Digital | Divide

Analysis of the Uptake of Information Technology in the Dublin Region

BY TRUTZ HAASE AND JONATHAN PRATSCHKE

Commissioned by Dublin Employment Pact
in partnership with:

Dublin Regional Authority
Dublin City Development Board
Dún Laoghaire Rathdown County Development Board
Fingal County Development Board
South Dublin County Development Board

Dublin Employment Pact

Trutz Haase Social and Economic Consultant, 17 Templeogue Road, Terenure, Dublin 6W. Tel: +353 1 490 8800; email: thaase@iol.ie

ISBN 0-9545661-3-0
Price: €25.00

NDP
NATIONAL DEVELOPMENT PLAN

Cover design and printing: Printwell Co-operative, 10 North Richmond Street, Dublin 1 01 8550873

Preface

The “Digital Divide” is the disparity between different groups and individuals in society in competence in and use of Information and Communication Technologies (ICT). Over the last number of years, the Digital Divide has been identified by the UN, the EU and national authorities – including the Irish Government – as a key issue given the growing role of ICT in all areas of economic and social life. Overcoming the Digital Divide is now regarded as central not only to general ICT development strategies, for which the level of ICT literacy in society is critical, but also and increasingly to social inclusion policy.

This increasing awareness of the Digital Divide and of the importance of effective strategies to address it have been reflected in recent policy initiatives at the European, national and local authority levels. In 2002 the European Commission issued its key policy statement, *eEurope 2005: An Information Society for All*. In Ireland, Government policy was set out in 2002 in *New Connections: A Strategy to Realise the Potential of the Information Society*, and this has been followed up by reports from the Information Society Commission, notably *Building the Knowledge Society* (2002) and *eInclusion: Expanding the Information Society in Ireland* (2003). At the local level in Dublin, the Chamber of Commerce published its seminal report *Dublin as a World Class e-City* in 2001, and Dublin City, South Dublin, Fingal and Dun Laoghaire-Rathdown County Development Boards have been developing ICT access strategies. These strategies, including initiatives such as Universal Participation, have involved interactive portals, content development initiatives, policies on the roll-out of physical infrastructure, as well as policies on access through the education system, community-based initiatives, the public libraries etc. In addition, through the national access programmes CAIT 1 and 2, a wealth of community based initiatives were developed on the ground and delivered very important lessons on the effective targeting of the Digital Divide.

Despite this extensive activity around the development of access strategies, attempts to actually quantify and locate the Digital Divide have, to date, relied on surveys of numbers of computers in households, and this necessarily has led to a rather scattergun approach to impacting on it. As the current study clearly demonstrates, however, such data tells us very little about actual disparities in competence and confidence in the use of ICT. To move from general access strategies to targeted eInclusion strategies requires a very detailed knowledge of the nature and extent of the Digital Divide. Much useful information in this regard has recently been collected by the CSO through the 2002 Census of Population and this data will be of great value in the development of both national and local strategies.

In the context of these various initiatives, and of lack of clarity in relation to the Digital Divide, the Dublin Employment Pact organised a Roundtable in the Department of the Taoiseach in June 2002 on “Dublin in the Knowledge Age”. The Round Table was addressed by Professor Luc Soeté of the University of Maastrict, one of the leading EU-level experts on digital inclusion, and Dr. Chris Horne, CEO of Iona Technologies and chairman of the group which produced the report *Dublin a World Class e-City*, and was attended by experts and policy makers from the public, private and community sectors, as well as from leading ICT companies, the local authorities and the research and educational sector. A major conclusion of the meeting was that Ireland was seriously underdeveloped in relation both to ICT infrastructure provision as well as educational provision and general digital literacy. In particular, the Round Table identified the vagueness that existed around the nature and extent of the Digital Divide and the urgent need for effective strategies to address it. The Dublin Employment Pact undertook to develop an initiative to establish clarity in these areas to assist the development of national and local policies aimed at tackling the Digital Divide in Ireland.

The outcome of this process was the development of terms of reference for a major survey and study of the nature and extent of the Digital Divide in the Dublin Region and of the key elements of an effective strategy to tackle it. To oversee this process a Steering Group was established, composed of representatives of the Employment Pact, the Dublin Regional

Authority, Dublin City Development Board and Dun Laoghaire-Rathdown, Fingal and South Dublin County Development Boards[1]. Following a competitive tendering process, Trutz Haase and Jonathan Pratschke were commissioned to produce the report. Beyond issues such as general physical provision, individual access opportunities, education and content development, the report was to survey and analyse the actual disparities in ICT use and competence between groups and individuals in society. It was to quantify and locate the findings and focus in its recommendations on the added value of targeted strategies to impact on the Digital Divide.

On the basis of a highly innovative scientific survey and analysis, this excellent and ground-breaking report establishes for the first time the exact nature and extent of the Digital Divide in Dublin and in the process overthrows many preconceived notions in relation to it. It quantifies the extreme disparities between social groups in relation to digital access – measured in terms of ICT competence and confidence – as well as measuring levels of access by age, gender and other factors. It focuses on three areas – the household, the school and the neighbourhood – where the divide is most strongly shaped and hence can be tackled most effectively.

As demonstrated in this report, digital inclusion is not only a factor of general ICT policy, but must now become a key element in social inclusion policy, as it is a factor of it. The recommendations of this report set the parameters for the added effect in closing the Digital Divide that can be achieved through a targeted community-based approach aimed at those who are being left behind in the digital revolution. Schools and the education system in general have a major role to play in this, as have the local authorities and local and community organisations. The comprehensive findings of the report set the benchmark against which all future initiatives, whether national or local, can be measured. The targeting aspect is critical, and must replace the scattergun approach which has characterised some programmes in the past. The report pinpoints the precise actions which, if properly resourced, could impact on the Digital Divide and reduce it by several percentage points within each year of operation. The cost of such an initiative rolled out nationally would be no more than €15 million in year one and €10 million per annum thereafter.

This report deserves the widest possible attention. It must inform any new national initiative and shape local authority and community-level strategies. It will also contribute to strategic thinking at EU level in relation to digital inclusion. The Steering Group which commissioned this research would like to express its sincerest thanks to the research team for this truly world-class report. The results of their work will help shape the ICT access strategies being developed by the Development Boards, including the joint development of a Charter of Digital Rights and a common approach to this issue across the Dublin Region.

Philip O'Connor
Dublin Employment Pact
Chair, Digital Inclusion Steering Group

[1] The Project Steering Group was composed of Philip O'Connor (DEP), Yvonne Keating (DEP), Patricia Potter (DRA), Lorna Maxwell (South Dublin CDB), Ciaran Staunton (Fingal CDB), Peter Finnegan (Dublin CDB), Noreen O'Connell (Dublin CDB), Mary Mallon and Wessel Badenhorst (Dun Laoghaire-Rathdown CDB).

Table of Contents

Figures and Tables

Acknowledgements

This study is the fruit of a collaborative process that involved a number of people in addition to the authors. Indeed, it would not be possible to complete a research project such as this without incurring a considerable debt of gratitude. In particular, we are indebted to the members of the Project Steering Group, who provided support, encouragement and feedback throughout the research.

We would like to thank Aidan Hall (Department of the Taoiseach, Information Society Commission), Tommy Cooke (Dublin Institute of Technology), Carmel Duggan (Work Research Co-operative), Emer Coveney and Peter Byrne (Dublin Inner City Partnership) who provided invaluable advice.

Special thanks go to the 1,340 individuals who generously gave their time to participate in the household survey, to Noeline Murray and the rest of the team at Quota Search for their excellent work in carrying out the interviews, and to Will Redmond of the Data Entry Bureau, who coordinated the process of data entry with great professionalism.

Our thanks also go to all of the Principals, Vice-Principals, IT Co-ordinators and IT teachers who took the time to complete the school survey forms with a high level of conscientiousness.

Finally, we would like to express our gratitude to Philip O'Connor of the Dublin Employment Pact for entrusting us with this study and for providing continuous support.

Trutz Haase & Jonathan Pratschke (November 2003)

Executive Summary

This study takes place against the backdrop of rapid changes in information technologies, which have already had a considerable impact on the economic activities, labour market experiences and private lives of Irish people. In its report, *How the General Public is Adapting to the Information Society in Ireland*, the Information Society Commission draws attention to the significant unevenness that has characterised the uptake of information technology in Ireland. This study seeks to quantify and explain this unevenness and to provide a "definitive analysis of digital inclusion in Dublin" (Terms of Reference).

This report breaks new ground by employing a broad and multifaceted definition of access to information and communication technologies and by providing an in-depth analysis of how the neighbourhood context and the attributes of individuals and households contribute to uneven uptake. In fact, this is the first Irish study to provide empirical evidence for the existence of neighbourhood effects in relation to a specific form of social disadvantage. By conceptualising and measuring neighbourhood effects on the uptake of ICTs, we provide an additional rationale for treating area/community-based interventions as an important dimension of official responses to the digital divide.

Conceptualising the Digital Divide

According to the Information Society Commission, the digital divide should be conceptualised in terms of awareness, user-friendliness, competence, reliability and physical access to digital technologies. In fact, eInclusion is related more closely to the ability to use new technologies to achieve specific results than to computer ownership or home internet access. Moreover, the international literature suggests that digital inequalities do not result from a temporary unevenness in uptake that will inevitably disappear as fast internet connections become more affordable. On the contrary, the historical evidence suggests that the adoption of successful new technologies often reinforces economic advantage, especially where considerable initial resources are required to gain access to these. Thus, without successful state intervention, and if the diffusion of Information and Communication Technologies continues to follow its current trajectory, the uptake of computers and internet may have the effect of exacerbating existing social divisions.

The effects of social stratification on the digital divide are thus inseparable from broader forms of social inequality, and interventions which are aimed at the provision of access to and/or training in the use of ICT are likely to be of limited impact unless they are embedded in a wider strategy for combating social exclusion. On the other hand, the digital divide is rather different from other forms of social exclusion, and the provision of training programmes and computer centres in disadvantaged areas can undoubtedly boost rates of internet use in these areas. The existence of substantial age cohort effects suggests that, at least in principle, social inequalities do not constitute insurmountable barriers to the wider use of digital technologies, and formal training can facilitate computer and internet competence.

The complex nature of the analysis carried out during this research project, and the requirement that the results should provide reliable benchmarks for future comparison, placed considerable demands on the data collection process. We made extensive use of multi-item questions to achieve robust constructs (access, awareness, use, proficiency and confidence), as well as response scales to generate sensitive measures. We also analysed computer instruction in schools (65% of second-level schools in Dublin responded to our schools questionnaire) and carried out a large household survey (which generated 1,340 valid interview schedules from 1,172 households). Finally, the use of a 'clustered' sample design enabled us to distinguish between individual-level effects and neighbourhood effects.

The Extent of the Digital Divide in the Greater Dublin Area

In overall terms, 40 per cent of households in Dublin possess a computer, although there are considerable differences between the different social class categories, ranging from a high of 71 per cent amongst Higher Professionals to just 15 per cent amongst those in the Unskilled Manual class. Levels of internet access in private households are below those of computer ownership, but mirror the gradual decline across the social class spectrum that is observed in relation to computers. In total, 31 per cent of households have access to the internet, the highest rate being observed, once again, amongst Higher Professionals (63%) and the lowest in Unskilled Manual households (9%). When we examine the differences that exist in relation to household income, we find once again that uptake decreases with income. High-income households (i.e. those with a net monthly income of more than €3,000) are roughly three times more likely to have a computer and to have home internet access than households with an income of less than €500.

If we compare these estimates with the much higher ones obtained by a recent MRBI poll, carried out for the Commission for Communications Regulation, it becomes clear that greater care needs to be taken in future studies with regard to the process of data collection. The two-stage cluster sample strategy used in the present study, whilst slightly more expensive, is likely to result in much more accurate findings than the more frequent quota sampling approach, particularly when combined with telephone interviewing. Similarly, greater conceptual clarity is required in relation to the measurement of the digital divide. For example, when we look at the data in terms of the likelihood of an individual from a particular class having access to, and actually using a computer, we find that people from the Higher Professional class are, on average, four times more likely to own and use a computer, compared to those from the Unskilled Manual social class, but eleven times more likely to feel confident about computers. This indicates that home computer access may underestimate the overall extent of the digital divide.

In terms of gender differences, we find surprisingly small disparities when we measure the digital divide on the basis of physical access: 41.7 per cent of male respondents and 38.5 per cent of female respondents have access to a computer at home. The differences in home internet access are of a similar order: 33.5 per cent compared with 28.2 per cent. However, great care needs to be taken when interpreting these figures, as they relate exclusively to the availability of computers and do not reflect differences in utilisation, proficiency and confidence. In fact, women have a considerably lower level of computer awareness than men (48.9% versus 58.4%), as well as a lower level of usage (44.2% versus 50.2%), proficiency (29.6% versus 38.4%) and confidence (26.1% versus 37.4%). Indeed, home access singularly fails to identify any of these differences.

Students and school pupils, and those working for payment, are more likely to have home access to a computer (56% and 50% respectively), whilst all other economic categories are well below the average of 40 per cent. For example, 30 per cent of respondents engaged in home duties report having a computer at home, and this applies to 23 per cent of those who are unemployed and 22 per cent of those who are unable to work due either to disability or long-term illness. Only 17 per cent of people who have retired have a computer in their home. Home access to a computer is roughly twice the average rate for individuals with a postgraduate qualification (80% compared to 40%), whilst the rate amongst those with primary education only is about half the average rate (20% compared to 40%). The corresponding differentials are even greater for internet access: 68 per cent compared to 31 per cent and 13 per cent compared to 31 per cent. In fact, people with a postgraduate qualification are seven times more likely to use a computer regularly than those with a primary education only, twenty times more likely to be proficient computer users and twelve times more likely to feel confident about computers than those with a primary education only.

Understanding Contextual Factors

Acquiring familiarity with computers depends not only on individual attributes, but crucially also on contextual factors. People come into contact with digital technologies via their family and friendship networks as well as at their workplaces, colleges and schools. Informal advice and support are crucial to acquiring basic computing skills, and where neighbours and friends use computers and internet, this can facilitate the learning process. One of the strengths of the present research is its ability to shed light on the ways in which individual attributes interact with the social context to influence the utilisation of digital technologies.

We present the results of a series of multilevel models that explain the determinants of familiarity with digital technologies, confidence in computers and competence in their use. There is a high degree of consistency in the results of our statistical models, although different facets of the digital divide also have their own specificities. The key individual-level variables that influence computer awareness, confidence and competence are having a third-level education, belonging to a younger or older age group, being in a low or high social class category, household income and the number of friends and neighbours who are able to provide help and advice in relation to computers and internet. Other variables, including financial difficulties, the degree of satisfaction with one's neighbourhood of residence, being unemployed, engaged in home duties or a full-time student and the amount of support provided by other family members also have an influence on various aspects of the digital divide.

Our multilevel models show that the marked differences observed between neighbourhoods in uptake of digital technologies cannot be explained by 'compositional effects' alone: neighbourhood differentials remain in relation to familiarity, anxiety and competence, and the percentage of local people with a third-level qualification has a statistically significant effect on computer anxiety and computer competence, even after controlling for individual educational attainments and for other individual-level attributes. Furthermore, the influence of individual-level characteristics itself varies according to the neighbourhood context: the impact of having a third-level education, of being over 55 years of age and of having a strong computer support network, for example, depends on the kind of neighbourhood in which one lives.

It is interesting to observe that the influence of support networks depends on the nature of the local neighbourhood, suggesting that these informal channels for the transmission of skills may have a more important role in areas where computer skills are at a relatively low level. From a policy-making perspective this is an important finding, as it suggests that a programme of public interventions that boosts computer competence in these areas can have a particularly strong, indirect effect on neighbourhood differentials by injecting additional skills into existing social networks.

Given the increasing importance of computer literacy, gaining familiarity with ICTs at primary and secondary school is clearly of fundamental importance. There are significant differences in student to IT teacher ratios in second-level schools in Dublin, and the differences are even more pronounced in relation to ICT facilities. In all 121 schools included in our survey, students had access to 5,720 computers in total, and 4,381 of these were connected to the internet. This yields an overall average of roughly one computer for every 10 students and one internet connection for every 13 students in Dublin second-level schools. Conditions are most favourable in PLCs, however, where there are roughly 4 students per computer and 7 students per internet access point. Vocational schools come next (12 students per computer and 14 students per internet access point), followed by Community and Comprehensive schools (the corresponding ratios are 13 and 22 respectively). The situation in the Secondary Schools is similar as far as the ratio of students to computers is concerned, but the ratio of students to internet access points is much higher than in other schools.

As a whole, the analysis of the situation at Dublin's second-level schools reveals that the shortcomings may not only lie with the present state of computer facilities, but even more so their effective utilisation. Schools are particularly under-resourced with respect to the ongoing running costs of computer facilities, including free broadband access, maintenance cost, and supervision to allow greater student access to existing computer facilities outside formal class instruction.

This situation is further reflected in the poor utilisation of existing computer facilities at schools for the local community. Evening classes in computing and internet use are confined mainly to PLCs (80%), vocational schools (69%) and community/comprehensive schools (69%). In contrast, less than one in five secondary schools provide any form of adult IT training. A similar pattern is observed in relation to community access to IT facilities, with one-third of PLCs, vocational schools and community/comprehensive schools providing access, compared with less than 10 per cent of secondary schools. It is clear from this that there is considerable scope for expanding the utilisation of IT facilities in second-level schools.

A Policy Response to the Growing Digital Divide

In the final section of the report we discuss the existing policy landscape and explore the implications of our empirical analysis for the policy-making agenda. As far as the Equalskills Initiative is concerned, we conclude that on its own, this programme is unlikely to provide sufficient exposure to ICTs and to give participants a skills base that enables them to expand their ICT usage autonomously. A government-sponsored nationwide extension of the programme should only be considered, in our view, if it is complementary to and not at the expense of a more in-depth community-based training approach which targets the most disadvantaged individuals and communities in Ireland.

We believe that the CAIT 1+2 Initiatives have moved in broadly the right direction in tackling the digital divide. It therefore makes sense that any new initiative in this area should have a broadly similar design to these initiatives. However, we believe that experience from other projects, notably the Digital Community Project in Dublin’s Inner City, provide additional insights into the most effective ways of addressing this divide. This study therefore draws attention to the potential of a public-private partnership between existing local development structures and major private sponsors at the regional level. Future initiatives that build on such example would not only be more sustainable, but also in a position to harness substantial logistical and technical through the Regional Technical Colleges.

The study concludes that equality in access to new information technologies and the targeted provision of computer centres and training programmes in disadvantaged areas represent the most promising measures for minimising the threat of a growing digital divide. Insisting on the equitable roll-out of new technology can help to reduce the danger of a widening digital divide in Ireland but, taken on its own, this is unlikely to narrow the gap without further targeted intervention by the state. The Irish Government therefore has a key role to play in supporting disadvantaged individuals and communities through the targeted provision of ICT access and training facilities.

1 Introduction

This study was commissioned by the Dublin Employment Pact, in partnership with the Dublin Regional Authority, the Dublin City Development Board and the Fingal, South Dublin and Dun Laoghaire-Rathdown County Development Boards, and conducted by a team of social and economic consultants under the project leadership of Trutz Haase.

The study takes place against the backdrop of rapid changes in information technologies which have already had a considerable impact on the economic activities, labour market experiences and private lives of Irish people. In its report, *How the General Public is Adapting to the Information Society in Ireland*, the Information Society Commission draws attention to the significant unevenness that has characterised the uptake of information technology in Ireland to date. For example, it notes the considerable differences that exist between men and women and between different age cohorts, socio-economic groups and regions, as well as by employment status, occupation, educational achievements and income:

“This highlights the gap between those of different socio-economic backgrounds and the need for action to be taken in this area to ensure that Ireland does not develop into a two-tier Information Society. The fact that the gap between the information rich and poor has not substantially changed since 1996 … points to the need for increased activity in this area.”

As new information technologies increasingly permeate everyday life, the need to regulate this process so as to avoid reproducing or even exacerbating existing inequalities is increasingly felt. At national level, this hinges on the balanced development of the telecommunications infrastructure, the provision of an appropriate legal and regulatory environment and the promotion of major eGovernment initiatives. Government measures include support for eBusiness, research and development, lifelong learning and specific measures to promote eInclusion. The existing national initiatives are complemented by a large number of regional and local initiatives which aim to address the digital divide. Important initiatives within the four Dublin Local Authorities include a programme which aims to ensure that all primary and second-level schools have computers and high-speed internet access, the provision of computer and internet access in public libraries and in some of the city’s most disadvantaged neighbourhoods as well as numerous training initiatives, typically targeted at those from more disadvantaged social and economic backgrounds. Another initiative undertaken by Dublin City Council provides a community-relevant portal (www.dublin.ie).

This study does not set out to evaluate the relevance or effectiveness of these initiatives, but aims instead to shed greater light on the nature and extent of the digital divide itself. The term ‘digital divide’ is often used without clarifying what this refers to, and precise estimates of the extent of this divide in Ireland are lacking. This makes it difficult to evaluate the effectiveness of any existing policies and excludes the possibility of specifying targets for new initiatives. For this reason, we have decided to focus on the articulation of the digital divide in Dublin across a variety of scales, from the individual to the neighbourhood, and to explore the related conceptual and measurement issues in considerable detail. The hope of the commissioning agencies – Dublin Employment Pact, the Dublin Regional Authority and the four City and County Development Boards – is that a better understanding of the digital divide can encourage the development of more appropriate and effective social policies.

