51	0.42	1.51	1.00	0.22	0.60	-0.04	0.36	0.01	1.00	0.92	0.97	-0.32	0.20	2.49	1.00
Cohabiting	-0.41	0.51	0.64	1.00	0.42	0.67	-0.24	0.44	0.31	1.00	0.58	0.79	-0.43	0.28	2.41	1.00
Separated/widowed																
Area Deprivation (IMD)	-0.01	0.02	0.24	1.00	0.62	0.99	0.03	0.02	1.76	1.00	0.18	1.03	-0.01	0.01	0.20	1.00
Area Income	0.02	0.02	2.54	1.00	0.11	1.03	-0.03	0.01	3.65	1.00	0.06	0.97	-0.01	0.01	2.38	1.00
Area Employment	-0.01	0.01	0.64	1.00	0.42	0.99	0.00	0.01	0.00	1.00	0.98	1.00	-0.02	0.02	0.80	1.00
Area Health	0.00	0.01	0.19	1.00	0.67	1.00	0.00	0.01	0.25	1.00	0.61	1.00	0.01	0.01	0.71	1.00
Area Education	0.00	0.01	0.40	1.00	0.53	1.00	0.01	0.00	2.70	1.00	0.10	1.01	0.01	0.01	0.85	1.00
Area Crime	0.00	0.01	0.31	1.00	0.58	1.00	0.01	0.00	3.31	1.00	0.07	1.01	0.00	0.01	0.12	1.00

	Individual Networking				Social Networking				Communication			
	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)
Education	0.61	0.10	**	1.84	0.62	0.21	**	1.86	0.69	0.22	**	1.99
SES of individual	0.10	0.13	0.42	1.11	0.21	0.24	0.39	1.23	0.25	0.27	0.34	1.29
Age/Generation	-0.15	0.06	*	0.86	-0.02	0.13	0.90	0.98	-0.14	0.13	0.28	0.87
Gender	-0.30	0.14	*	0.74	0.39	0.28	0.17	1.47	-0.36	0.32	0.26	0.70
Urbanisation	-0.24	0.26	0.35	0.78	-0.01	0.51	0.98	0.99	0.24	0.53	0.64	1.28
Income	0.23	0.14	0.10	1.26	0.04	0.27	0.87	1.04	-0.35	0.29	0.24	0.71
Children	0.23	0.16	0.15	1.25	0.52	0.30	0.09	1.68	-0.35	0.35	0.32	0.71
Disability	0.52	0.29	0.07	1.68	0.13	0.46	0.79	1.13	0.47	0.57	0.41	1.59
Employment status			0.69				0.18				**	
Student	-0.08	0.39	0.84	0.92	0.18	0.78	0.82	1.19	-0.78	0.68	0.25	0.46
Employed	-0.32	0.28	0.26	0.73	0.81	0.45	0.07	2.25	0.93	0.52	0.08	2.54
Retired	-0.18	0.41	0.67	0.84	0.58	0.62	0.35	1.79	-0.43	0.71	0.54	0.65
Unemployed	-0.07	0.41	0.86	0.93	-0.13	0.62	0.83	0.87	-0.45	0.64	0.48	0.64
Home Caretaker												
Ethnicity			0.76				0.92				*	
Asian	0.04	0.82	0.96	1.04	-19.13	12733.08	1.00	0.00	-18.79	12401.25	1.00	0.00
African Caribbean	0.45	0.76	0.56	1.56	0.30	13646.78	1.00	1.35	-19.22	12401.25	1.00	0.00
White	0.44	0.70	0.53	1.55	-18.58	12733.08	1.00	0.00	-17.69	12401.25	1.00	0.00
Other ethnic group												
Marital Status			*				**				0.15	
Single	0.19	0.22	0.41	1.20	0.28	0.51	0.59	1.32	-1.13	0.62	0.07	0.32
Married	-0.43	0.21	*	0.65	-1.03	0.45	*	0.36	-0.59	0.61	0.34	0.56
Cohabiting	-0.17	0.28	0.55	0.85	-0.28	0.56	0.62	0.76	-1.23	0.66	0.06	0.29
Separated/widowed												
Area Deprivation (IMD)	0.03	0.01	*	1.03	0.05	0.02	*	1.05	-0.01	0.03	0.73	0.99
Area Income	-0.02	0.01	*	0.98	-0.01	0.02	0.42	0.99	-0.01	0.02	0.47	0.99
Area Employment	-0.05	0.02	**	0.95	0.02	0.02	0.27	1.02	0.02	0.02	0.27	1.02
Area Health	0.01	0.01	0.26	1.01	-0.02	0.01	0.15	0.98	-0.02	0.01	0.15	0.98
Area Education	0.01	0.01	0.34	1.01	0.01	0.01	0.16	1.01	0.01	0.01	0.16	1.01
Area Crime	-0.01	0.01	0.21	0.99	0.01	0.01	0.36	1.01	0.01	0.01	0.36	1.01