2 Aims of the Analysis

The Terms of Reference are unambiguous about the aims of the research: *"The study will be a definitive analysis of digital inclusion in Dublin."* To this end, the study brief specifies that a high-level analysis should be undertaken in order to investigate the factors that influence the uptake of Information and Communication Technologies (ICTs) by people living in different areas of the city. In particular, it should provide answers to the following questions:

- What is the socio-economic profile of ICT users?
- How do ICT awareness and use vary according to individual attributes and community of residence?
- What is the link between ICT skills, training and employment?
- Are people with a low awareness of ICTs clustered together geographically or evenly dispersed throughout Dublin?
- How do neighbourhoods and social networks influence the use of ICTs?
- Are specific interventions required in areas where ICTs have a low rate of penetration?
- What kinds of interventions should be implemented to reduce the disparities between individuals and communities in relation to ICT use?
- Is it possible to develop statistically robust indicators of the extent of the 'digital divide' which can provide a benchmark for future reference?

This study does not attempt to provide an evaluation of the various initiatives that have been undertaken by central Government, the County Development Boards, Local Authorities, and other stakeholders in addressing the digital divide. Instead, it aims to provide (i) a clearer conceptual understanding of the digital divide, (ii) a definitive quantification of the extent of the digital divide, and (iii) an analysis of the relative importance of the various social, economic and cultural factors that influence the uptake of ICT.

The aim is therefore to address one of the principal weaknesses of evaluation studies on digital inclusion initiatives in Ireland, namely their inability to actually *quantify* the impact of these interventions on the digital divide. By providing a monitoring framework and robust benchmarks, this study makes it possible to evaluate eInclusion initiatives and to estimate their contribution to narrowing the digital divide.

3 Background to the Study

A number of recent studies have described the development of the Information Society in Ireland in considerable detail and set out the threats and opportunities associated with this process. Thus, rather than providing yet another description of these developments, we will simply refer to the key publications in this area. This will allow us to focus on a set of issues which we feel have not received sufficient attention, in particular the conceptualisation, measurement and explanation of the digital divide.

3.1 Managing the Emerging Information Society

The Irish Government has been relatively pro-active in promoting the growth of a knowledge-based society. Whilst its overall outlook is shaped by a concern to maintain the competitiveness of the Irish economy in an increasingly globalised marketplace, it has also given considerable attention to the question of digital inclusion. Government thinking in relation to the Information Society is set out in a number of documents which are readily available on official web sites, including that of the Information Society Commission.

The first major document is ***IT Access for All***, published by the Information Society Commission (ISC) in March 2000. This is the first major publication dealing with what has come to be known as the 'digital divide' and focuses almost entirely on the question of social inclusion in the context of the Information Society. The main conclusion is that access to and the ability to use information technology are both major factors in determining whether or not an individual is equipped to participate in the Information Society. The report refers to research showing that those who are at a social and economic disadvantage in society tend to be slower in adopting new technologies, raising the question of whether people living in disadvantaged communities face additional obstacles to technology uptake, and indeed whether there is a risk that the Information Society might perpetuate or even exacerbate existing social inequalities.

With regards to access to information and communication technology, *IT Access for All* distinguishes between (i) awareness, (ii) physical accessibility, (iii) usability and user-friendliness, (iv) ability to use the new technology and (v) availability of technical support. Unfortunately, many subsequent studies do not give due weight to this complexity, reducing the question of 'access' to the much narrower issue of physical access to computers and/or the internet. It is the intention of this study to build on the conceptualisation advanced by *IT Access for All* by exploring the aforementioned aspects of access to ICTs, by making detailed comparisons between these different aspects and by providing a careful assessment of their relevance.

The response of the Irish Government to the various studies published by the Information Society Commission and by other key stakeholders was published in the form of a Government Action Plan in March 2002. ***New Connections – A Strategy to Realise the Potential of the Information Society*** outlines the broad parameters of government policy in relation to the development of the Information Society.

The action plan begins by addressing the infrastructural requirements of the Information Society:

- *Telecommunications infrastructure:* developing the capacity necessary for delivering advanced telecommunications services
- *Legal and regulatory environment:* ensuring a secure and predictable legal framework for electronic transactions that provides the necessary confidence for both business and consumers
- *eGovernment:* a key leadership role for Government in stimulating greater engagement with ICTs through its own business processes and service delivery arrangements.

The action plan goes on to outline the support framework needed in order to facilitate the development of the Information Society:

- *eBusiness:* to support and underpin the competitiveness of business, and of indigenous enterprise in particular, in meeting the challenges of a new competitive environment
- *R&D:* a basis for innovation through science and technology to support knowledge-based economic activity
- *Lifelong learning:* to ensure availability of knowledge and skills, to support the process of adapting to ongoing change and to build on the potential of ICTs to facilitate new ways of learning
- *eInclusion:* to ensure that the Information Society develops in the direction of greater inclusiveness and that it builds on the potential of ICTs to address issues of disadvantage and exclusion.

Referring to the revised National Anti-Poverty Strategy, the section on eInclusion reiterates the fact that building an inclusive society is the *"key priority"* of the Government. The document also acknowledges that *"public policy interventions are needed to avoid the danger of exacerbating existing inequalities, and to prevent the emergence of what has become known internationally as a digital divide."* Building on the earlier publications of the ISC, the document continues that *"it is increasingly evident that our approach must extend beyond raising awareness and providing points of public access to the internet. Measures are needed to build the capacity necessary to support inclusive Information Society development, and to actively promote participation among late adopters of new technologies. …It is clear that community and voluntary organisations have the potential to play an important role in making the necessary connections, a point reinforced by a key report produced recently for the European Commission's Information Society Technologies (IST) Research Programme."*

In line with these general commitments, the document highlights seven specific initiatives that form part of the Government Action Plan:

- *Awareness initiatives delivered by the ISC* – The ISC has organised a wide range of initiatives directed at 'late adopters' of new technologies.
- *Library internet access* – Internet access is now generally available within the public library network, which comprises more than 1,400 access points, compared with just 108 in June 1999.
- *Equalskills* – The Equalskills project is a basic ICT literacy initiative that is being piloted in the South West and Shannon regions. The project was launched in September 2001, will run until September 2002, and aims to provide 100,000 people with basic skills in using personal computers, browsing the internet and sending and receiving email messages.
- *CAIT* – The CAIT initiative was in operation from July 2001 to December 2002, with an overall budget of €5m, and supported 71 community-led projects that aimed to encourage late adopters of new technologies. It built on the experience, local knowledge and relationships built up by community and voluntary organisations in order to implement targeted projects addressing the digital divide.
- *Local authorities* – A number of local authorities have used their websites in order to provide information and services of interest to the local community, thus stimulating interest in the internet.
- *Muintir na Tíre project* – Drawing on support from the Department of Social, Community and Family Affairs, Muintir na Tíre has developed a portal that enables local branches to construct websites containing local content quickly and easily. This model may have wider relevance within the community and voluntary sectors.
- *Accessibility* – Under the eEurope Action Plan, all public sector websites are required to be WAI18 (level 2) compliant by end-2001.

Whilst the Action Plan itself provides no benchmarks for monitoring the extent of the digital divide, and does not indicate targets for reducing this within a specific time frame, it nevertheless restates the Government's commitment to conducting "*further research to* *determine the nature and extent of the digital divide in Ireland and to support an informed approach to the actions that are needed to foster inclusive Information Society development."*

Building the Knowledge Society was the second major report published by the Information Society Commission. Similar in structure to *New Connections* (see above), this document lays out broad parameters for future government policy with respect to development of the Information Society. The report contains detailed recommendations with respect to (i) broadband, (ii) enterprise development, (iii) eGovernment, (iv) legal and regulatory issues, (v) eInclusion and (vi) Northern Ireland Cooperation.

The report welcomes the initiatives undertaken by the Irish Government, but calls for a more strategic and coordinated approach to policy-making in terms of inclusive Information Society development, as well as a stronger focus on evaluating the outcomes of existing initiatives. However, the document does not provide any new insights into the extent of the digital divide, nor does it address the question of how targets should be set for enhancing eInclusion.

3.2 A New Conjuncture

The present study could not have come at a more opportune time. The two main initiatives to address eInclusion undertaken by the Government in recent years have come to an end, and fundamental decisions must now be made regarding future nation-wide interventions. Equalskills, a pilot initiative in the Munster and Shannon regions supported by the Irish Government, came to an end in June 2002. The programme is still active, to the extent that ECDL, the main delivery agent for Equalskills, has decided to make the course materials available throughout the country. CAIT 1 concluded in December 2002, and was replaced by CAIT 2. However, all available funding for CAIT 2 was exhausted by mid-2003 and no new projects can join the programme.

Independent evaluations of the CAIT 1[2] and Equalskills[3] initiatives have just been completed, allowing us to draw conclusions in relation to the most appropriate structure of future initiatives aimed at narrowing the digital divide. We are also in a position to draw on recent publications dealing with the digital divide in Ireland, notably a study by the Dublin Chamber of Commerce[4], the evaluation report on the Dublin Inner-City Schools Computerisation Project[5] and a recent study on eInclusion, commissioned by the Information Society Commission[6].

Another factor that favours the delivery of a community-based ICT initiative is the recent consolidation of all such initiatives under a single government department, the Department of Community, Rural and Gaeltacht Affairs (DCRG). We believe that the co-operation of County Development Boards, Local Authorities, Area-based Partnerships and regional educational establishments, under the leadership of a single Government Department, is crucial to achieving a measurable impact on the digital divide.

Finally, we should be aware that a window of opportunity exists at the current time with respect to the funding of a decisive eInclusion initiative. Although we are writing at a time of increasing fiscal constraints, additional funds are likely to be made available to the DCRG in the near future as a result of the release of funds from dormant bank accounts by the Exchequer. A consensus appears to be emerging that these funds should be allocated to community development projects and that a new eInclusion initiative might provide a suitable vehicle for investing some of the available funds in a highly targeted and effective manner. In this context, it is only appropriate that this study should engage with the policy-making agenda by showing how the digital divide can be measured and monitored, by exploring the key factors underlying this divide and by indicating in broad terms how a new programme could go about tackling this new source of inequality within Irish society.

---

[2] Duggan, C. and Dunne, K. (2003) *Final Evaluation of the CAIT Initiative*
[3] Warren, P. *et al* (2002) *Ex-Post Evaluation of the Equalskills Initiative*
[4] Dublin Chamber of Commerce (2001) *Dublin as a World Class e-City*
[5] Dublin Institute of Technology (2001) *Final Evaluation Report to the DISC Project*
[6] O'Donnell, S. *et al* (2003) *eInclusion – Expanding the Information Society in Ireland,* (forthcoming).

4 Methodological Considerations

This study breaks new ground by operationalising a broad definition of 'access' to information and communication technologies and by providing an in-depth analysis of how the neighbourhood context and the attributes of individuals and households contribute to unequal technology uptake. In Chapter 7 we present the results of the first Irish study to provide empirical evidence of the existence of neighbourhood effects in relation to a specific form of social disadvantage. Whilst the statistical analysis of contextual effects is now well-established in the international research literature, this has not had any appreciable influence within Ireland. By explicitly conceptualising and measuring neighbourhood effects on the uptake of ICTs, our study provides an additional rationale for treating area/community-based interventions as an important dimension of government-led responses to the digital divide.

4.1 Measuring Technology Uptake

In its publication *IT Access for All*, the Information Society Commission suggested that merely providing physical access to computers does not automatically translate into the inclusion of previously-excluded groups within the Information Society (p. 7). The broadest definition of access, in the view of the ISC, should include the following aspects:

- ***Awareness*** – the gap between superficial awareness of new technology and a real understanding of the opportunities that it offers.
- ***Physical Access*** – referring to both the ability to purchase equipment and to pay charges associated with using services such as the internet.
- ***Usability and User-friendliness*** of hardware and software.
- ***Ability to Use*** – the availability of tuition or guidance.
- ***Reliability of the Technology*** – the availability of technical support

Since this report was published, the public debate has largely been dominated by the issue of fast internet connectivity (broadband), and the question of the price at which this service will become available. This is an important issue, both in the overall context of the development of a competitive knowledge society and in terms of the equitable provision of the infrastructure underlying this development, and we will discuss these issues in detail in Section 4.3.

However, despite its importance to the development of a knowledge-based society in Ireland, the availability of broadband is – at least at the current point in time – of secondary importance as far as the *measurement* of the digital divide is concerned. As our study shows, fewer than 2 per cent of households in Dublin have a fast internet connection, a negligible percentage in the context of current levels of computer use (47%) and internet use (43%) amongst the adult population in Dublin. eInclusion is therefore linked primarily with the ability to use new technologies to achieve specific results, such as making use of online services, acquiring information, expanding one's knowledge, manipulating data, text and graphics and gaining access to specific forms of employment. It is with this in mind that we have developed the following conceptual distinctions for the measurement of the digital divide:

1. ***Ownership (Computers/Internet in Household)***
   The presence of a computer in a private household and its connection to the Internet are the most common measures of ICT uptake. These are frequently used in cross-national studies to assess progress towards the Information Society in different countries. As far as the digital divide is concerned, however, these measures may not be the most useful or the most meaningful, as we will show later.

2. Awareness

Awareness of digital technologies can only be measured by asking people how familiar they are with various technologies. For the purposes of this study, we asked a sample of respondents to rate their familiarity with thirteen different technology products, using a five-point scale; *(i) never heard of it, (ii) heard the name only, (iii) have a vague idea, (iv) fairly familiar, (v) very familiar*. Our measure of awareness is based on the last two response categories.

3. Use

Our identification of computer and internet users is based on the average number of hours per week that people use computers or internet (at home, work or elsewhere) and on the kinds of tasks that they carry out using computers or the internet. We asked about 14 different uses of computers and internet, including work, emailing friends and relatives, studying, getting information on news and current affairs and so on. The response categories were as follows: *(i) never, (ii) rarely, (iii) sometimes, (iv) often*. Our measure of computer use is based on the last two response categories alone.

4. ***Proficiency***

An accurate measure of proficiency would obviously require direct observation of an individual's computer skills. As this exceeds the scope of a large household survey, we decided to collect data on perceived proficiency (for example, by asking respondents whether they can deal with most or all of the difficulties that they encounter when using computers and whether they would describe themselves as skilled computer users) and on the number of computer packages that they use. We inquired about how often people use eight different types of computer software (e.g. Word Processing, Databases etc.), again utilising a four-point response scale: *(i) never, (ii) rarely, (iii) sometimes, (iv) often*. Only respondents who use three or more packages 'sometimes' or 'often' are considered 'proficient' computer users, and this is one of the measures that we will use to estimate the extent of the digital divide in Dublin.

5. ***Confidence***

Our final measure addresses how confident people feel in relation to computers. It is based on responses to nine attitudinal questions, including 'Just hearing the word 'computer' makes me feel… (confident/insecure)' and 'Seeing computers appear in more and more places makes me feel… (comfortable/nervous)'. Respondents were asked to indicate their feelings on a seven-point response scale, and only those who indicated a high level of confidence (i.e. a score of 1 or 2 out of 7) were classified as 'confident'.

As will be evident from the above examples, the study makes intensive use of multi-item questions and response scales. Rather than relying in the interviews on a single question or on yes/no responses, studies have shown that indicators derived from a set of questions covering multiple items provide a much more accurate and robust estimate of individual attributes and opinions. This is because random variations associated with the wording of specific questions cancel out when responses are aggregated across several items. Furthermore, the use of scaled responses makes inter-temporal comparisons more sensitive, and even relatively subtle changes in familiarity or competence, for example, can be registered. These design issues are crucial in the collection of reliable baseline data for benchmarking purposes.

4.2 Conceptualising the Influence of Individual and Community Attributes

Populations commonly exhibit a complex structure with multiple levels: students are clustered within classrooms, patients are assigned to clinics and children grow up within families and local communities. Until relatively recently, the most common approaches to the analysis of hierarchically-organised data involved either disaggregating data to the individual level (student, patient, family member) or aggregating it to the higher level (classroom, school, clinic, household, neighbourhood or community). The difficulty with disaggregation and aggregation is that they are far from optimal approaches and do not permit us to analyse the actual structure of the data. To overcome these difficulties, multilevel models are being applied in a growing number of social science research areas, including educational and organisational research, epidemiology, voting behaviour, sociology, and geography.

By using a statistical model that is articulated at several levels, it is possible to make more powerful inferences and to gain a better substantive understanding of how real-world phenomena are determined. By working simultaneously at the individual and contextual levels (in the case of this study, the neighbourhood/community), these statistical models begin to reflect the realities of social organisation. By providing estimates of both the average effect of a variable over a number of settings and the extent to which that effect varies according to the local context, these models provide a much more sophisticated picture of the relationship between a set of explanatory variables, on the one hand, and a set of outcome variables, on the other. The higher-level effects are commonly referred to as ‘neighbourhood effects’, as they identify contextual influences on individual outcomes. We will use this term in its generic sense throughout the rest of this report.

In an interesting recent study that utilises multilevel modelling in relation to computing skills, Kaplan (2002) reports that the latter are a function of student-level and school-level characteristics, and that approximately 15 per cent of the variation in ICT skills can be accounted for by differences among schools. The results of this research have been judged promising enough to make multilevel modelling the main methodological tool for a major forthcoming OECD study of ICT skills. We believe that by expanding on this approach, the present study is at the methodological forefront of the study of ICT uptake at the international level, as well as making a considerable contribution to Irish debates.

4.2.1 Individual Attributes

At the individual level, our concern in analysing the digital divide is to identify how social, economic and demographic characteristics affect engagement with ICTs. In Chapter 6, we will use the following individual-level dimensions in order to characterise each respondent: (i) social class, (ii) income, (iii) gender, (iv) age, (v) economic status, and (vi) education. Additional variables are included in the statistical models presented in Chapter 7.

4.2.2 Exploratory Analysis and Statistical Models

In Chapter 6 we will limit ourselves to an individual-level analysis of the digital divide, with the aim of identifying the key dimensions of differentiation in relation to computer ownership and use. In Chapter 7, we will provide the results of a series of statistical models that bring together all of the different influences, at the individual and neighbourhood levels, and enable us to explore their combined effect.

4.3 The Digital Divide

The extent to which people from disadvantaged social, economic or cultural backgrounds or communities are excluded from participation in the Information Society depends on a large number of factors. There is widespread agreement amongst stakeholders and policy-makers that, if left to market forces alone, the uneven development of information and communication technologies would be likely to exacerbate existing social and economic inequalities. As a consequence, there is increasing recognition of the role of Government in ensuring that all sections of society can benefit equally from the opportunities generated by ICTs.

The OECD’s *Information Technology Outlook* study notes that the growth in demand for internet connectivity has been driven by a combination of faster connection speeds, improved reliability and service, easier technical use and declining access costs. Dial-up telephone modems remain the most popular mode of household access, used in two-thirds of all homes in OECD member states, although more advanced forms of delivery are gradually becoming more accessible, including cable, DSL, ISDN and wireless technologies. The popular distribution of powerful but relatively cheap units also facilitates new ways of accessing the Internet.

The Government Action Plan *New Connections* provides a comprehensive overview of the possible role of Government in ensuring eInclusion. The most important considerations are (i) issues surrounding the roll-out of telecommunications infrastructure, (ii) the encouragement of lifelong-learning through the educational system, (iii) the facilitation of 'late adopters' of ICTs and (iv) the development of relevant content, notably in the context of eGovernment and the presence of the community and voluntary sectors on the internet. As noted above, recent debates in the national media have been dominated by discussions about the roll-out of broadband and the price at which fast internet access may become available to the consumer. However, the relationship between this process, on the one hand, and the evolution of the digital divide, on the other, remains unclear, as we will show in the next section.

4.3.1 Evidence from Abroad

One approach to tackling the digital divide relies on the notion that the provision of popular content (e.g. entertainment, films, music) via broadband will increase the attractiveness of this service and create a mass market for fast internet. This, argue the proponents of this view, will lead to a fall in prices and an increase in the attractiveness of ICTs, as was the case for the diffusion of the television during the 1950s and 1960s. The role of the state should therefore be confined to (i) the provision of the initial infrastructure and (ii) the regulation of service provision to ensure that rural and disadvantaged urban areas are not excluded, just as telecommunications regulation offset the cost of rural phone connections in an earlier period. For example, Robert Wright argues that internet companies will compete to connect the public with a speed and efficiency that no government programme can match, even in disadvantaged neighbourhoods, once there is mass demand for this service. The 'broadband thesis' is therefore optimistic, implying that the social profile of the online community in affluent post-industrial societies will gradually broaden over time, like the early audience for radio and television broadcasts, until eventually it comes to mirror society as a whole.[7]

It is important to realise, however, that parallels with the early history of the television break down very quickly, as the internet not only involves a two-way flow of information, but also relies on a very problematic interface that requires considerable formal and informal training. Thus, even if broadband becomes more affordable in the near future, the issue of the digital divide will remain – the key question is how effectively and to what end people use the new technologies. But the size of the Irish market and the geographical dispersion of the population – even within the Dublin region – means that the development of a comprehensive network of fibre optic cables is unlikely without massive state investment. Even in much larger, more densely-populated European cities this process has been highly uneven.

It is therefore important to consider the more pessimistic approach – 'diffusion theory' – developed by Everett Rogers[8]. Drawing on case studies of the impact of technological innovations, ranging from the invention of stirrups and gunpowder to the telegraph, railways and the steam engine in the 19th century, as well as airplanes, automobiles and telephones in the 20th century, Rogers argues that early adopters of new innovations are characteristically drawn from groups with higher socio-economic status. Education, literacy, and social status provide access to the essential financial and information resources required to adapt flexibly to innovative technologies. Moreover, diffusion theory suggests that the adoption of successful new technologies often reinforces economic advantage. The existing social structure also plays a role; innovations in highly-stratified societies typically reinforce existing socio-economic disparities. The nature of the technology concerned can also influence this process, including the initial resources required for access, both financial and educational. Diffusion theory predicts that, without successful state intervention, and if the spread of the

7 See, for example, David Resnick (1998) 'Politics on the Internet: The Normalization of Cyberspace', in *The Politics of Cyberspace*. Ed. Chris Toulouse and Timothy W. Luke. NY: Routledge

8 Everett M. Rogers (1995) *Diffusion of Innovations*. 4th edition. New York: Free Press

Internet follows the trajectories established by previous technologies, the adoption of computer technology and internet can be expected to exacerbate existing social divisions, at least in the early-to-middle stages of the S-shaped diffusion curve, and perhaps also in the longer-term if the new technology produces substantial productivity gains and is characterised by enduring access barriers.

The existing evidence gives some support to both the ‘optimistic’ and the ‘pessimistic’ theses, although the more pessimistic ‘diffusion thesis’ seems to hold most water. As far as the optimistic approach is concerned, David Birdsell and his colleagues have shown, by analysing Harris national surveys from 1995 to 1998, that as the proportion of U.S. users surged from 14 per cent to 58 per cent of the population, the social profile of the online community broadened.[9] Once heavily overbalanced by male users, the Web is now accessed by men and women almost equally. And once predominantly white, the Web population now reflects America much more accurately than when the technology was in its infancy. Along similar lines, the 1998 Pew Research Center study reports greater diversification in the American online community[10]. A Stanford Institute study[11] suggests that racial differences in online access in America have become less important today than income differentials, conclusions echoed by the Forrester Report.[12]

But the 1999 report *Falling through the Net* emphasises that the digital divide between those with access to new technologies and those without (in terms of racial, educational and income inequalities) widened in the US during the mid- to late-1990s, not narrowed. The aforementioned study, commissioned by the Department of Commerce, concludes that ethnic differences in the virtual world cannot be accounted for solely by levels of affluence, since in their adoption of home computers and links to the Web, African-Americans lag substantially behind White Americans within every income category: *"A White, two-parent household earning less than $35,000 is nearly three times as likely to have Internet access as a comparable Black household and nearly four times as likely to have Internet access as Hispanic households in the same income category"*. Anthony Wilhelm confirms that racial and ethnic differences in computer usage have not disappeared, and his analysis of the 1994 US Current Population Survey data reveals that these differences persist even after controlling for education and household income.[13] A detailed study of trends in computer ownership and Internet use by Hoffman and Novak also concludes that the overall gap between whites and African Americans increased during the mid to late-1990s.[14] Moreover, it remains uncertain whether the ‘normalisation’ of African-American participation in the online population will eventually occur even if use of the Web eventually reaches 80-90% of all Americans, since there are still racial disparities in access to far more basic and longer-established technologies, such as household telephones.

Census data from the US also confirm the resilience of the digital divide: whilst home ownership of PCs quadrupled between 1984 and 1997, this period saw growing disparities in ownership rates according to household income, race and education. An OECD study, drawing on data from France, Japan and the United States, confirms the substantial disparities that exist in the availability of personal computers in the home at different levels of household income, and reveals that the size of the gap between the lowest and highest income groups *widened* between 1995 and 1998.[15] The main reason for this is that economic resources, including personal or household income, influence the ability to afford home computers and modems, related software, and monthly service provider, telephone or

9 David Birdsell, Douglas Muzio, David Krane and Amy Cottreau (1998) 'Web Users are Looking more Like America'. *The Public Perspective*. 9(3):33)
10 Pew Research Center (1998) *The Internet News Audience Goes Ordinary*
11 Norman Nie and Lutz Erbring (2000) *Internet and Society: A Preliminary Report*. Stanford Institute for the Quantitative Study of Society. February 17. Stanford University, CA
12 Ekaterina O. Walsh (2000) *The Truth about the Digital Divide*. The Forrester Report. Forrester Research Inc.
13 Anthony G. Wilhelm (2000) *Democracy in the Digital Age*. New York: Routledge
14 Donna L. Hoffman and Thomas P. Novak (1999) 'The Evolution of the Digital Divide: Examining the Relationship of Race to Internet Access and Usage over Time'. Paper presented at the conference Understanding the Digital Economy: Data, Tools and Research http://elabweb.com
15 OECD (2000) *Information Technology Outlook*. Paris: OECD

broadband cable connection charges. Telephone costs can be substantial, typically outweighing the initial investment in computer hardware within a few years.

Pippa Norris (2001) provides relevant information on the changing nature of the digital divide in Europe, drawing on Eurobarometer data from the period between 1996 and 1999.[16] She notes that the income gap in internet users across Europe is substantial: on average, the richest European households are three times more likely to be online than the poorest. There is a consistent and significant association between household income and levels of Internet access in all EU countries, with the sole exception of Greece. Moreover, across Europe the relative size of the gap between rich and poor remained roughly constant from spring 1996 to spring 1999. During these years, the EU Internet population grew at a rate of roughly 10 per cent per annum, but this did not lead to a generalised diminution in the digital divide. In fact, the comparison of societies that are 'leaders' and 'laggards' in the information age gives no support to the claim that income differentials necessarily diminish as Internet use widens throughout the population; if anything the reverse seems to be the case. Despite relatively widespread use of the Internet in Britain, for example, the most affluent households are five times more likely to be online than the poorest.

The variations in computer and internet use observed in European countries suggest that many factors within each nation influence the digital divide, such as state initiatives to make internet terminals available through community centres, unemployment offices and schools, as well as the financial cost of hardware, software and internet access. But the differential between rich and poor families evident in countries like Britain, Luxembourg and Denmark mean that, at least for the foreseeable future, we should not expect the income gap to close automatically as internet access becomes more widespread. Norris also compares the results of statistical models for the 1996 and 1999 data, and concludes that, far from equalizing, the digital divide in Europe expanded during these years; the inequalities of access by income, education, occupational status and age became stronger and only the gender gap weakened.

4.3.2 Bridging the Gap

These findings are not particularly surprising, particularly if we take into account the social divide that exists in relation to other technologies. Internet use is significantly associated with access to all forms of communication technologies, including VCRs and cable TV. In fact, individuals living in affluent households that possess many different consumer durables designed for traditional forms of home entertainment and communication are also more likely to access networked computers. Research has shown that ownership of personal computers is related to all sorts of other common household gadgets from deep-fat fryers to video cameras and clock radios (Norris, 2001). There are obviously exceptions to this, including less affluent students, poorly-paid service professionals and clerical workers, who work and study in environments where the Internet is easily available, even if they lack home access.

Nevertheless, the association between computers and other consumer durables implies that broad and deep-rooted patterns of social stratification constitute the major explanation for patterns of internet diffusion. Norris concludes: *"In Europe, as in the United States, the sweeping tide of the Internet has left behind many poorer households, manual workers, the less educated, the elderly and women. Yet there is nothing distinctive about these social and regional inequalities in the virtual world, which also characterize access to the information society delivered via old media technologies like cable or satellite TV, VCRs and fax machines. We may be less concerned about the implications of lack of access to cable TV or VCRs than lack of access to the Internet, but this insight has important implications for policy initiatives designed to overcome the social barriers to digital access".*

Norris suggests that providing training in keyboard skills and improving internet access in schools is helpful, but unlikely to have anything more than a limited effect given the deep-rooted socio-economic barriers to access. In fact, Norris is pessimistic about 'quick-fix'

[16] Pippa Norris (2001) *Digital Divide. Civic Engagement, Information Poverty & the Internet Worldwide*, New York: Cambridge University Press

solutions like wiring classrooms for internet and providing access in poor neighbourhoods*: "the heart of the problem lies in broader patterns of social stratification that shape not just access to the virtual world, but also full participation in other common forms of information and communication technologies"*.

In part, we concur with this view: in order to reduce the effects of social stratification on the digital divide, it is necessary to tackle broader forms of social inequality. The effects of interventions which aim to provide access to and/or training in the use of ICT in isolation will have a limited impact unless they are embedded in a wider strategy for combating social exclusion. On the other hand, the digital divide is rather different from other forms of social exclusion, and the provision of training programmes and computer centres in disadvantaged areas undoubtedly influence rates of internet use in these areas, as Norris herself acknowledges. Furthermore, the existence of substantial age cohort effects (c.f. Chapter 6) suggests that, at least in principle, social inequalities do not constitute insurmountable barriers to the wider use of digital technologies. Moreover, these age cohort effects suggest that it is contact with, and formal training in the use of digital technologies that has the greatest influence on the acquisition of computer and internet competence.

We may therefore conclude that equality in access to new information technologies, as well as the targeted provision of computer centres and training programmes in disadvantaged areas, are key instruments in minimising the threat of a growing digital divide. As the international evidence suggests, if the principle of equity is not central to the provision of broadband services, the digital divide may increase rather than decrease. But even in a 'best case scenario', the development of fast internet is unlikely, on its own, to reduce the digital divide.

5 The Data

The complex nature of the analysis carried out for this study, and the requirement that the results provide reliable benchmarks for future comparison, obviously placed considerable demands on the data collection process. In the previous section, we mentioned our use of multi-item questions to achieve robust constructs, as well as the use of response scales to generate sensitive measures capable of detecting subtle changes over time. In this section, we will describe how the household and school surveys were designed and discuss the reliability of the resulting databases.

5.1 The Household Survey

5.1.1 Sample Design

One of the major aims of this study is to identify the main individual, family and neighbourhood characteristics that influence the uptake of information and communication technologies. The most important aspect of the study design is therefore its ‘nested’ or two-stage approach to sampling, which is necessary in order to differentiate both *within* and *between* neighbourhoods. For this reason, a stratified two-stage cluster sample was collected, based on a random sample of 40 neighbourhoods and a sample of 30 households within each of these neighbourhoods, for a total of 1,200 households.

The sampling frame for the study was provided by the INCA database (Irish National Classification of Addresses), which contains more than 1.4 million residential address codes from the Geodirectory developed by An Post. These addresses are grouped into roughly 21,000 ‘neighbourhoods’, of which 6,390 fall within the four Local Authority areas in Dublin. The only restriction imposed during sampling was a uniform geographical coverage of the four Local Authority areas, and to this end we stratified by Local Authority area and District Electoral Division (DED).

Table 5.1: Number of Neighbourhoods by Local Authority Area

	Population in 2002		Neighbourhoods in Sample Frame		Neighbourhoods in Sample	
Local Authority Area	Number (000)	%	Number	%	Number	%
Dublin City Council	495	44.1	3,029	47.4	19	47.5
Dublin Fingal	196	17.5	1,024	16.0	7	17.5
South Dublin	240	21.4	1,207	18.9	7	17.5
Dun Laoghaire-Rathdown	191	17.0	1,130	17.7	7	17.5
Total	1,123	100	6,390	100	40	100

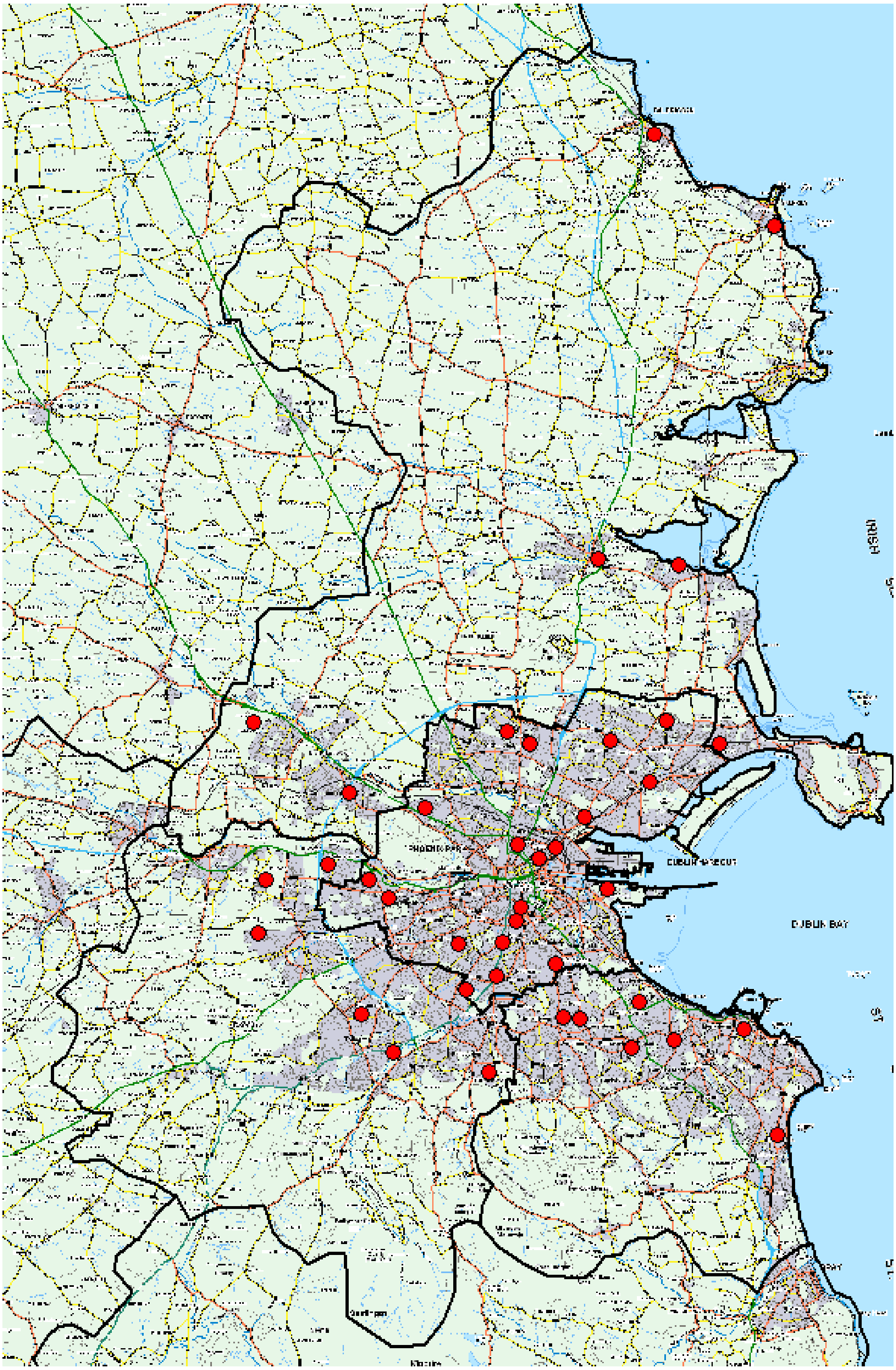
The sample distribution of neighbourhoods across Local Authority Areas in the Greater Dublin Area accurately matches the overall distribution of INCA codes, and closely reflects the distribution of households and individuals between the different Local Authority areas.

Each INCA ‘neighbourhood’ has at least 20 residential delivery points (i.e. households). As 30 households were to be interviewed in each neighbourhood, it was deemed that a minimum of 50 addresses would be needed in each cluster to allow for non-response. Thus, where an INCA area contained less than 50 households, the next adjoining area was included. Table 5.2 shows the distribution of the resulting sample of neighbourhoods by Local Authority Area. Figure 5.1 below shows the actual location of the neighbourhoods within the Greater Dublin Area.

Table 5.2: Selected Neighbourhoods by Local Authority Area

INCA_ID	INCA_ID2	DED Name	Partnership Area	Households in Neighbourhood	Households Interviewed
		South Dublin			
3011013		Edmondstown		58	30
3006048	3006049	Clondalkin - Dunawley	Clondalkin	64	30
3015048	3015049	Lucan - Esker	Clondalkin	105	30
3020016	3020017	Palmerstown West	Clondalkin	64	29
3042009		Templeogue - Kimmage	Crumlin/Kimmage/W'town	93	29
3028003	3028004	Tallaght - Avonbeg	Tallaght	76	29
3036001	3036002	Tallaght - Kingswood	Tallaght	97	26
		Dublin Fingal			
4003014		Balbriggan Urban		100	30
4016002		Castleknock - Knockmaroon		52	29
4023004	4023005	Holmpatrick		96	30
4030021	4030022	Malahide West		128	26
4040003	4040004	Swords - Village		61	30
4009094	4009095	B'town - Blakestown	Blanchardstown	75	30
4035022	4035023	Sutton	Northside	157	30
		Dun Laoghaire-Rathdown			
5009002	5009003	Blackrock - Carysfort	Dun Laoghaire	91	30
5017012		Blackrock - Williamstown	Dun Laoghaire	104	30
5031006	5031007	Clonskeagh - Windy Arbour	Dun Laoghaire	242	29
5041016	5041017	Dundrum - Taney	Dun Laoghaire	96	29
5052013	5052014	DL - West Central	Dun Laoghaire	47	30
5058015	5058016	Killiney North	Dun Laoghaire	77	28
5066006		Stillorgan - Merville	Dun Laoghaire	63	29
		Dublin City			
35130001	35130002	Rathmines West E		64	30
35161003		Rathmines East B		119	30
35202001		Rathmines West A		60	30
35358002	35358003	Ashtown A		70	28
35468006		Clontarf West C		56	29
35520002		Clontarf East A		108	30
35046006		Drumfinn	Ballyfermot	94	30
35073001		Decies	Ballyfermot	82	30
35019002		Ballymun D	Ballymun	139	31
35413002		Ballymun C	Ballymun	56	30
35101004		Kimmage B	Crumlin/Kimmage/W'town	54	30
35237002	35237003	Woodquay B	Dublin Inner City	71	28
35268006	35268007	Pembroke East A	Dublin Inner City	108	30
35301003		St. Kevin's	Dublin Inner City	99	28
35331001		Inns Quay B	Dublin Inner City	92	30
35384002		Rotunda A	Dublin Inner City	134	30
35545001		Ballybough A	Dublin Inner City	106	28
35442005	35442006	Kilmore D	Northside	60	27
35496001	35496002	Grange A	Northside	78	30
		Total		**3,596**	**1,172**

Figure 5.1 Location of Neighbourhoods



As can bee seen from Table 5.2, the 40 neighbourhoods comprise almost exactly 3,600 households; i.e. three households for every household to be interviewed. The survey design thus placed the interviewers under considerable pressure to contact the pre-selected households. Only where no contact could be made after several repeat visits were interviewers allowed to substitute a different household for the sampled address. This procedure was applied in a rigorous fashion, as the authors believe that quota surveys can often lead to subtle forms of bias. In contrast, we believe that aiming consistently for a truly random sample leads to more accurate estimates of ICT uptake. We will return later to this point when comparing our results with those of other studies.

Finally, it should be mentioned that the interviewers were asked to leave additional interview schedules with the households, to be filled out either by a second adult/partner or a child over 15 years of age. The reason for this is that the questionnaire contains a number of items dealing, for example, with proficiency and confidence in the use of computers, that cannot be answered by proxy. Therefore, all interview schedules had to be completed by an individual respondent. Secondly, as at least some of the interviews took place during the daytime, we expected that interviewers would be more likely to make contact with a household member not employed outside the home, and would therefore be more likely to encounter female rather than male interviewees.

5.1.2 Re-weighting the Data

In total, 1,340 valid interview schedules were completed, covering 1,172 households. Reweighting techniques are often used to ensure that samples of data reflect known population characteristics, and this can be useful where data collection processes are not truly random. To determine whether this was necessary in the present case, we began by examining the gender distribution of our respondents. Women account for 717 (or 53.5%) of respondents, whilst 623 respondents (46.5%) are male; the corresponding figures for the adult population of the four Local Authority Areas are 51.6 per cent and 48.4 per cent respectively, based on the 2002 Census of Population. To approximate the known population characteristics by a margin of just two percentage points is highly satisfactory, and this provides an initial indication of the quality of the data that we collected for this study. In order to correct for this small discrepancy, all observations were re-weighted in order to reproduce the gender ratio in the Local Authority Areas.

A careful analysis of the distribution of the sample by social class, age group, economic status and educational attainments revealed that no further re-weighting was required, as the sample quite accurately mirrors the known population characteristics in relation to all of these dimensions. A comprehensive comparison between the social and economic characteristics of the sample population and (with the except of household income) the 2002 Census of Population is provided in Appendix 1.

5.2 The School Survey

The main reason for carrying out a school survey was that, as existing research has shown, the school environment constitutes by far the strongest influence on younger age cohorts. The authors therefore believe that it would be amiss to assess the influence of individual, family and neighbourhood characteristics on ICT uptake without also inquiring about the role of schools in this respect.

Initial inspection of the location of the second-level schools that serve the 40 selected neighbourhoods shows that each area can be linked with two or three local schools, thus necessitating the collection of information from about 100 schools. As there are only 187 second-level schools in the four Local Authority Areas, it was decided to include all schools in the survey, thus providing comprehensive coverage of the Greater Dublin Area.