	Shopping			Finance			Political participation			Civic participation						
	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)				
Education	0.69	0.22	**	1.99	0.59	0.10	**	1.81	0.76	0.10	**	2.14	0.93	0.17	**	2.53
SES of individual	0.25	0.27	0.34	1.29	0.39	0.13	**	1.48	0.25	0.13	*	1.29	0.27	0.23	0.24	1.31
Age/Generation	-0.14	0.13	0.28	0.87	0.02	0.07	0.72	1.03	0.23	0.07	**	1.26	0.17	0.11	0.11	1.18
Gender	-0.36	0.32	0.26	0.70	0.02	0.15	0.91	1.02	-0.25	0.14	0.08	0.78	-0.33	0.25	0.19	0.72
Urbanisation	0.24	0.53	0.64	1.28	-0.14	0.27	0.62	0.87	-0.06	0.26	0.82	0.94	-0.64	0.37	0.08	0.53
Income	-0.35	0.29	0.24	0.71	-0.15	0.14	0.29	0.86	-0.09	0.14	0.49	0.91	0.21	0.22	0.36	1.23
Children	-0.35	0.35	0.32	0.71	-0.08	0.16	0.63	0.93	0.66	0.16	**	1.94	0.24	0.28	0.38	1.27
Disability	0.47	0.57	0.41	1.59	0.35	0.29	0.24	1.42	0.60	0.29	*	1.83	1.12	0.38	**	3.06
Employment status			**				**				**				0.84	
Student	-0.78	0.68	0.25	0.46	-1.39	0.39	**	0.25	-0.27	0.38	0.47	0.76	-0.37	0.70	0.60	0.69
Employed	0.93	0.52	0.08	2.54	0.02	0.29	0.93	1.02	0.08	0.28	0.76	1.09	-0.28	0.57	0.62	0.75
Retired	-0.43	0.71	0.54	0.65	-1.29	0.41	**	0.28	-0.93	0.40	*	0.40	-0.41	0.73	0.57	0.66
Unemployed	-0.45	0.64	0.48	0.64	-0.75	0.42	0.07	0.47	-0.72	0.43	0.10	0.49	0.28	0.76	0.71	1.32
Home Caretaker																
Ethnicity			*				0.19				0.98				0.97	
Asian	-18.79	12401.25	1.00	0.00	0.23	0.89	0.80	1.25	0.05	0.89	0.95	1.06	19.14	11967.98	1.00	204566914.98
African Caribbean	-19.22	12401.25	1.00	0.00	0.83	0.84	0.33	2.29	-0.11	0.84	0.90	0.90	19.09	11967.98	1.00	195181441.31
White	-17.69	12401.25	1.00	0.00	0.07	0.77	0.93	1.07	-0.11	0.78	0.89	0.89	18.89	11967.98	1.00	160563797.03
Other ethnic group																
Marital Status			0.15				**				0.27				*	
Single	-1.13	0.62	0.07	0.32	-0.48	0.23	*	0.62	-0.17	0.23	0.45	0.84	0.83	0.41	0.04	2.30
Married	-0.59	0.61	0.34	0.56	0.21	0.21	0.32	1.24	-0.40	0.21	0.05	0.67	-0.16	0.39	0.69	0.86
Cohabiting	-1.23	0.66	0.06	0.29	-0.42	0.28	0.14	0.66	-0.31	0.27	0.26	0.73	0.66	0.46	0.16	1.93
Separated/widowed																
Area Deprivation (IMD)	-0.01	0.03	0.73	0.99	0.03	0.01	*	1.03	0.02	0.01	0.07	1.02	0.06	0.02	**	1.06
Area Income	-0.01	0.02	0.47	0.99	-0.01	0.01	0.13	0.99	-0.02	0.01	*	0.98	-0.01	0.01	0.53	0.99
Area Employment	0.00	0.01	0.94	1.00	0.00	0.01	0.73	1.00	-0.02	0.01	0.22	0.98	-0.02	0.01	0.22	0.98
Area Health	-0.01	0.01	0.10	0.99	0.01	0.01	0.39	1.01	-0.02	0.01	0.18	0.98	-0.02	0.01	0.18	0.98
Area Education	-0.01	0.00	0.25	0.99	-0.01	0.00	*	0.99	-0.01	0.01	0.14	0.99	-0.01	0.01	0.14	0.99
Area Crime	0.00	0.00	0.64	1.00	0.00	0.00	0.21	1.00	0.00	0.01	0.62	1.00	0.00	0.01	0.62	1.00