A postal questionnaire containing detailed questions about ICT facilities and teaching methods was sent to the Principal of all 187 second-level schools, requesting that they either complete this themselves or pass it on to a relevant teacher, particularly where there was a special post of responsibility in the IT area. In total, 121 schools (65%) provided the information that we sought. Table 5.3 shows the number of schools that responded to the survey in each Local Authority Area. Response rates were evenly distributed across the four areas, as well as between different types of school. We are thus in a position to provide a comprehensive overview of teaching facilities and instruction methods in relation to ICT in second-level schools in Dublin.

Table 5.3: Participating Schools by Local Authority Area

	Second-Level Schools		Respondents		Response Rate
Local Authority Area	**Number**	**%**	**Number**	**%**	**%**
Dublin City Council	89	47.6	58	47.9	65.2
Dublin Fingal	26	13.9	17	14.0	65.4
South Dublin	35	18.7	22	18.2	62.9
Dun Laoghaire-Rathdown	37	19.8	24	19.8	64.9
Total	**187**	**100**	**121**	**100**	**64.7**

6 The Digital Divide

This chapter presents some of the main findings of the household survey. We will begin by looking at the extent to which the availability of a computer and internet access in the home depend upon social class, income, gender, age, economic status and level of education. We will then broaden our measures of uptake in line with the concepts outlined by the Information Society Commission in *IT Access for All*. The additional dimensions that we will consider are awareness and use of computers and internet, as well as proficiency and confidence. The data presented in graphical form in this chapter are reported in numeric form in Appendix 2.

6.1 Access of Households to Technology Products

By far the most frequent measure of ICT uptake is the proportion of households with a computer or with internet access. This is the principal variable used to compare uptake in different countries, as successive EU surveys, the Nielsen Ratings and MRBI polls illustrate.

From the outset, it is important to state that we have doubts about the relevance of this measure, particularly when applied to the study of *within*-country disparities in uptake, i.e. the digital divide. Firstly, ownership of, or access to a given technology says nothing about the benefits that accrue to the individual as a result. As far as the digital divide is concerned, it has been suggested that people from disadvantaged backgrounds may be less inclined to use new technologies – particularly computers – and that this, in turn, may reproduce and even exacerbate existing forms of social exclusion. But the mere presence of a computer within a given household does not address the most important issue, which involves the use of computers and other technologies *as a means to achieve a given end*, and not merely as a consumption item. This raises questions about the uses to which computers are put and the ability of individual household members to use them effectively.

Secondly, the fact that certain applications of computer technology – such as mobile phones, teletext televisions and so on – are rapidly approaching universal ownership means that they are of little use in identifying differentials in relation to social exclusion. In cross-national comparisons, the usefulness of this measure derives primarily from the fact that some countries have very low ICT uptake rates, whilst others approach saturation. However, the higher the level of uptake, the less useful the measure becomes for the measurement of the digital divide within a given country.

The third caveat that we would like to draw attention to is that household access to computers and the internet does not imply that all members of a household actually use them, or know how to use them, and provides no insights into what they are being used for. The Information Society Commission points to the importance of age, gender and level of education in relation to the digital divide; but these effects are confounded by household measures of ownership and access.

Bearing this in mind, we will nevertheless begin by using household ownership of computers and access to the internet in order to position the present study within the context of previous research on the digital divide in Ireland and in order to facilitate future comparisons. Although it may not be the most appropriate index of unequal uptake, this variable is nevertheless of considerable interest.

Figure 6.1 Proportion of Households with Computers, Internet Access, ISDN and Broadband by Social Class

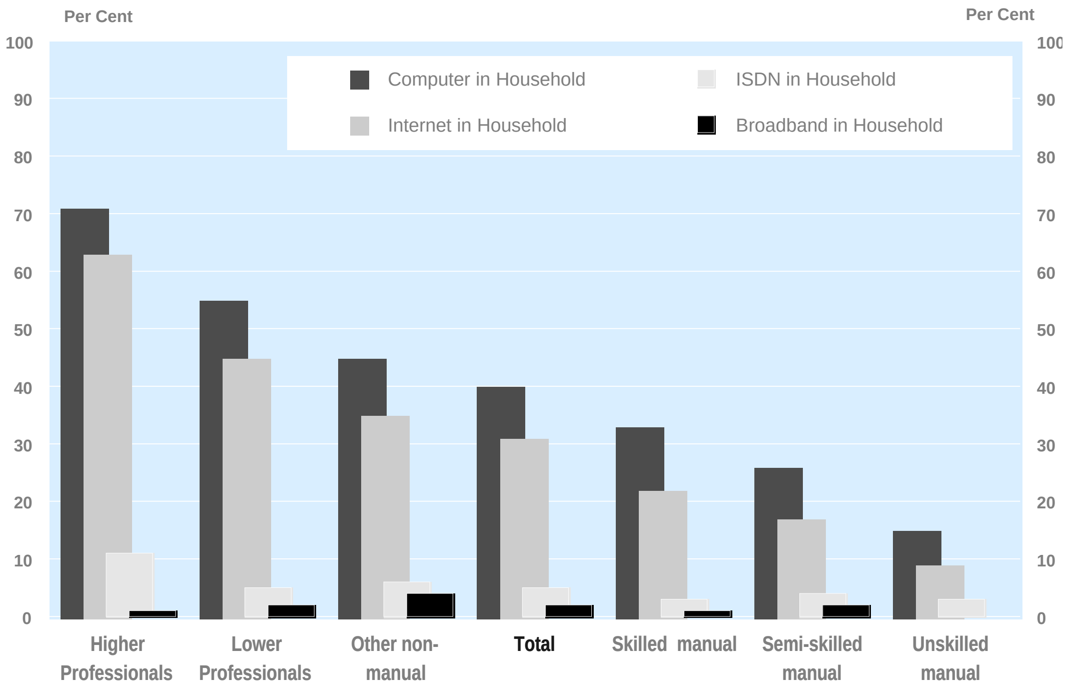


Figure 6.1 above illustrates the disparities in ownership of computers and home internet access by household social class. The latter variable is derived from the occupation and work role of the respondent[17], and is divided, in accordance with the conventions of the Central Statistics Office (CSO), into the following categories: (1) Higher Professional: higher managerial occupations and business proprietors; (2) Lower Professional: lower managerial occupations and small proprietors; (3) Other Non-Manual workers; (4) Skilled Manual workers (5) Semi-Skilled Manual workers; and (6) Unskilled Manual workers. As the study was limited to the four Dublin counties only, and all of the forty neighbourhoods were urban in character, the coding of households engaged in farming does not apply. Considerable care was taken when recording the occupation of the respondent at the interview stage to ensure that the maximum amount of information was recorded on both the profession and seniority of employees.

Figure 6.1 confirms what we know about social class disparities in home computer and internet access. In overall terms, 40 per cent of households possess a computer, and there are considerable differences between social class categories, ranging from a high of 71 per cent amongst Higher Professionals and reaching a low of 15 per cent amongst those in the Unskilled Manual class. Internet access in private households is marginally below that of computer ownership, but mirrors the gradual decline across the social class spectrum that is observed in relation to computers. In total, 31 per cent of households have access to the internet, the highest rate being observed for Higher Professionals (63%) and the lowest in Unskilled Manual households (9%).

Both ISDN and broadband are comparatively undeveloped: only 5 per cent of households have an ISDN connection and just 2 per cent have broadband. Significantly, and with the exception of ISDN connectivity amongst Higher Professional households, neither ISDN nor ADSL/broadband have, at this level, a significant variation across the social class spectrum.

Comparing our 'headline' results with those reported in other studies, a number of interesting observations can be made. Drawing on the Nielsen NetRatings, *Building the Knowledge*

[17] Social class categorisation is based on the information provided by the individual respondent, except in the case of students, retired people etc., in which case it is derived from the responses of other household members.

Society reports a home internet penetration rate for Ireland of 34 per cent (July 2002), whilst pointing out that this rate had only increased by one percentage point over the course of the preceding year. Broadband penetration is reported at under one per cent in the same publication, based on OCED estimates for June 2001.

It is also possible to draw comparisons with a recent MRBI poll, which was carried out during 2002 for the Commission for Communications Regulation[18]. This poll found that 49 per cent of all Irish households had home access to the internet, rising to 60 per cent in the Dublin region. This is almost twice the rate that we detected, and we must therefore conclude that the MRBI poll greatly exaggerates the availability of internet access in Dublin households. The most likely reason for the large disparity between the results of these two studies, which are separated by little more than one year, is attributable to the data collection process. The MRBI poll was carried out using computer-assisted telephone interviewing (CATI) combined with a survey quota methodology. In the context of research on ICT uptake, we believe that this approach to data collection may have given rise to a strong selection bias, as respondents with little or no experience with computers are more likely to have declined to participate in the telephone interview.

We believe that greater care needs to be taken in future studies with regard to the process of data collection and the sampling methodology employed. The two-stage cluster sample strategy used in the present study, whilst slightly more expensive, is likely to result in much more accurate findings than the more frequent quota sampling approach, particularly when combined with telephone interviewing (CATI).

Figure 6.2 Proportion of Households with Computers and Internet Access by Income

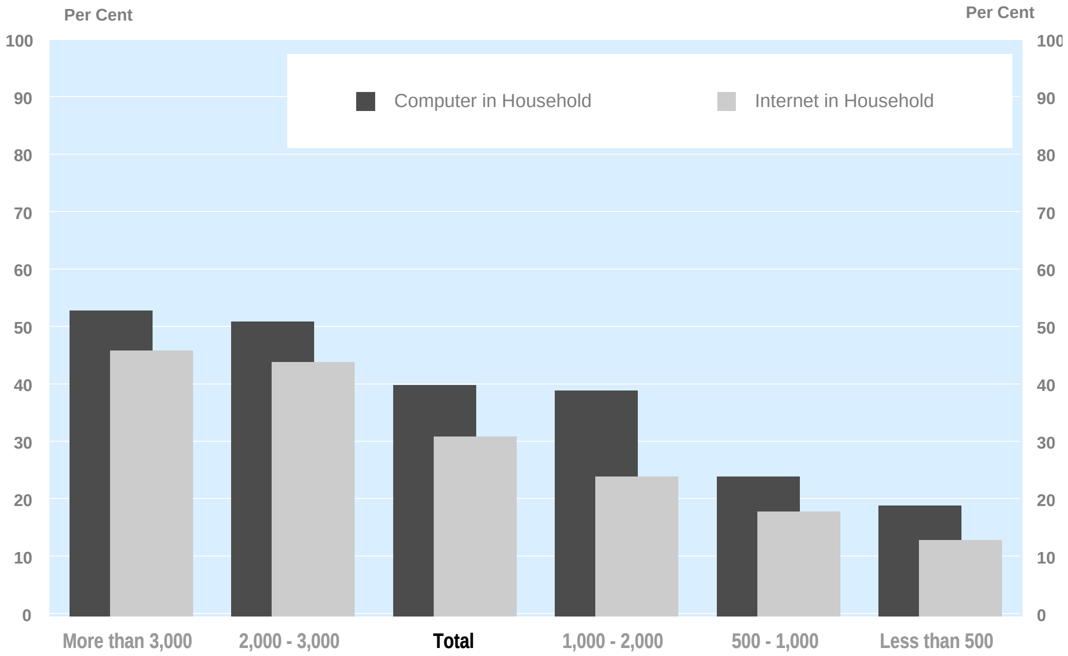


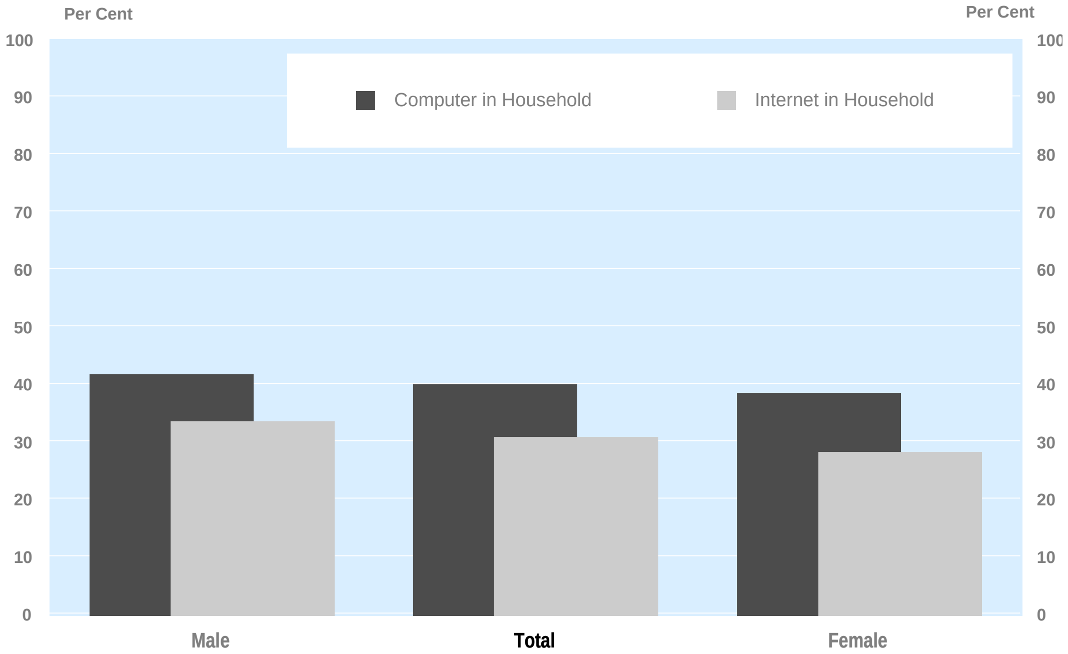
Figure 6.2 above depicts the differentials that we observe in home computer and internet access by household income. Collecting information on income using a household survey is sometimes criticised, as the information gained is thought to be less reliable than that on social class and education. Nevertheless, we decided to include a question that measures net monthly household income using the following categories: (1) More than €4,000 (2) €3,000 - €4,000 (3) €2,000 - €3,000 (4) €1,000 - €2,000 (5) €500 - €1,000 (6) Less than €500. More than 80 per cent of respondents provided an indication of their household income, which suggests that it is quite feasible to collect this information within the context of a household

[18] MRBI (2002) 'Consumer Demand for Broadband in Ireland – Survey Findings'. Paper delivered by Ian McShane, Managing Director, MRBI, at the ODTR National Conference, 2002.

survey. In the remaining 20 per cent, an estimate was calculated based on other individual and household characteristics. As only 5 per cent of respondents indicated a monthly household income in excess of €4,000, the first two categories where combined for the purposes of the subsequent analysis.

Figure 6.2 shows the proportion of households with home computer and internet access across the resulting income categories, and the ability of this variable to differentiate between households in terms of ICT uptake confirms its validity. The picture that emerges reinforces our previous analysis by social class: there is a steady decline in uptake as income decreases. High-income households (i.e. those with a net monthly income of more than €3,000) are roughly three times more likely to have a computer and to have home internet access than households with an income of less than €500.

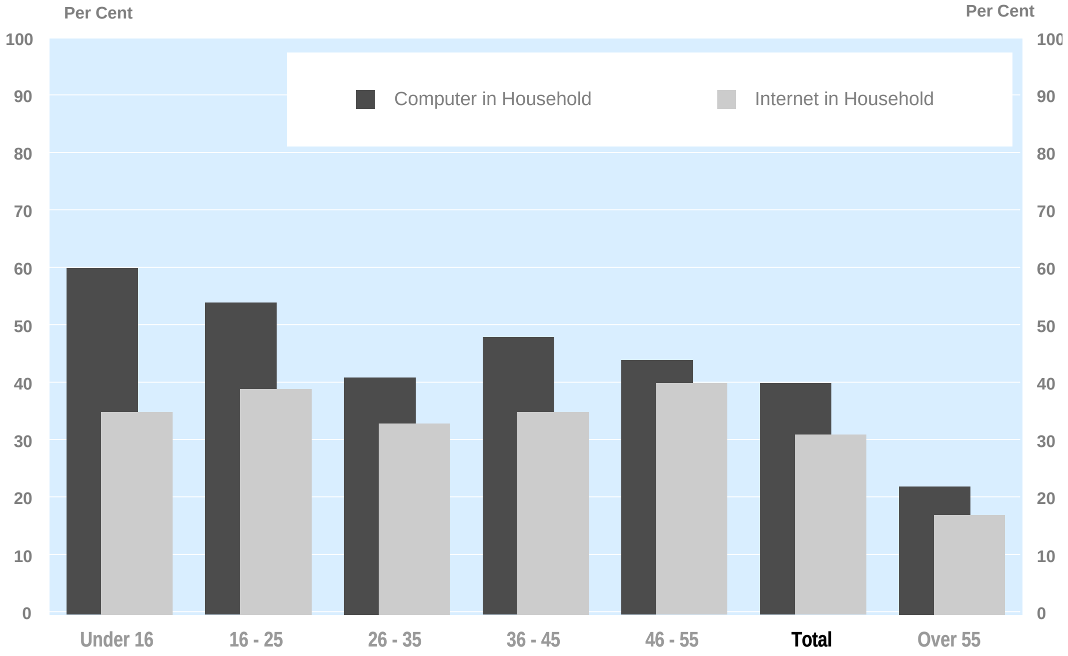
Figure 6.3 Proportion of Households with Computers and Internet Access by Gender



Turning now to gender differences, we find that these are surprisingly small: 41.7 per cent of male respondents and 38.5 per cent of female respondents have access to a computer at home. The differences in home internet access are of a similar order: 33.5 per cent compared with 28.2 per cent. However, great care needs to be taken when interpreting these figures, as they relate exclusively to the availability of computers and do not reflect differences in utilisation, proficiency and confidence with computers.

Analyses based entirely on home access to computers internet can therefore shed little light on the role of gender in relation to the digital divide, as they assume that all household members have equal access to these and are equally proficient in their use.

Figure 6.4 Proportion of Households with Computers and Internet Access by Age



An interesting picture emerges when we look at rates of home computer and internet access by the age of the respondent (Figure 6.4). As one might expect, both computer ownership and internet access decline sharply amongst elderly age cohorts. With respect to the two youngest age cohorts, home access to computers is relatively high, although there is an indication that parents are more restrictive with respect to internet access for children, particularly for those under 16 years of age. Obviously, the fact that computer and internet access rates are high for both young people and those aged between 36 and 55 has to do with a life cycle effect whereby parents may purchase computers primarily for use by their children.

Figure 6.5 Proportion of Households with Computers and Internet Access by Economic Status

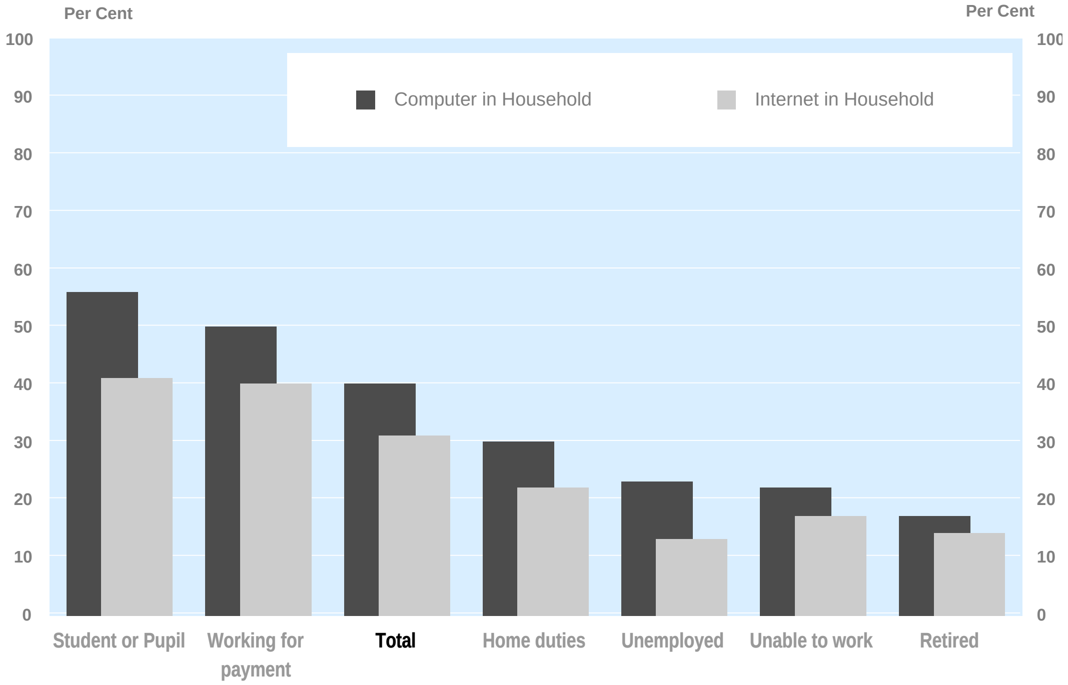
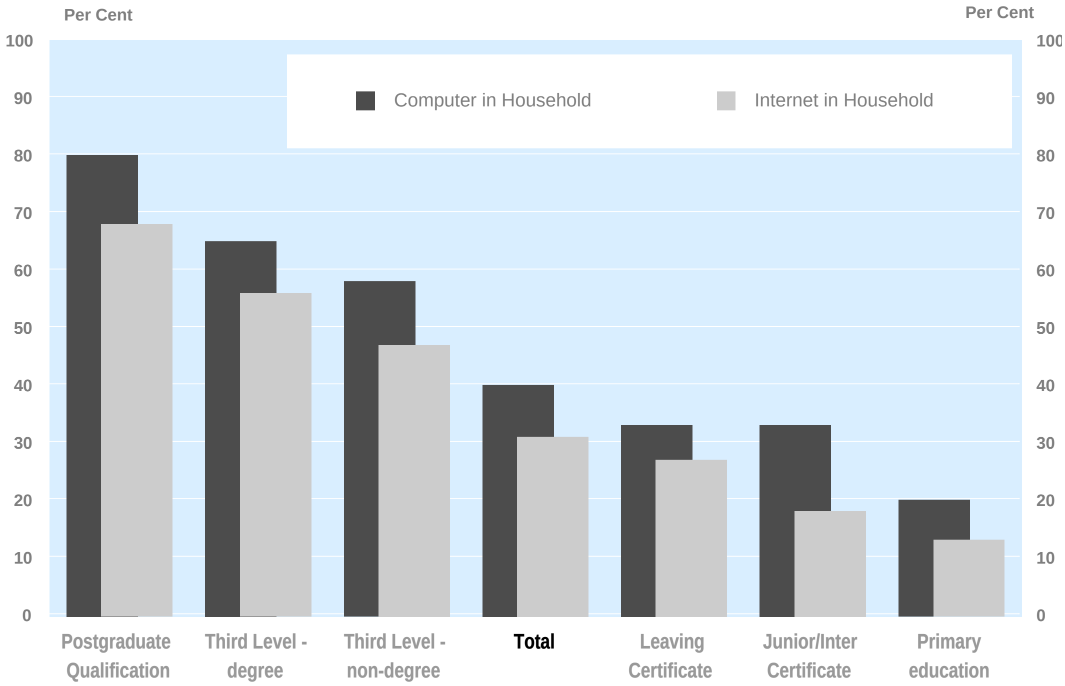


Figure 6.5 provides an overview of the impact of economic status on ICT uptake. Students and school pupils, on the one hand, and those working for payment, on the other, are more likely to have home access to a computer (56% and 50% respectively), whilst all other categories are well below the average of 40 per cent. For example, thirty per cent of respondents engaged in home duties report having a computer at home, and this applies to 23 per cent of those who are unemployed and 22 per cent of those who are unable to work due either to disability or long-term illness. Only 16 per cent of people who have retired have a computer in their home.

Figure 6.6 Proportion of Households with Computers and Internet Access by Education

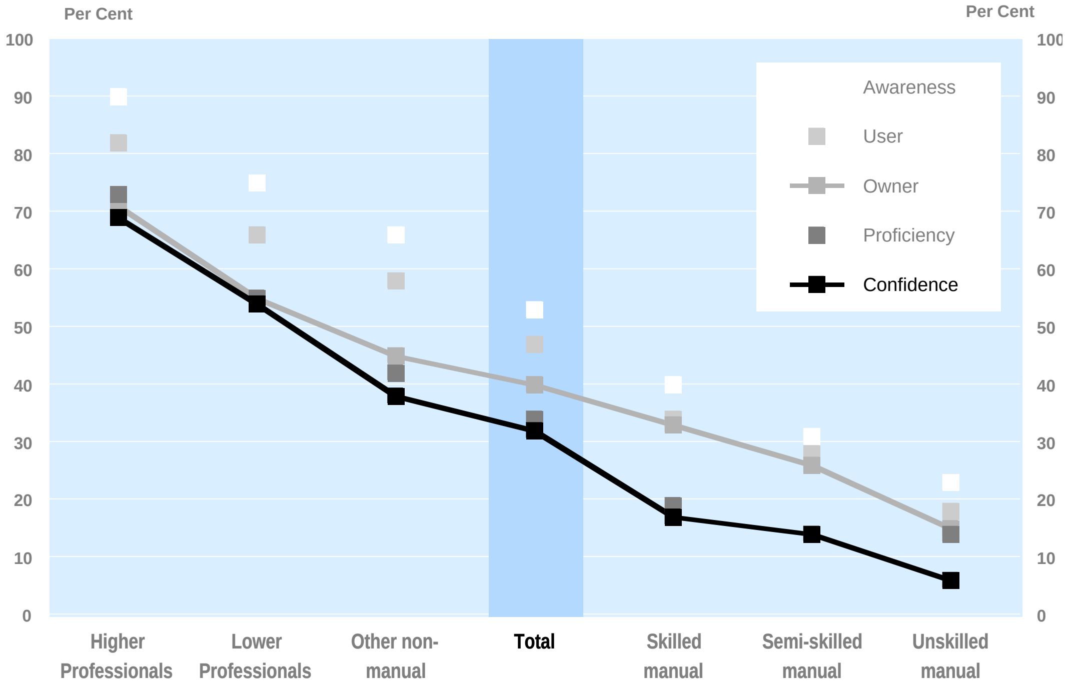


Finally, we address the impact of education on home computer and internet access in Figure 6.6. Unsurprisingly, the picture that emerges is in harmony with our earlier analysis of the influence of social class and income. Home access to a computer is about twice the average rate for individuals with a postgraduate qualification (80% compared to 40%), whilst the rate amongst those with primary education only is about half the average (20% compared to 40%). The corresponding differentials are even greater for internet access: 68 per cent compared to 30 per cent and 12 per cent compared to 30 per cent.

6.2 Awareness, Use, Proficiency and Confidence

As we stressed in the previous section, home computer and internet access are somewhat misleading measures of the digital divide, as they measure the *potential* access of household members rather than their *actual* access. In this section, we will contrast rates of household computer ownership with measures of awareness, use, proficiency and confidence. A precise definition of each of these concepts was provided in Chapter 3. For ease of reference, we will identify home computer access using a grey line and confidence with computers using a black line. The former provides a reference point in relation to the previous section, whilst the latter is a particularly pertinent measure of the digital divide for benchmarking purposes.

Figure 6.7 Computer Awareness, Use, Ownership, Proficiency and Confidence by Social Class



Unsurprisingly, all of our measures – computer awareness, actual use, home computer access, proficiency and confidence in using computers – are highly correlated. When analysed by social class (Figure 6.7), all of the estimates are highest in the Higher Professional Class (ranging between 69% for Confidence and 90% for Awareness) and consistently fall as we descend the social class hierarchy, reaching their lowest point in the Unskilled Manual Class, ranging between 6 per cent for Confidence and 23 per cent for Awareness.

Amongst the three non-manual social classes, the proportion of people who use a computer is higher than the proportion with home ownership; naturally, some people use computers at work, college, school, in a library or an Internet Café, without having access to them at home. In contrast, amongst the three manual classes, use and ownership are more closely aligned.

In the three non-manual classes, levels of proficiency and confidence in the use of computers are broadly similar to those for home computer access. In contrast, amongst the three manual classes, the proportion of people who are confident with computers is much lower than the proportion with access to a computer at home. In fact, only half of people in the manual social classes with access to a computer at home may be said to be confident in relation to computers.

When we look at the data in terms of the likelihood of an individual from a particular class having access to, and actually using a computer, the following picture emerges. A person from the higher professional class is about four times more likely to own and use a computer compared to a person from an unskilled manual background, but is about eleven times more likely to feel confident about computers. This indicates that home computer access may underestimate the overall extent of the digital divide.

Figure 6.8 Awareness, Use, Ownership, Proficiency and Confidence by Income

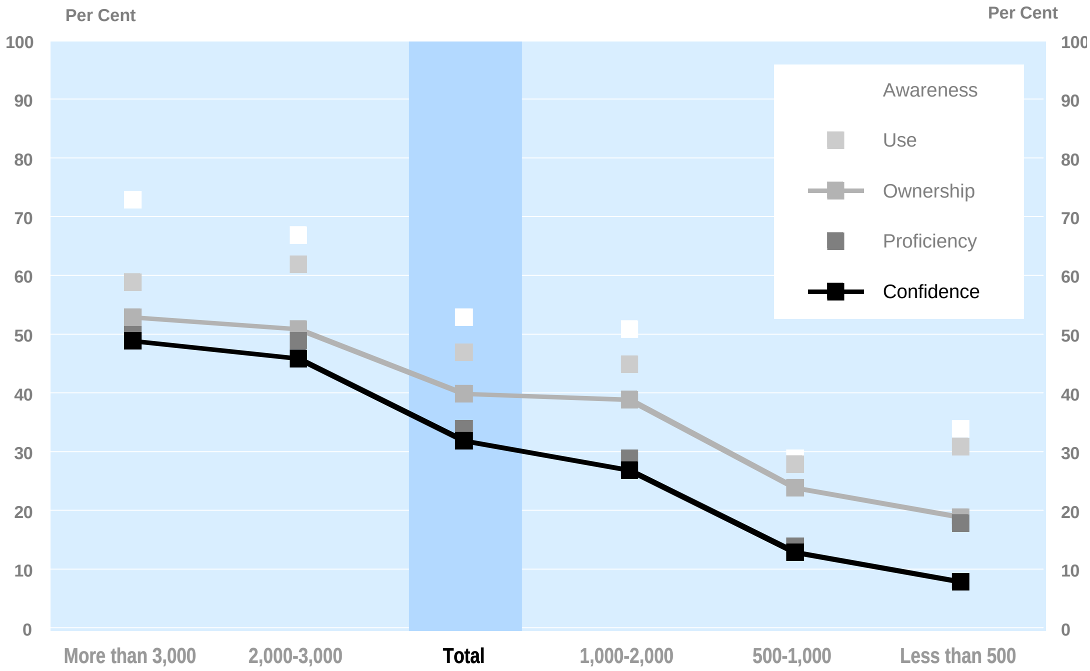
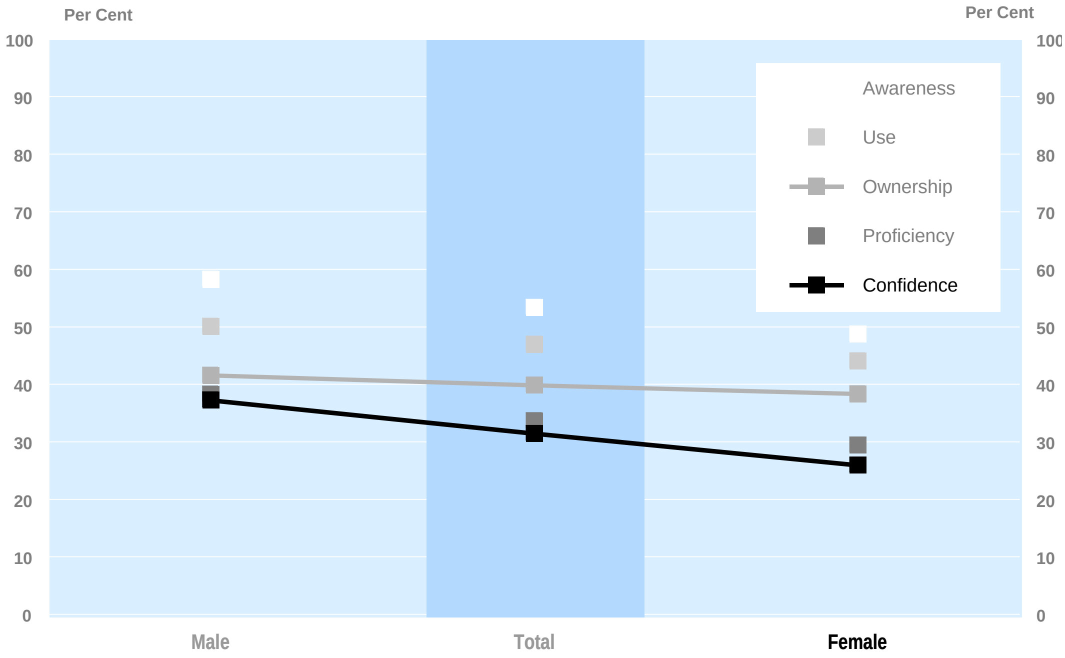


Figure 6.8 repeats the analysis by various income groups, broadly confirming the observations made above in relation to social class. However, it is interesting to note that the group with the lowest incomes has a higher level of computer awareness and use than we might have expected; this may be due to the clustering of students in this category.

Figure 6.9 Awareness, Use, Ownership, Proficiency and Confidence by Gender



We are now in a position to return to the issue of gender differentials in the use of ICTs (Figure 6.9). As we noted earlier, there is only a small difference in home computer access between male and female respondents (see Figure 6.3), and this is because most households contain both women and men. However, as Figure 6.9 clearly demonstrates, the mere availability of a computer tells us little about who actually uses it. In fact, women have a considerably lower level of computer awareness than men (48.9% versus 58.4%), as well as a lower level of usage (44.2% versus 50.2%), proficiency (29.6% versus 38.4%) and confidence (26.1% versus 37.4%). Indeed, home access singularly fails to recognise any of these differences and must therefore be deemed misleading in relation to gender differentials.

Figure 6.10 Awareness, Use, Ownership, Proficiency and Confidence by Age

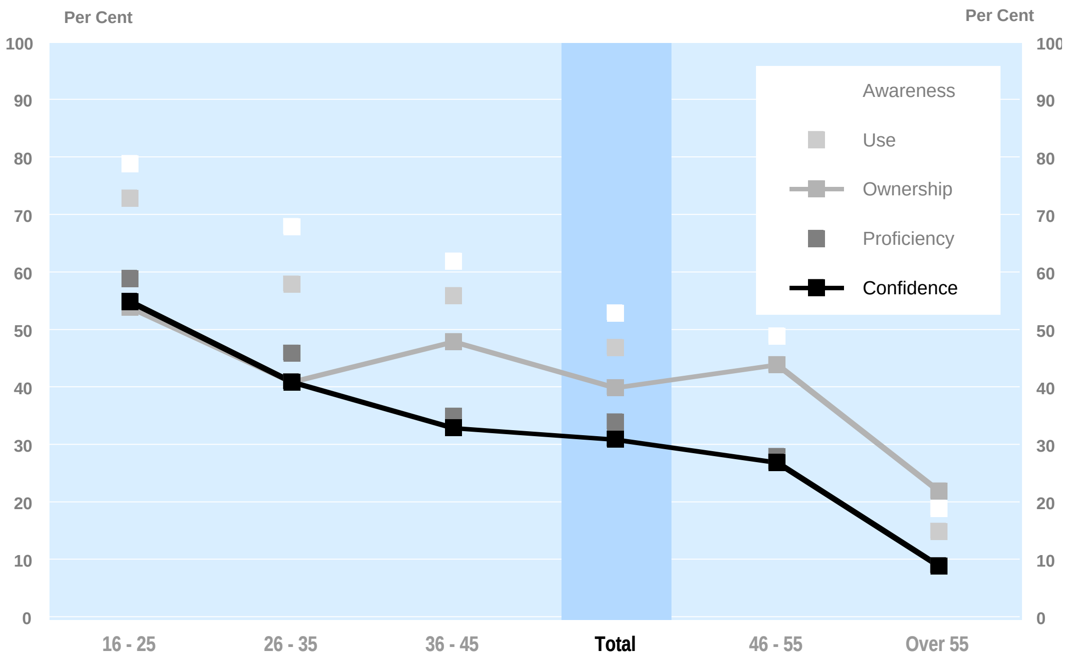
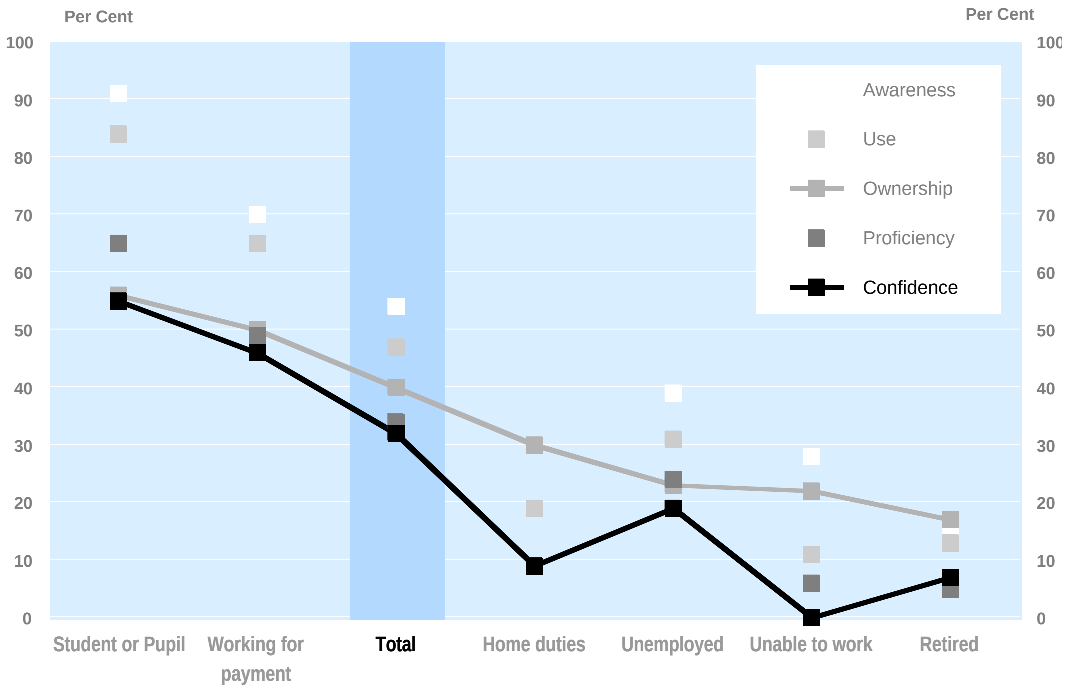


Figure 6.10 shows how our four measures of computer access and use vary by age. Again, this graph reveals how misleading the concept of home computer access can be when taken in isolation. All of the other measures – awareness, use, proficiency and confidence – underline the relevance of age to the digital divide. As we proceed from each age cohort to the next, these four measures consistently decline. Children in the under 16 age group are four times more likely to be 'computer aware' than those aged over 55, six times more likely to actually use a computer, seven times more likely to be proficient and six times more likely to feel confident in relation to computers.

The only measure that departs from this pattern is that of home computer access. As is readily apparent from Figure 6.10, this variable confounds computer use and proficiency, on the one hand, and life cycle effects and purchasing power, on the other. Most people reach their greatest economic well-being between 36 and 55 years of age, and this is also a key period as far as child-rearing is concerned. The higher level of home computer availability in these age cohorts therefore masks the considerable *within-household* variation in computer use, proficiency and confidence.

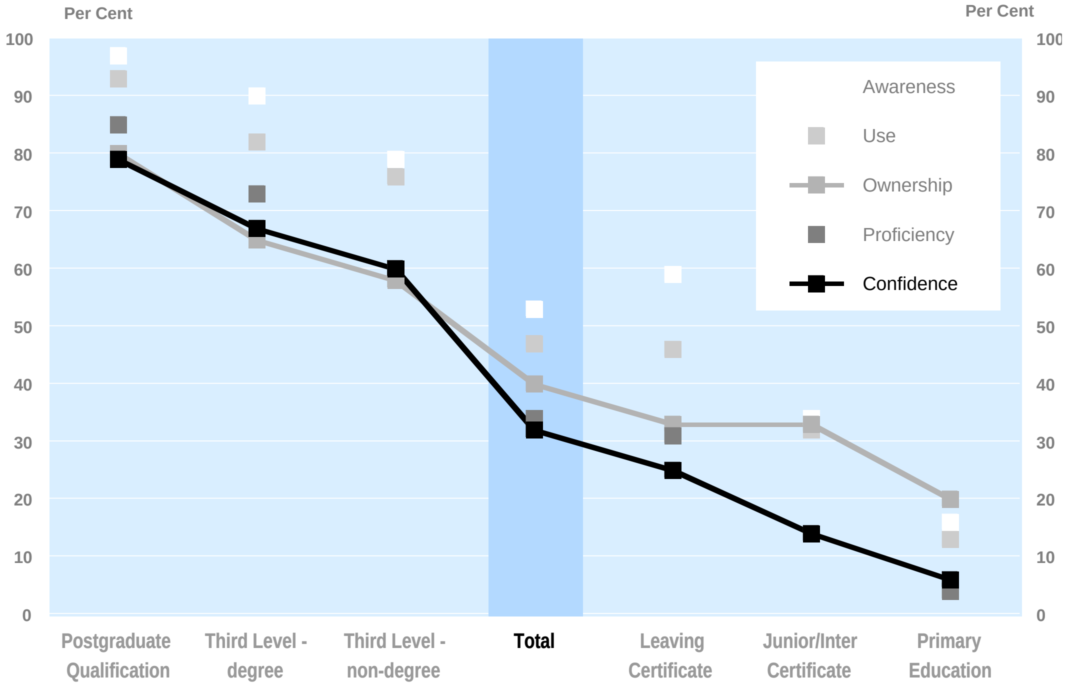
Figure 6.11 Awareness, Use, Ownership, Proficiency and Confidence by Economic Status



Further insights into within-household variations can be gained from Figure 6.11. Firstly, it is apparent that the current generation of students and school pupils engage with computers to a much greater extent than other groups. Secondly, the graph reveals a considerable gap between the physical availability of computers to those engaged full-time in home duties and the actual use that this (predominantly female) group makes of computers. Thirty per cent of those engaged in home duties state that there is a computer in their household, but only two-thirds of these (19% of total) actually use the available computer and only one-third (9% of total) are proficient and confident in its use.