Note. These logistic analyses is based on logistics regressions which also controlled for access location, access quality and ICT attitudes which were significant for most uses

Annex 4: Logistics regressions of different types of uses – Non-users and users (OxIS database)

	Information			Learning			Gaming/Play			Leisure						
	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)				
Education	0.59	0.19	**	1.80	0.73	0.18	**	2.07	0.14	0.10	0.14	1.15	0.60	0.22	**	1.83
SES of individual	0.46	0.23	*	1.59	0.27	0.21	0.19	1.31	-0.17	0.13	0.20	0.85	0.27	0.26	0.30	1.32
Age/Generation	0.11	0.12	0.35	1.12	-0.10	0.10	0.36	0.91	-0.28	0.07	**	0.76	0.01	0.13	0.97	1.01
Gender	-0.17	0.26	0.50	0.84	0.06	0.24	0.81	1.06	-0.87	0.15	**	0.42	-0.02	0.29	0.96	0.98
Urbanisation	0.66	0.44	0.13	1.93	0.67	0.38	0.08	1.96	0.78	0.28	**	2.19	0.13	0.48	0.79	1.14
Income	-0.24	0.25	0.34	0.79	-0.06	0.23	0.80	0.94	-0.41	0.14	**	0.67	0.43	0.29	0.14	1.53
Children	-0.05	0.29	0.87	0.95	-0.20	0.26	0.44	0.82	0.18	0.15	0.24	1.20	0.07	0.34	0.84	1.07
Disability	0.85	0.48	0.07	2.34	1.04	0.44	*	2.82	-0.26	0.30	0.38	0.77	-0.70	0.43	0.10	0.50
Employment status			**				**				0.51				**	
Student	-0.92	0.73	0.21	0.40	0.42	0.70	0.54	1.52	0.35	0.39	0.37	1.42	-0.88	0.70	0.20	0.41
Employed	-0.39	0.51	0.45	0.68	0.46	0.39	0.24	1.59	-0.06	0.28	0.83	0.94	0.78	0.51	0.12	2.18
Retired	-2.33	0.65	**	0.10	-0.75	0.54	0.16	0.47	-0.10	0.41	0.80	0.90	-0.51	0.66	0.44	0.60
Unemployed	-1.70	0.63	**	0.18	-0.70	0.52	0.18	0.50	-0.39	0.39	0.32	0.68	0.20	0.64	0.76	1.22
Home Caretaker																
Ethnicity			0.08				*				0.70				0.30	
Asian	-2.45	3.25	0.45	0.09	-2.12	3.32	0.52	0.12	-0.37	0.89	0.67	0.69	0.39	1.53	0.80	1.48
African Caribbean	-1.09	3.23	0.74	0.34	-0.68	3.28	0.83	0.50	-0.82	0.83	0.33	0.44	2.24	1.55	0.15	9.37
White	-3.05	3.15	0.33	0.05	-2.81	3.22	0.38	0.06	-0.67	0.78	0.39	0.51	0.75	1.30	0.56	2.11
Other ethnic group																
Marital Status			0.30				0.92				0.10				0.06	
Single	0.09	0.46	0.85	1.09	0.03	0.40	0.95	1.03	0.13	0.22	0.55	1.14	-0.70	0.58	0.23	0.50
Married	-0.58	0.41	0.16	0.56	-0.10	0.35	0.77	0.90	-0.32	0.20	0.12	0.73	-1.37	0.57	*	0.26
Cohabiting	-0.42	0.49	0.39	0.66	-0.24	0.42	0.58	0.79	-0.40	0.27	0.15	0.67	-0.66	0.62	0.29	0.52
Separated/widowed																
Area Deprivation (IMD)	-0.02	0.02	0.34	0.98	0.02	0.02	0.43	1.02	-0.01	0.01	0.51	0.99	0.00	0.02	0.97	1.00
Area Income	0.03	0.01	*	1.03	-0.02	0.01	0.18	0.98	-0.01	0.01	0.18	0.99	-0.02	0.02	0.30	0.98
Area Employment	-0.03	0.01	0.06	0.97	-0.01	0.01	0.55	0.99	0.00	0.01	0.87	1.00	-0.01	0.02	0.51	0.99
Area Health	0.02	0.01	0.07	1.02	0.01	0.01	0.52	1.01	0.00	0.01	0.61	1.00	0.01	0.01	0.29	1.01
Area Education	0.00	0.01	0.75	1.00	0.00	0.01	0.65	1.00	0.01	0.00	0.09	1.01	0.01	0.01	0.48	1.01
Area Crime	0.01	0.01	0.33	1.01	0.00	0.01	0.45	1.00	0.01	0.00	0.05	1.01	0.00	0.01	0.98	1.00