Another important observation relating to Figure 6.11 concerns those who are unable to work. Although this group accounts for only one per cent of our sample, and our estimates should therefore be treated with caution, these may nevertheless be used as a guide to the impact of the digital divide on those who suffer from a long-term illness or disability. As with people engaged in home duties, the computer access variable masks considerable within-household variations. Of those who are unable to work, just over one fifth (22%) have access to a computer at home, compared to an average rate of 40 per cent. However, only one in ten people who are long-term ill or disabled actually use computers, compared to almost half (47%) of the population as a whole. The proficient use of computers amongst the members of this group drops further, to 6 per cent, and not a single person characterised as unable to work felt confident in relation to computers. Information and communication technologies are frequently invoked as having the potential to alleviate some of the debilitating effects of long-term illnesses and disability. However, when we look at the current situation in greater detail, our survey shows an alarmingly low level of ICT utilisation within this group.

Figure 6.12 Awareness, Use, Ownership, Proficiency and Confidence by Education



In our final graph, we look at the role of educational attainments (Figure 6.12). Again, and in line with our analysis of social class and income differentials, the data reveal a vast gap between the various categories. Taken on its own, educational attainments are associated with the sharpest differentiation in ICT uptake. Computer awareness amongst people with postgraduate qualifications is almost universal (97%), compared with less than one-in-six (16%) for those with a primary education only. The corresponding figures for computer use are 93 per cent and 13 per cent respectively, making people with postgraduate qualifications seven times more likely to use a computer regularly than those with a primary education only.

Most revealing, however, are the contrasts that emerge in relation to proficiency and confidence. Only 4 per cent of people with a primary education indicate that they use more than three software packages, and only 6 per cent indicate overall confidence in using a computer. This makes people with postgraduate qualifications twenty times more likely to be proficient computer users and twelve times more likely to feel confident about computers than those in the lowest category for educational attainments. This suggests that the education system plays an important role in empowering people in relation to technology, allaying their anxieties and fears, motivating them to experiment and to learn, as well as playing a direct role in transmitting computer skills.

These figures emphasise the central importance of formal education with respect to the digital divide. As social class and income are both strongly influenced by individual educational achievements, we may conclude that education is the single most important determinant of ICT uptake, computer proficiency and confidence with computers. For this reason, we will return to the role of second-level schools in relation to the digital divide in Chapter 8.

In the remainder of this chapter, we will discuss the additional insights that can be gained from the data collected during our household survey. This will be followed by a more sophisticated statistical analysis of the individual, household and neighbourhood influences on ICT uptake in Chapter 7.

6.3 Further Insights into the Digital Divide

In the first two sections of this chapter, we provided benchmark data based on five different measures of uptake of information and communication technology. In this section, we will report on some of the additional findings of our survey, with the aim of enriching and extending this analysis.

Figure 6.13 Familiarity with Digital Technology Products

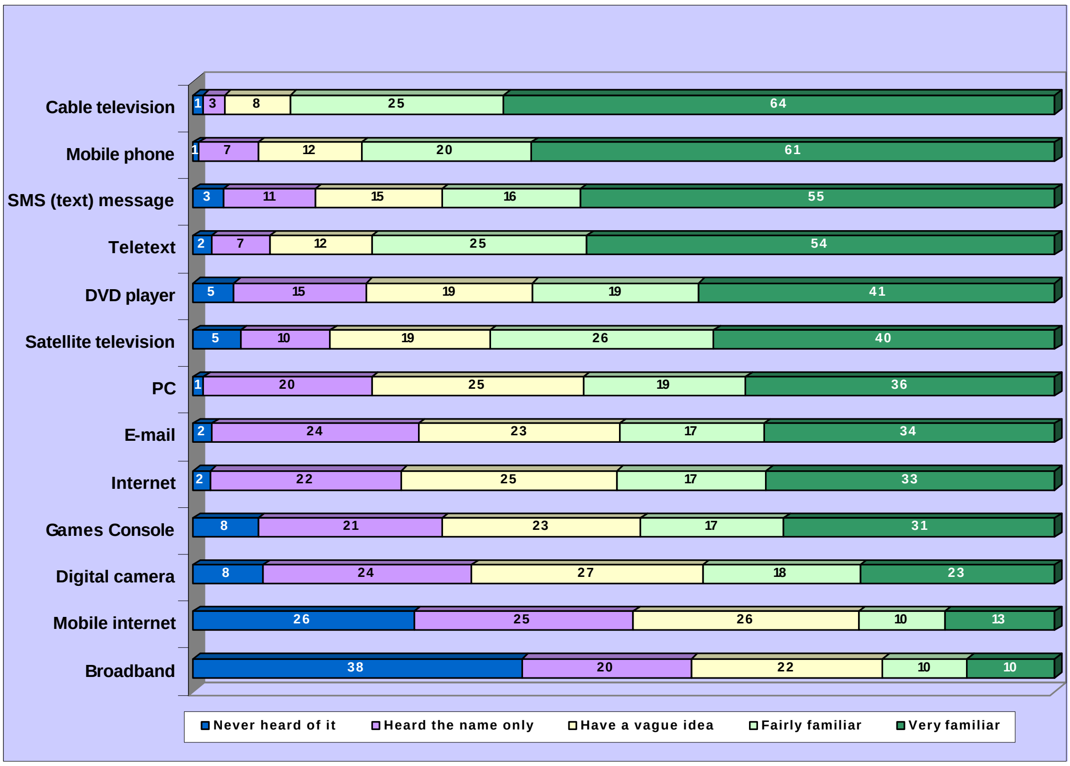


Figure 6.13 above shows the degree of familiarity of our sample with a range of different digital technologies. Just over half (55%) of respondents say that they are fairly or very familiar with PCs, and exactly half say the same about internet and e-mail. Not surprisingly, the most familiar digital technologies are related to television and mobile telephony, where familiarity exceeds 80 per cent.

Figure 6.14 Sources of Learning about Computers

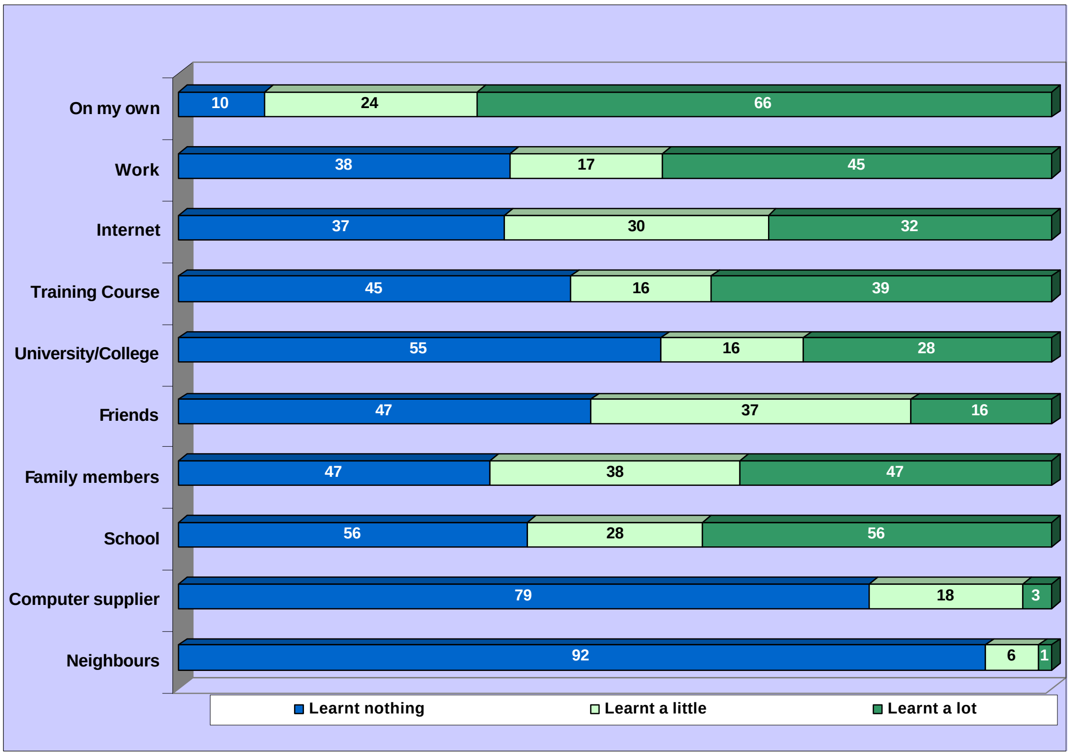


Figure 6.14 illustrates where people state that they have learnt the most about computers, and shows that work, training courses, school/college, family, and to a lesser extent friends all contribute to learning about computers. However, this process is also characterised by a strong element of self-teaching, with no less than 66 per cent of respondents having learnt a lot on their own (compared to just 16% who state that they have learnt a lot from their friends). Interestingly, computer suppliers are seen as making only a minor contribution to the acquisition of computer skills, and this is also true of neighbours.

Figure 6.15 disaggregates the responses to the previous question by age group, focusing on the issue of school-based learning about computers. The age differences in this respect could not be clearer, as 58 per cent of children (under 16 years of age) state that they have learnt a lot at school, compared to 32 per cent amongst those aged 16 to 25, 14 per cent amongst those aged 26 to 35. This percentage drops away rapidly amongst older age cohorts, dropping to just 1 per cent amongst those aged 46 to 55.

Figure 6.16 summarises the purposes for which computers are used, and reveals that the principal activities of computer-users are emailing friends and relatives (50% say that they do this often), completing work tasks (48% frequently use computers for work purposes), recreation (34%) and studying (18%). Only 9 per cent of respondents shop or bank online frequently.

Figure 6.17 reveals the considerable differences that exist in relation to the use of computers at work between the different social class categories. Whilst 74 per cent of higher professionals frequently use computers in their work, this applies to just 16 per cent of people in the skilled manual and 23 per cent of those in the semi-skilled manual class; the number of computer-users in our sample from the unskilled manual class is negligible.

Figure 6.15 Computer Knowledge Acquired Through School

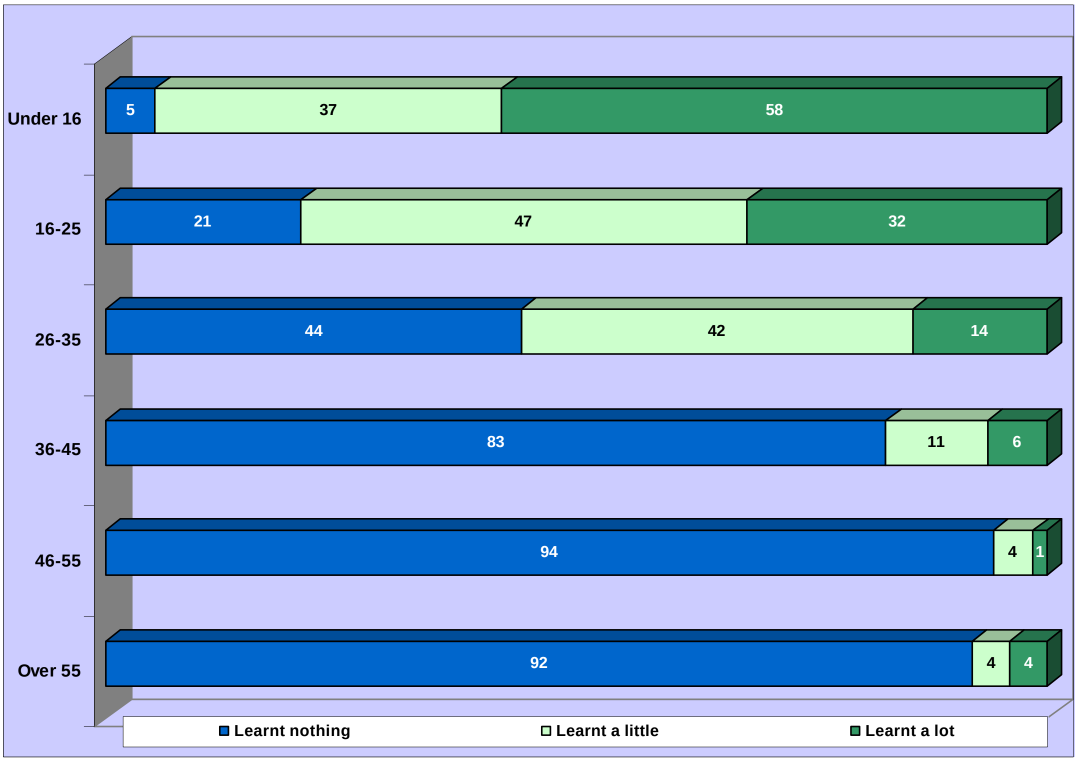


Figure 6.16 Purpose of Computer Use (Computer Users Only)

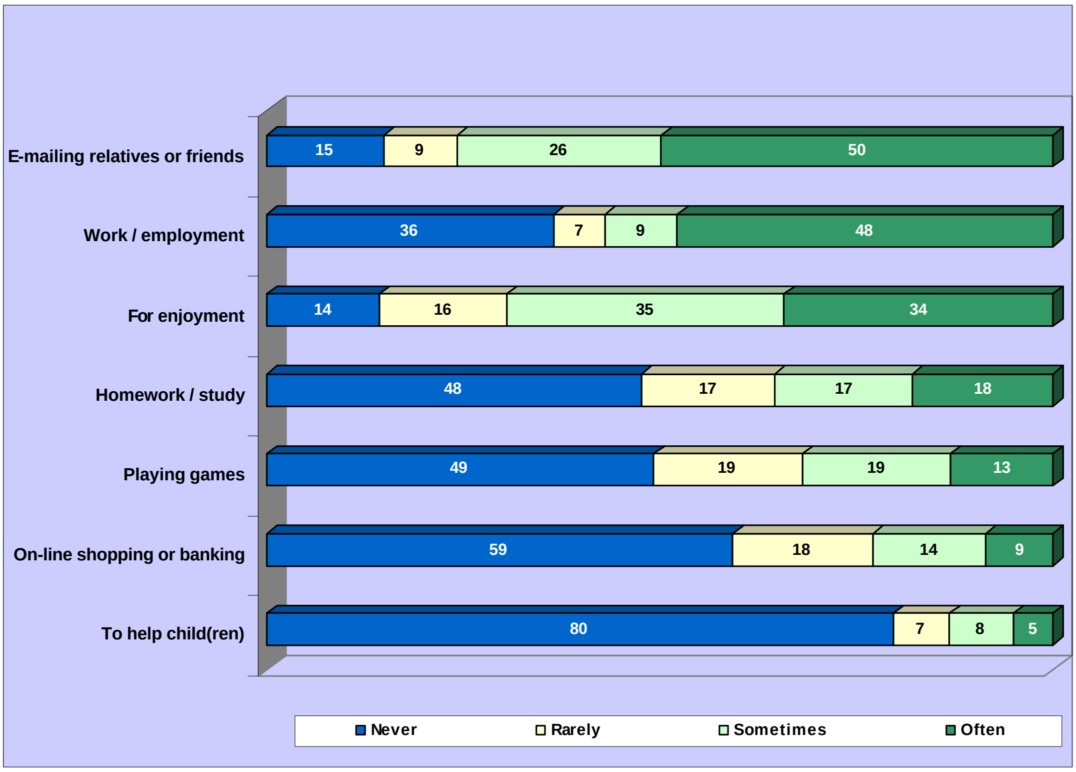


Figure 6.17 Frequency of Computer Use for Work Purposes (At Work Population Only)

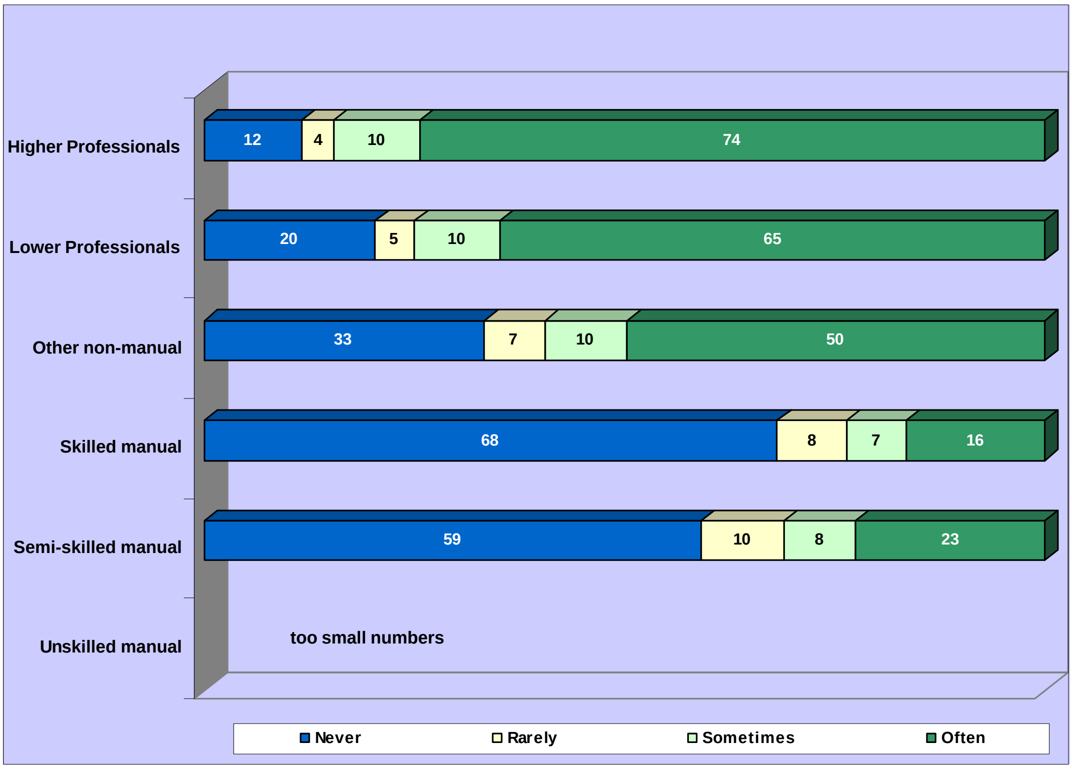


Figure 6.18 Types of Information Sought From Internet (Computer Users Only)

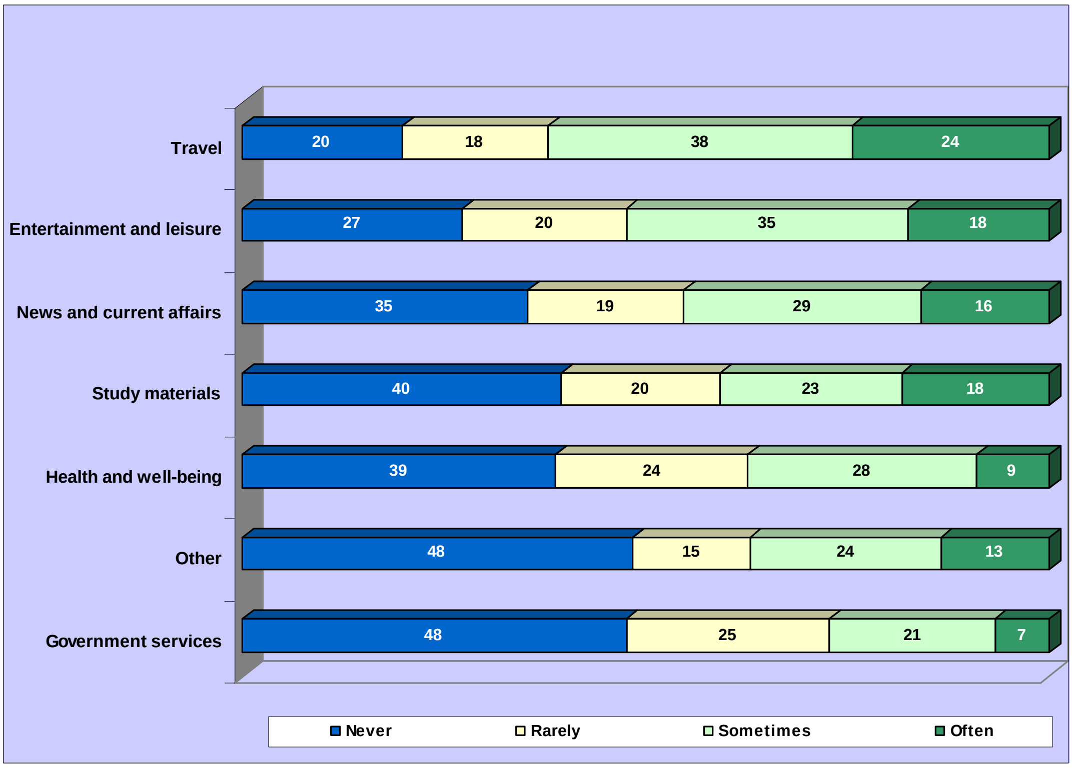
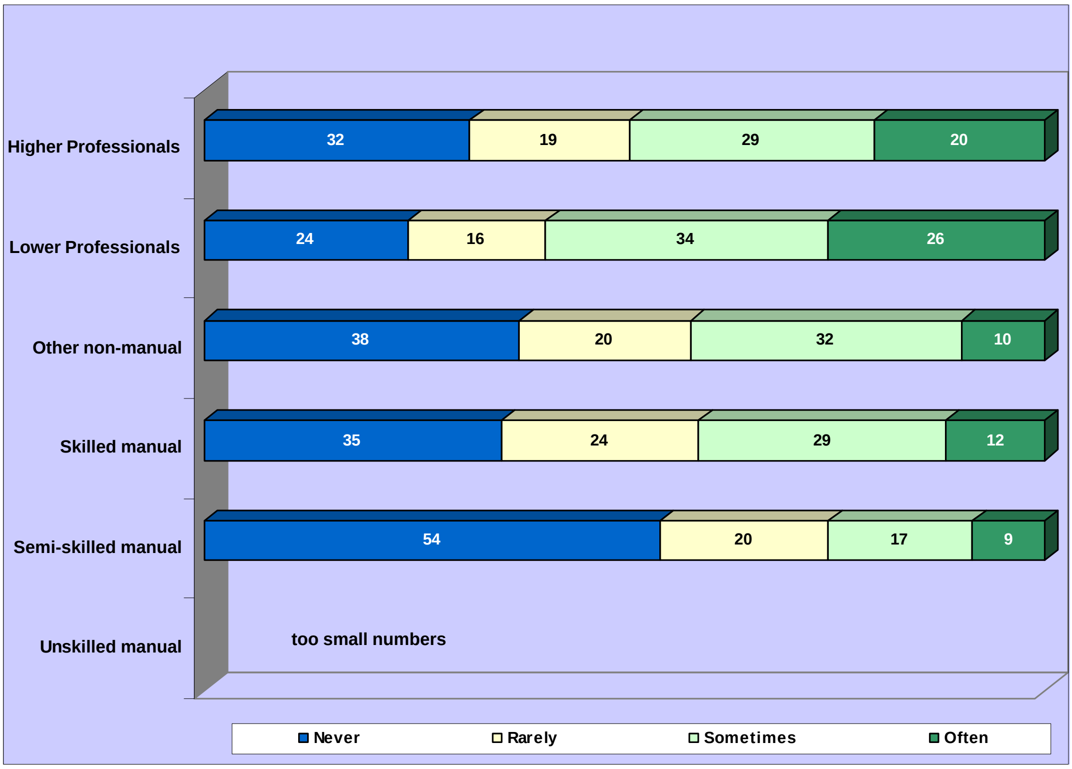


Figure 6.18 above shows the kinds of information that computer users seek from the internet, and confirms that travel and entertainment, followed by news and study purposes, attract somewhat greater interest than health or government services.

Figure 6.19 Use of Internet to Follow News and Current Affairs (Computer Users Only)



Focusing exclusively on news and current affairs (Figure 6.19), we find once again that professionals are much more likely to use the internet to retrieve information on these topics than those from the manual class categories. This pattern becomes even more pronounced in relation to government services (Figure 6.20).

Figure 6.20 Use of Internet to Access Government Services (Computer Users Only)

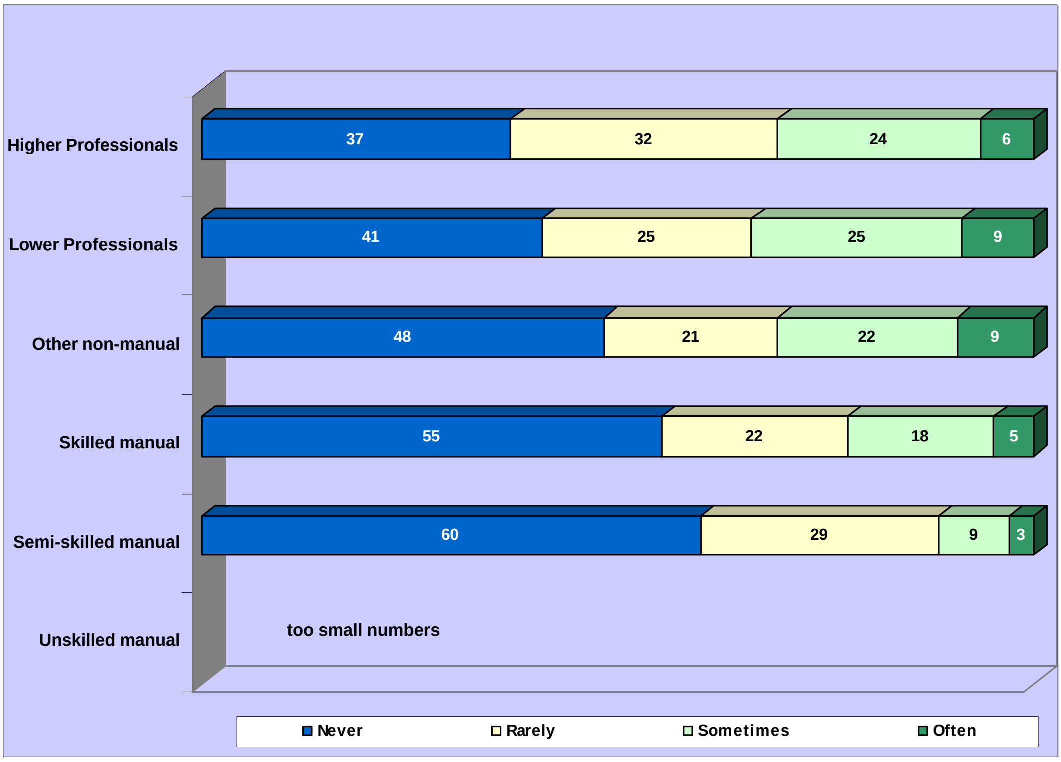
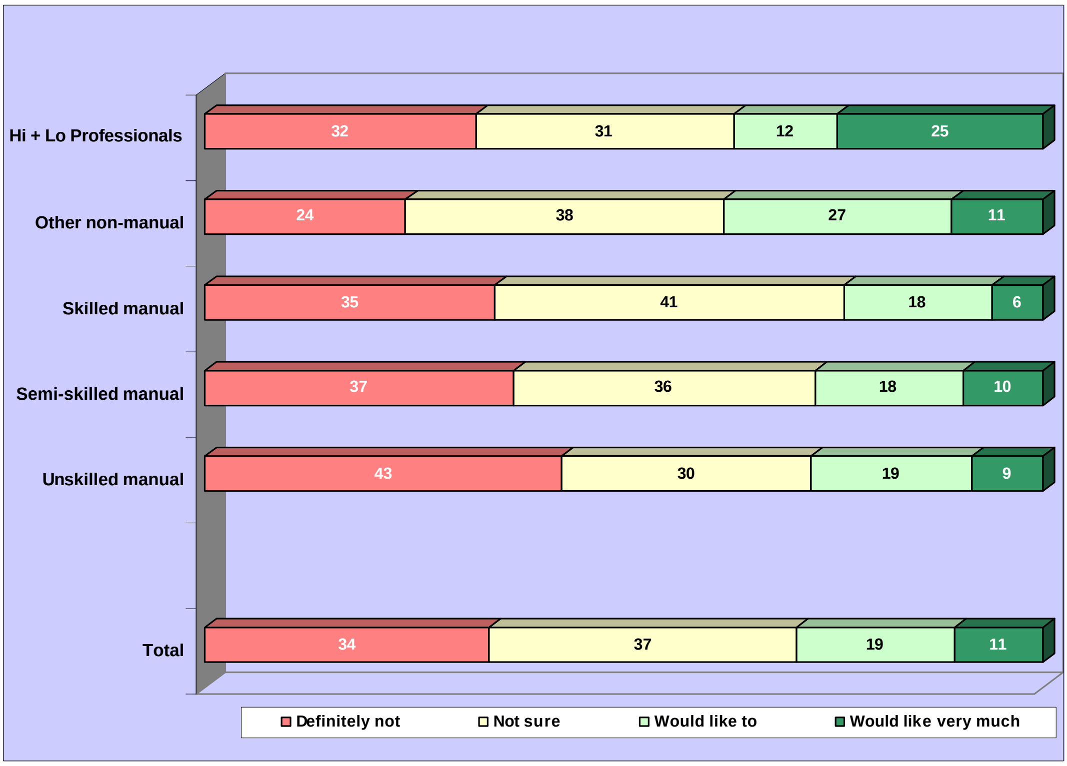


Figure 6.21 Degree of Interest in Using Computers (Non-Users Only)



Finally, Figure 6.21 reports the degree of interest of non-users from the various social class categories in using computers: whereas one quarter (25%) of professionals who do not currently use a computer would 'very much like to' do so, this applies to only about one in ten respondents in the semi-skilled or unskilled manual class categories.

7 Identifying Neighbourhood Effects

In the previous chapter of this report we examined the nature of the digital divide in Dublin from the perspective of social class, education, income and other differentiating variables. In this chapter, we will draw together the various strands of this analysis and provide a comprehensive picture of the determinants of access and use. Our starting point is that acquiring familiarity with computers depends not only on individual attributes, but crucially also on contextual factors. People come into contact with digital technologies via their family and friendship networks as well as at their workplaces, colleges and schools. Informal advice and support are crucial to acquiring basic computing skills, and where neighbours and friends use computers and internet, this can facilitate the process of learning about these technologies.

Neighbourhood effects – that is, the independent influence of the neighbourhood of residence on a given outcome – arise as a result of these kinds of interactions and influences. We hypothesise that neighbourhood effects might accentuate and reinforce the 'digital divide' by encouraging computer literacy in affluent areas and by obstructing it in disadvantaged neighbourhoods. Naturally, individuals are also nested within households, workplaces, schools, universities and so on; each of these social contexts may have an influence on their familiarity with and competence in using digital technologies. However, the neighbourhood of residence is likely to have an overriding influence, as it shapes the ways in which individuals participate in each of the above spheres and exercises a particular influence on the development of children and young adults.

Contextual effects such as these give rise to a hierarchical structure in which individuals are nested within neighbourhoods, and this structure makes it more difficult to identify the determinants of the digital divide. This is because these influences may themselves operate at different levels, but also because analysing 'nested' data using classical statistical techniques such as Multiple Regression typically generates biased results. In fact, individuals who reside within the same neighbourhood and pupils who frequent the same school are not independent of each other as they share key aspects of their social environment, interact with each other and are frequently 'sorted' into groups according to the same criteria, thus violating a fundamental assumption of standard statistical procedures (Goldstein, 1995; Smyth, 1999).

One of the strengths of the present research is its ability to shed light on the ways in which individual attributes interact with the social context to influence the utilisation of digital technologies. To this end, we will present the results of a series of multilevel models that seek to explain the determinants of familiarity with digital technologies, confidence in computers and competence in their use. Multilevel modelling techniques have undergone rapid development since the early 1980s, due primarily to concerns about the influence of schools on educational outcomes. Although researchers were already aware that the nesting of pupils within schools often leads to bias, the potential of statistical models to provide insights into the hierarchical structure of social reality only became apparent when powerful personal computers and sophisticated computer software became available.

There are very few published examples of multilevel models based on Irish data. This is undoubtedly due, at least in part, to the complexity and relative novelty of these techniques. Nevertheless, a certain scepticism is also evident amongst researchers in Ireland regarding the influence of the social context on various forms of social disadvantage. For example, Nolan and Whelan (1999) conclude their analysis of cumulative disadvantage in Ireland by stating that *"The evidence we have presented is consistently negative in relation to policy proposals that attribute a substantial independent causal effect to location"* (p. 120; see also Nolan et al., 2000 and Fahey and Williams, 2000). This is despite the fact that their own results suggest that, even after controlling for a range of individual-level variables, household heads living on Local Authority estates are almost six times more likely to be unemployed than those living in other areas[19].

It is also noteworthy that Emer Smyth, in a study on school effectiveness in Ireland (Smyth, 1999) concludes that *"[s]ocial class inequalities persist in academic achievement, absenteeism rates and drop-out rates. Furthermore, the social class context of the school has an additional effect on pupil outcomes, over and above a pupil's individual background. Working-class pupils in predominantly working-class schools tend to have lower exam grades, higher absenteeism, and higher drop-out rates than those in predominantly middle-class schools"*. The most important finding of Smyth's research, in this context, is that the neighbourhood context not only matters, but has a considerable impact on socio-economic outcome variables. Significantly, Smyth was one of the first people to apply multilevel modelling techniques to Irish data, and her results confirm the potential of these procedures in identifying contextual effects.

The multilevel analysis of hierarchically structured social data relies not only on more sophisticated methods than traditional forms of statistical analysis, but also on a distinctive approach to sampling, which is referred to as 'clustered' sampling. The sampling strategy used for the present study was described in detail in Chapter 3. Essentially, it consists of first creating a random sample of neighbourhoods and then a random sample of individuals within the higher-level units. Only through the application of such specific sampling methods and the use of multilevel modelling software can we even hope to identify the influence of individual attributes and the neighbourhood context on the digital divide.

7.1 Model Specification

The specification of multilevel models should, ideally, be guided by theoretical hypotheses regarding potential explanatory variables, interaction effects and neighbourhood influences. Given the flexibility and complexity of these models, this is the only way to avoid estimating hundreds of different models with a consequent risk of 'capitalising on chance'. To this end, a relatively structured approach was adopted, where we specified the variables of interest and moved from relatively simple models to more complex ones in a logical progression. Not only does this enhance the robustness of the resulting models and assist with the convergence of the Maximum Likelihood estimates, it also helps us to understand how key parameters in the models change as we relax different assumptions and as we implement various specifications.

For each of the three dependent variables, we will report estimates from five different multilevel models: (1) the 'variance components' model with no explanatory variables (2) the 'variance components' model with individual-level explanatory variables (3) the 'variance components' model with neighbourhood-level explanatory variables (4) the 'variance components' model with both individual-level and neighbourhood-level explanatory variables (5) the full multilevel model with random slopes for individual-level explanatory variables.

Before presenting the results of these models, however, we will provide a graphical example of the differences between multilevel models and the straightforward approach to statistical modelling represented by the Classical Linear Regression model (Figures 7.1 to 7.3). These graphs are based on the dataset that we will use later in this chapter to model the determinants of the digital divide. Figure 7.1 shows the results of a standard regression model where familiarity with digital technologies is regressed on a measure of the ability of friends and neighbours to provide assistance in relation to computers and internet. The graph indicates that as the strength of the friend/neighbour computer support network increases, so also does familiarity with ICTs, and the sloping line captures our model-based estimates of this effect.

[19] The authors' suggestion that this differential can be explained by unmeasured individual characteristics that differ systematically across different kinds of neighbourhoods is not convincing, particularly given the quality of the individual-level predictors available to them. Until control variables that account for this differential have actually been identified, it is misleading to overturn the results of empirical analysis by invoking unmeasured individual differences.

Figure 7.1: Classical Linear Regression Model

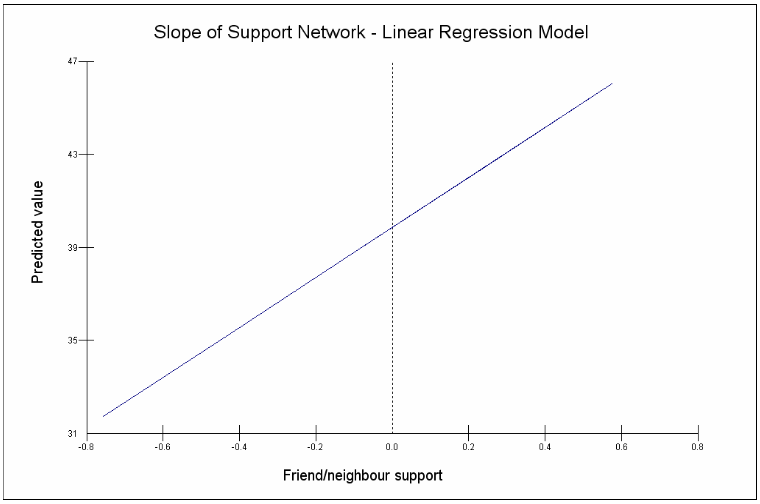


Figure 7.2 below corresponds to our Model Type 2, which is known as a 'random intercept model' because the intercept of the regression line (i.e. the point where it intersects the vertical axis to the left of the diagram) is free to vary across neighbourhoods. This results in a distribution of regression lines, one for each neighbourhood, and indicates that, although familiarity with ICTs increases in linear fashion with computer support network, average familiarity differs systematically across neighbourhoods even after controlling for this. In fact, familiarity is considerably higher in some neighbourhoods than others, to the extent that individuals with strong computer support networks in some areas have much lower levels of familiarity than individuals with weak support networks in others. The length of the regression lines corresponds to the range of the support network scores within the various neighbourhoods.

Figure 7.2: Variance Component Model - Individual and Neighbourhood levels

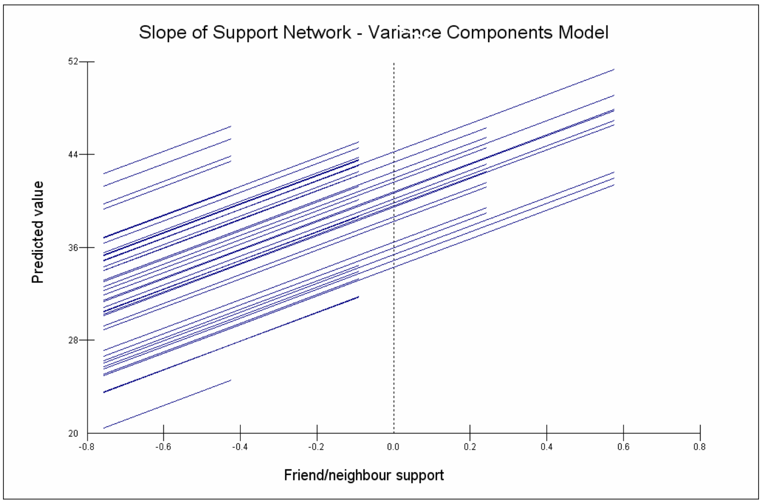


Figure 7.3: Full Multilevel Model

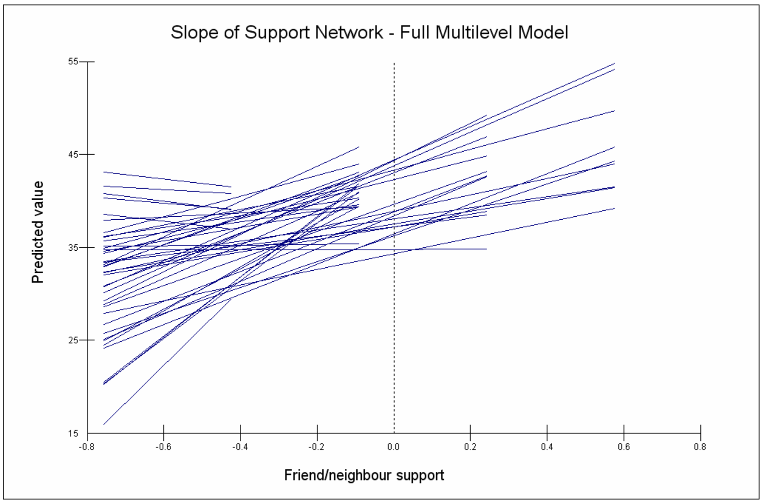


Figure 7.3 corresponds to our Model Type 5, a full multilevel model with random slopes and intercepts (note that the term ‘random’ merely implies that the slopes and intercepts are free to vary across neighbourhoods). Full multilevel models not only take account of the level effects that characterise different neighbourhoods, but also allow for the possibility that the effect of the explanatory variables themselves may vary according to the neighbourhood context. Figure 7.3 shows that the influence of computer support networks vary considerably according to the neighbourhood context. Support network is on the horizontal axis, whilst the predicted value for familiarity with digital technologies is on the vertical axis. There are neighbourhoods where computer support networks appear to make an enormous difference to familiarity with ICTs (steeply-sloping line), and others where the effect is practically zero (horizontal line). In areas with very low intercepts, support networks tend to make a big difference, whilst in areas with very high intercepts (high average levels of familiarity), they tend to make little difference. In other areas the effect of this variable is rather more similar.

The relevance of this rather technical account rests with its practical implications. If, in the context of the digital divide, we find that there are significant neighbourhood effects, this provides a rationale for policy interventions that incorporate a neighbourhood dimension. The average regression slope for variables such as education, social class and income provides an estimate of their contribution to the digital divide, the degree of variation in the intercepts captures inter-neighbourhood differentials in computer familiarity or competence, and the variation in slopes indicates the extent to which social class differentials, for example, are higher or lower for people living in different areas.

Dependent Variables

In this chapter we will report the results of three multilevel models, which seek to explain the determinants of the following variables:

- familiarity with digital technologies
- computer anxiety
- computer competence.

The first two variables are continuous, derived from multi-item scales, whilst the third is dichotomous, being based on a threshold value for competence.

Independent Variables

Turning now to our pool of explanatory variables, we find that most of the individual-level variables are not continuous. With the exception of income, satisfaction with one's area of residence and computer support networks, all of the other variables are categorical in nature. Age was recorded using age bands, social class and education level are divided into ordered categories, whilst economic status is divided into mutually-exclusive groups. In all of these cases, the most effective approach involves choosing a reference category and then constructing one or more dichotomous variables that capture the differential effect of belonging to one or other of the aforementioned categories. In the case of economic status, for example, we can estimate the effect of being unemployed, being a full-time student or being engaged in home duties *relative to being at work*, whilst the different age categories can be used to identify the effect of being in a given age group, relative to the reference group of 16 to 25 year-olds. Finally, in terms of education, we can estimate the effect of having a primary education only or a third-level education relative to the reference group (individuals who have completed the Leaving Certificate).