	Individual Networking				Social Networking				Communication			
	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)
Education	0.61	0.10	**	1.85	0.61	0.19	**	1.84	0.65	0.10	**	1.91
SES of individual	0.13	0.13	0.33	1.13	0.34	0.23	0.14	1.41	0.02	0.13	0.89	1.02
Age/Generation	-0.14	0.06	*	0.87	0.00	0.12	0.99	1.00	-0.10	0.06	0.12	0.90
Gender	-0.30	0.14	*	0.74	0.25	0.26	0.34	1.29	-0.21	0.14	0.13	0.81
Urbanisation	-0.20	0.26	0.45	0.82	0.20	0.46	0.67	1.22	0.01	0.26	0.98	1.01
Income	0.21	0.14	0.11	1.24	-0.03	0.25	0.90	0.97	0.20	0.14	0.15	1.22
Children	0.24	0.16	0.13	1.27	0.53	0.29	0.06	1.70	0.24	0.16	0.12	1.28
Disability	0.48	0.28	0.09	1.61	0.03	0.43	0.94	1.03	0.64	0.28	*	1.89
Employment status			0.76				0.15				0.84	
Student	-0.09	0.39	0.82	0.91	0.05	0.76	0.94	1.06	-0.11	0.38	0.78	0.90
Employed	-0.31	0.28	0.26	0.73	0.73	0.44	0.09	2.08	-0.29	0.28	0.29	0.75
Retired	-0.24	0.40	0.55	0.79	0.28	0.59	0.64	1.32	-0.35	0.41	0.39	0.70
Unemployed	-0.12	0.40	0.76	0.88	-0.22	0.58	0.70	0.80	-0.24	0.40	0.56	0.79
Home Caretaker												
Ethnicity			0.87				*				0.91	
Asian	0.22	0.82	0.78	1.25	-2.22	2.97	0.46	0.11	0.10	0.81	0.91	1.10
African Caribbean	0.53	0.76	0.49	1.69	-0.07	2.95	0.98	0.93	0.27	0.76	0.72	1.31
White	0.44	0.70	0.53	1.56	-2.43	2.86	0.40	0.09	0.34	0.70	0.63	1.40
Other ethnic group												
Marital Status			*				**				*	
Single	0.19	0.22	0.39	1.21	0.19	0.48	0.69	1.21	0.16	0.22	0.47	1.18
Married	-0.45	0.21	*	0.64	-1.04	0.43	*	0.35	-0.46	0.20	*	0.63
Cohabiting	-0.16	0.28	0.57	0.86	-0.29	0.52	0.58	0.75	-0.30	0.28	0.28	0.74
Separated/widowed												
Area Deprivation (IMD)	0.02	0.01	0.07	1.02	0.04	0.02	0.08	1.04	0.02	0.01	0.23	1.02
Area Income	-0.02	0.01	*	0.98	0.00	0.01	0.81	1.00	-0.02	0.01	*	0.98
Area Employment	0.00	0.01	0.84	1.00	-0.04	0.01	**	0.96	0.00	0.01	0.76	1.00
Area Health	0.00	0.01	0.74	1.00	0.01	0.01	0.19	1.01	0.00	0.01	0.86	1.00
Area Education	0.00	0.00	0.59	1.00	0.01	0.01	0.47	1.01	0.01	0.00	0.19	1.01
Area Crime	0.00	0.00	0.74	1.00	-0.01	0.01	0.34	0.99	0.00	0.00	0.85	1.00

	Shopping			Finance			Political participation			Civic participation						
	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)				
Education	0.72	0.21	**	2.05	0.60	0.10	**	1.82	0.77	0.10	**	2.17	0.98	0.17	**	2.66
SES of individual	0.36	0.25	0.16	1.43	0.43	0.13	**	1.54	0.29	0.13	*	1.33	0.35	0.22	0.11	1.42
Age/Generation	-0.08	0.12	0.54	0.93	0.04	0.07	0.59	1.04	0.24	0.07	**	1.27	0.22	0.10	*	1.25
Gender	-0.46	0.29	0.12	0.63	-0.01	0.15	0.94	0.99	-0.27	0.14	0.06	0.76	-0.39	0.24	0.11	0.68
Urbanisation	0.48	0.48	0.31	1.62	-0.06	0.27	0.81	0.94	0.01	0.25	0.98	1.01	-0.47	0.36	0.19	0.63
Income	-0.38	0.27	0.16	0.68	-0.16	0.14	0.24	0.85	-0.10	0.13	0.46	0.91	0.18	0.22	0.40	1.20
Children	-0.22	0.33	0.51	0.80	-0.04	0.16	0.80	0.96	0.70	0.16	**	2.01	0.31	0.27	0.25	1.37
Disability	0.29	0.49	0.56	1.33	0.32	0.29	0.26	1.38	0.56	0.28	*	1.74	0.84	0.37	*	2.32
Employment status			**				**				**				0.59	
Student	-1.12	0.66	0.09	0.33	-1.45	0.39	**	0.23	-0.29	0.38	0.44	0.75	-0.25	0.69	0.72	0.78
Employed	0.71	0.51	0.16	2.03	0.01	0.28	0.98	1.01	0.10	0.27	0.72	1.10	-0.24	0.56	0.67	0.79
Retired	-0.85	0.67	0.20	0.43	-1.37	0.40	**	0.25	-0.99	0.40	*	0.37	-0.46	0.70	0.51	0.63
Unemployed	-0.75	0.61	0.22	0.47	-0.81	0.41	*	0.45	-0.72	0.43	0.09	0.49	0.52	0.71	0.46	1.68
Home Caretaker																
Ethnicity			0.09				0.08				0.88				0.82	
Asian	-2.79	3.99	0.48	0.06	0.47	0.90	0.60	1.60	0.27	0.90	0.77	1.31	19.36	11030.00	1.00	255063460.09
African Caribbean	-3.66	3.95	0.35	0.03	0.94	0.84	0.26	2.56	-0.02	0.85	0.98	0.98	19.02	11030.00	1.00	181549498.85
White	-2.45	3.92	0.53	0.09	0.06	0.78	0.93	1.07	-0.09	0.79	0.91	0.91	18.79	11030.00	1.00	144887182.41
Other ethnic group																
Marital Status			0.23				**				0.26				*	
Single	-0.92	0.54	0.09	0.40	-0.47	0.23	*	0.63	-0.17	0.23	0.45	0.84	0.71	0.39	0.07	2.03
Married	-0.62	0.52	0.23	0.54	0.17	0.21	0.41	1.19	-0.41	0.21	*	0.67	-0.26	0.37	0.49	0.77
Cohabiting	-1.07	0.57	0.06	0.34	-0.41	0.28	0.14	0.67	-0.30	0.27	0.26	0.74	0.62	0.44	0.16	1.85
Separated/widowed																
Area Deprivation (IMD)	-0.03	0.02	0.24	0.97	0.03	0.01	*	1.03	0.02	0.01	0.13	1.02	0.06	0.02	**	1.06
Area Income	0.00	0.02	0.88	1.00	-0.01	0.01	0.24	0.99	-0.01	0.01	0.09	0.99	0.00	0.01	0.83	1.00
Area Employment	0.02	0.02	0.19	1.02	0.00	0.01	0.81	1.00	0.00	0.01	0.76	1.00	-0.02	0.01	0.15	0.98
Area Health	-0.01	0.01	0.34	0.99	-0.01	0.01	0.13	0.99	0.01	0.01	0.27	1.01	-0.01	0.01	0.33	0.99
Area Education	0.01	0.01	0.24	1.01	-0.01	0.00	0.25	0.99	-0.01	0.00	0.03	0.99	-0.01	0.01	*	0.99
Area Crime	0.01	0.01	0.23	1.01	0.00	0.00	0.72	1.00	0.00	0.00	0.25	1.00	-0.01	0.01	0.43	0.99

This study explores the social implications of exclusion from the information society by examining the best empirical data available for the UK in 2008. The findings indicate that technological forms of exclusion are a reality for significant segments of the population, and that, for some people, they reinforce and deepen existing disadvantages. The study also sets out a range of possible policy responses to this issue.

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