The following **individual-level** variables constitute our pool of potential explanatory variables:

- Gender (dichotomous)
- Aged under 16 years (dichotomous)
- Aged 26-35 years (dichotomous)
- Aged 36-45 years (dichotomous)
- Aged 46-55 years (dichotomous)
- Aged over 55 (dichotomous)
- Living in Local Authority rented housing (dichotomous)
- Perceived financial position (dichotomous; 'In serious difficulties' and 'Finding it hard to manage' coded 1)
- Household income (original seven response categories rescaled 0 (no household income) to 1 (more than €4,000 per month after tax)
- Satisfaction with area of residence (continuous variable based on ratings (1-5) of sixteen different aspects of the neighbourhood, including the appearance of houses, street lighting, drinking in public spaces, playgrounds etc.)
- Unemployed (dichotomous)
- Student (dichotomous)
- On home duties (dichotomous)
- Low social class (dichotomous; Semi- and Unskilled Manual coded 1)
- High social class (dichotomous; Higher and Lower Professionals coded 1)
- Low education level (dichotomous; No formal education or Primary School only coded 1)
- High education level (dichotomous; Third Level qualification coded 1)
- Family computer support network (continuous variable based on ratings (1-3) of help available from children or other family members with computers or internet)
- Friend/neighbour computer support network (continuous variable based on ratings (1-3) of help available from friends or neighbours with computers or internet)

With regard to our neighbourhood-level explanatory variables, we would ideally have liked to collect independent data on each of the neighbourhoods, perhaps by making additional observations or consulting other sources. Unfortunately, this was beyond the scope of the current study, and we will therefore use only composite variables derived from our individual-level predictors by aggregating these to neighbourhood level. This is common practice in multilevel modelling, and will enable us to assess whether the socio-economic composition of an area has an independent effect on familiarity with digital technologies, computer competence and so on, over and above the influence of individual-level characteristics. Where a given individual-level variable is continuous, we will use the neighbourhood mean at the higher level, and where we have dichotomous variables, we will characterise neighbourhoods in terms of the proportion of people with low educational attainments, and those with a third-level education. A similar approach will be applied to the dummy variables for age group, economic status and social class.

Thus, the following **neighbourhood-level** variables will be used as explanatory variables at the higher level of our multilevel models:

- Percentage aged 26 to 45 years
- Percentage unemployed
- Percentage on home duties
- Percentage studying full-time
- Percentage renting their home from the Local Authority
- Percentage in financial difficulties
- Percentage with low educational attainments
- Percentage with high educational attainments
- Percentage in low social class categories
- Percentage in high social class categories
- Mean household income
- Mean satisfaction with neighbourhood

All continuous variables are 'grand mean centred', which means that the overall mean, across all neighbourhoods, is subtracted from the raw scores. This facilitates the interpretation of the variance components, as the slope variance, for example, is the variance of the slopes at the point where the variable in question is equal to zero. With 'grand mean centring', this zero point will always be within the main body of the data and has an intuitive interpretation.

The categorical variables, in contrast, are coded on the basis of our theoretical priorities. For example, gender is coded as males = -.5 and females = .5, which implies that the intercept is interpretable as the expected outcome for 'the average person', disregarding gender. The coding scheme for the other categorical variables is indicated above. With all variables centred, the variances of the intercept and slopes may be interpreted as the expected variances for individuals with zero scores on all other variables. With all explanatory variables are centred, the intercept is equal to the mean of the dependent variable (again, for the sub-group coinciding with zero scores on all variables).

7.2 Key Findings

All of the regression coefficients reported in Tables 7.1 to 7.3 are unstandardised (i.e. are presented in the original metric of the variables) and should be interpreted as expressing the net influence of a given variable on familiarity with digital technologies, computer anxiety and computer competence respectively, holding all other variables included in the model constant (we will use the expression 'all else being equal' to refer to these partial regression coefficients).

Model 1 in Table 7.1 below allows us to 'partition' the variance of the dependent variable (familiarity with digital technologies) between the two levels of the model, namely the individual level and the neighbourhood level. Almost one-fifth (0.19) of the total variance of the familiarity variable takes the form of inter-neighbourhood differences, which indicates that there is considerable scope for multilevel modelling and a strong prima facie case for arguing that the neighbourhood makes a difference to technology uptake.

7.2.1 Familiarity with Digital Technologies

Familiarity with digital technology is measured as the sum of the responses to 13 items in the questionnaire (each scored from 0 to 4) which ask whether the respondent has heard of a given technology (such as personal computers, internet, e-mail, etc.) and if so, how familiar they are with them. Fifteen individuals had to be omitted from the dataset because they had more than two missing values, and the remaining missing values were imputed using the EM algorithm. The measure of familiarity with digital technologies thus ranges between 0 and 52, has a mean of 34.29 and a standard deviation of 11.65. Summarising the key findings of the final model in Table 7.1, we can make the following observations:

Gender and age
Familiarity with digital technologies is almost two points higher for men than for women, all else being equal, and decreases consistently with age over 25 years. Whereas the scores for individuals aged 26-35 are just 3.6 points lower, on average, than those aged 25 and under, the differential reaches almost 15 points for those aged over 55, although the latter effect is sensitive to the neighbourhood context.

Income and financial difficulties
The difference between the highest and lowest income categories is equivalent to an increase of almost 5 points in familiarity with digital technology, all else being equal. If the family is described as having difficulty making ends meet, average familiarity is, on average, just over 1.5 points lower, and this effect is sensitive to the neighbourhood context.

Unemployment and social class
Being unemployed is associated with a negative differential of more than 3.5 points, all else being equal, and being engaged in domestic duties just a little less, 2.4. Individuals with an advantaged social class background score higher than other individuals, all else being equal (2 points, on average), and the effect of social class is 'random' (in the multilevel sense of having a distribution) across neighbourhoods. Conversely, those from a disadvantaged social class background score on average 1.5 points lower.

Educational attainments
After age, one of the largest effects is associated with educational attainments, and completing a third-level course is associated with a considerably higher level of familiarity with technology, holding all other variables constant, the difference being 5 points. Conversely, having a primary school education only or no formal education is associated with a drop of just over 2 points.

Satisfaction with neighbourhood
The higher the satisfaction expressed with the neighbourhood of residence (as measured by a multi-item scale, see Appendix 3), the higher the familiarity with digital technologies, after controlling for the other variables included in the model. The difference between the lowest and highest possible neighbourhood scores (approximately 52 units) is therefore equivalent to an increase in familiarity of more than 4.5 units, although once again this effect depends on the neighbourhood context. This suggests that the impact of the neighbourhood is in some sense independent of the subjective perceptions of local residents.

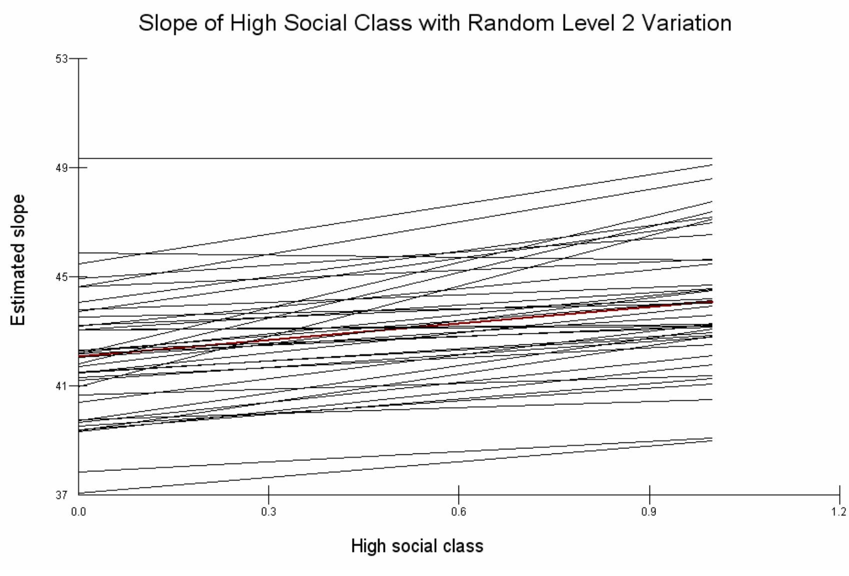
Computer support network
To the extent that other family members are able to offer help and assistance with computers or internet, familiarity levels rise (by almost one unit for each unit increase in the support network), although the effect of having supportive neighbours and friends is almost twice that of the family network (2.04). Although this is an individual-level variable, it underlines the importance of the local area, where many of these relationships are likely to be based. It also suggests that an intervention which enhances the computer competence of one section of the community is likely to have a considerable knock-on effect on their friends, family members and neighbours.

Neighbourhood effects
In addition to providing precise estimates of the average influence of a range of individual-level variables on familiarity with digital technologies, one of the key conclusions that may be drawn from model 5 is that the neighbourhood context has a significant impact, even after controlling for a range of individual characteristics. This is evident from the significant level 2 variance in the slopes for no less than five individual-level variables. This suggests that the way in which age, satisfaction with neighbourhood, financial difficulties, social class and computer support networks influence familiarity with digital technologies is conditioned by the nature of the local area in which people live.

To show just one example, we will consider the effect of social class on familiarity with computers across the different neighbourhoods (Figure 7.4). This graph is similar to Figure 7.3 above, as it shows how the slope for a given variable and the overall intercept for the model vary according to neighbourhood, although this time the effect is net of the other variables included in the model. Social class is coded 0 and 1, and captures the effect of being in the higher or lower professional social classes, relative to the reference category (other non-manual occupations). This is why the horizontal axis ranges from 0 to 1 – the slopes express the differential between professionals and other non-manual occupations. The vertical axis contains the predicted value for familiarity with digital technologies. We have included the mean slope (red line) for reference purposes, and indeed it is apparent that many of the regression lines are parallel to this, suggesting that the effect of social class on familiarity is roughly equal in the areas concerned, although the 'starting-point' in terms of familiarity differs considerably. However, social class has a strong effect in a subset of neighbourhoods, which tend to have above-average levels of familiarity. These may be neighbourhoods where social class differentials coincide with sharply-contrasting labour market experiences or different age profiles.

Our final multilevel model (Model 5) explains 61 per cent of the variance between individuals and 59 per cent of the variance between neighbourhoods. It is interesting to note, however, that if we concentrate on the neighbourhood averages alone, our level-2 predictors alone can explain 90 per cent of the variance at this level. This suggests that the significant variation that we observe between neighbourhoods in relation to these variables is attributable to structured aspects of these areas (see also Appendix 3)[20].

Figure 7.4: Computer Anxiety and High Social Class



[20] The specification of random slopes at the neighbourhood level leads to an increase in the variance of the level 2 intercepts, because this variance is measured at the point where the explanatory variables equal zero.

Table 7.1 Models for Familiarity with Digital Technologies (N=1325)

Parameter	Model 1	Model 2	Model 3	Model 4	Model 5	Model 5 - slope var.
Individual Level Effects:						
Intercept	34.40 *	41.91 *	34.41 *	42.32 *	42.13 *	
Gender		1.96 *		1.94 *	1.94 *	
Aged 0-15		not signif.				
Aged 26-35		-3.30 *		-3.32 *	-3.59 *	
Aged 36-45		-4.16 *		-7.86 *	-4.86 *	
Aged 46-55		-7.88 *		-4.20 *	-8.20 *	
Aged 56+		-14.85 *		-14.79 *	-14.86 *	19.01 *
Low social class		-1.22 *		-1.20 *	-1.49 *	
High social class		2.11 *		2.14 *	1.91 *	4.15 *
Household income		5.91 *		5.99 *	4.82 *	
Financial difficulties		-1.31 *		-1.39 *	-1.70 *	7.68 *
Unemployed		-3.15 *		-3.04 *	-3.59 *	
Full-time student		not signif.				
Home duties		-2.17 *		-2.17 *	-2.42 *	
Low education		-1.93 *		-1.91 *	-2.16 *	
High education		5.15 *		5.08 *	5.01 *	
LA rented		not signif.				
Satisfaction with area		0.10 *		0.08 *	0.09 *	0.04 *
Computer support – family		1.10 *		1.18 *	0.90 *	
Computer support – friends		2.62 *		2.62 *	2.04 *	40.37 *
Neighbourhood Level Effects:						
Percentage aged 26-45			0.12 *	0.08 *		
Percentage low social class			not signif.			
Percentage high social class			not signif.			
Mean income			not signif.			
Percentage financial difficulties			not signif.			
Percentage unemployed			-0.39 *	-0.24 *		
Percentage studying			0.18 *	-0.10		
Percentage on home duties			not signif.			
Percentage with low education			not signif.			
Percentage with high education			not signif.			
Percentage LA rented			not signif.			
Mean satisfaction with area			0.19 *			
Disadvantage Index score			not signif.			
Variances:						
Variance of level 1 residuals	109.99	48.90	110.02	48.95	42.83	
Variance of level 2 int. residuals	26.61	6.57	2.55	3.15	10.80	
Model assessment:						
Deviance statistic	10075.87	8981.81	10011.33	8961.06	8871.20	
Degrees of freedom	3	22	16	23	33	
Pseudo R^2: level 1		0.56	0.00	0.55	0.61	
Pseudo R^2: level 2		0.75	0.90	0.88	0.59	

** Parameter estimates followed by an asterisk are statistically significant at the .05 level.*

Model 5 includes two complex level 1 variance terms and five covariances between the random slopes at level 2 and the random intercepts at level 2; these are not shown in the table above.

7.2.2 Computer Anxiety

Computer anxiety is the transformed sum of the responses to 9 items (scored 0 to 6), which inquire about attitudes towards computers (e.g. "Just hearing the word 'computer' makes me feel… (confident/insecure)"). Despite the increasing use of computers, there is evidence that computer utilisation and competence are often hampered by 'computer anxiety'. For example, published research shows that approximately 20 per cent of European managers and professionals experience feelings of anxiety in relation to computers and other digital technologies (Bozionelos, 1996). McInerney and McInerney (1994) define computer anxiety as *"an affective response of apprehension or fear of computer technology accompanied by feelings of nervousness, intimidation, and hostility"*. Rosen and Maqurie (1990) performed a meta-analysis of 109 studies that investigated anxiety and stress associated with using a computer and concluded that computer anxiety affected 25% of those studied.

Eight individuals had to be omitted from the dataset because they had more than two missing values, and the remaining missing values were imputed as before, using the EM algorithm. Raw scale scores were transformed to a normal variate as the original variable had a non-Normal distribution. This procedure is recommended by Goldstein (1995) where the scale of the outcome variable is essentially arbitrary. Table 7.2 shows the results for our five models as before, and we will summarise the key findings that emerge from our final model (Model 5), which is a full multilevel model with 'random' intercepts and slopes. In interpreting the effect sizes, it is important to note that our measure of computer anxiety has been transformed, with the result that it has a mean of 0 and a standard deviation of 1.

Gender and age
Computer anxiety does not vary according to gender, but undoubtedly increases with age. Whereas the scores for individuals aged 26-35 are just 0.11 standard deviation units higher, on average, than for those aged 25 and under, the differential reaches 0.62 for those aged over 55, and the latter effect is sensitive to the neighbourhood context.

Income and financial difficulties
The difference between the highest and lowest income categories is equivalent to 0.21 standard deviation units, and computer anxiety is higher amongst low-income earners, all else being equal. If the family is described as having difficulty making ends meet, then computer anxiety is, on average, 0.29 units higher.

Economic status and social class
Being a full-time student is associated with a differential of -0.17, whilst being engaged in home duties tends to heighten anxiety (0.18). Individuals with a disadvantaged social class background score higher on anxiety than other individuals, controlling for the other variables in the model (0.18, on average), whilst those from the higher and lower professional social classes tend to have lower scores (-0.18).

Educational attainments
After age, one of the largest effects is associated with educational attainments, and completing a third-level course is associated with a considerably lower level of computer anxiety, all else being equal (-0.61). The effect of individual educational attainments is, however, variable across different neighbourhood contexts.

Computer support network
To the extent that friends and neighbours are able to offer help and assistance with computers or internet, computer anxiety levels decrease (by almost half a standard deviation unit (-0.42) for each unit increase in the support network), although once again this effect varies with the neighbourhood context.

Neighbourhood effects

Model 1 in Table 7.2 below allows us to 'partition' the variance of the dependent variable (computer anxiety) between the two levels of the model, namely the individual level and the neighbourhood level. More than one-fifth (0.22) of the total variance of the anxiety variable takes the form of inter-neighbourhood differences, which indicates that there is considerable scope for multilevel modelling and that neighbourhood context has a role in relation to computer anxiety (the aim of our model is to explain how this influence operates).

The results of our final model type (Model 5) indicate that the percentage of local people with a third-level qualification has a significant influence on the anxiety experienced by residents in relation to computers. This effect is in addition to the influence of the educational attainments of the individual themselves and shows in very clear terms how the character of a local area influences uptake of digital technologies.

Furthermore, the influence of three different individual-level variables varies according to the neighbourhood context. In other words, the way in which age, educational attainments and computer support networks influence computer anxiety is conditioned by the nature of the area in which people live. As an example, we will show how the effect of having a third-level education (as against having completed the Leaving Certificate) on computer anxiety varies across each of the neighbourhoods (Figure 7.5).

Figure 7.5: Computer Anxiety and Higher Education

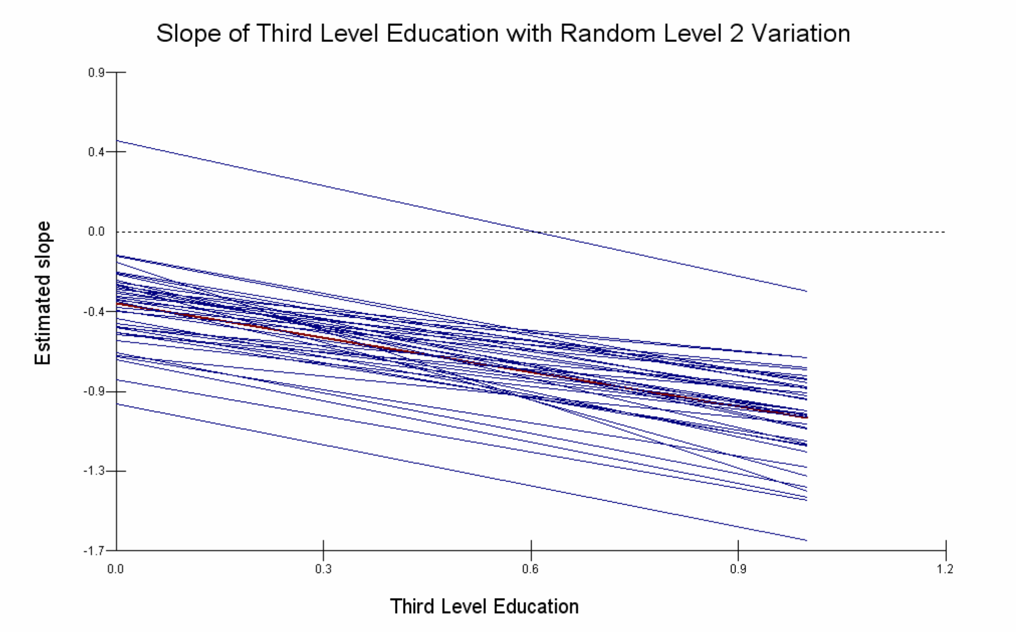


Figure 7.5 includes both the mean slope for third-level education and the estimated slopes for our 40 neighbourhoods. The graph shows that in all areas computer anxiety is considerably lower amongst residents with a third-level education compared to those with a Leaving Certificate. By and large, the regression lines are parallel, and thus the effect of a third-level education is very similar across the various neighbourhoods. However, in a small number of areas, steeper slopes are observed, indicating a stronger differential. It is interesting to note that even where anxiety levels are much higher (i.e. in the neighbourhood that corresponds to the regression line at the top of the graph), third-level education has a similar effect, and does not therefore reduce the differential between neighbourhoods to a significant degree.

Table 7.2 Models for Computer Anxiety (N=1317)

Parameter	Model 1	Model 2	Model 3	Model 4	Model 5	Model 5 - slope var.
Individual Level Effects:						
Intercept	0.01 *	-0.35*	-0.03*	-0.36*	-0.38*	
Gender		not signif.				
Aged 26-35		not signif.		0.09	0.11	
Aged 36-45		0.19*		0.20*	0.22*	
Aged 46-55		0.26*		0.27*	0.28*	
Aged 56+		0.61*		0.64*	0.62*	0.09 *
Low social class		0.15*		0.15*	0.18*	
High social class		-0.20*		-0.19*	-0.18	
Household income		-0.25*		-0.24*	-0.21*	
Financial difficulties		0.30*		0.32*	0.29*	
Unemployed		not signif.				
Full-time student		-0.19*		-0.19*	-0.17*	
Home duties		0.19*		0.18*	0.18*	
Low education		not signif.				
High education		-0.60*		-0.59*	-0.61*	0.09 *
LA rented		not signif.				
Satisfaction with area		not signif.				
Computer support – family		not signif.				
Computer support – friends		-0.43*		-0.42*	-0.42*	0.45 *
Neighbourhood Level Effects:						
Percentage aged 26-45			0.12 *	0.08 *		
Percentage low social class			not signif.			
Percentage high social class			not signif.			
Mean income			not signif.			
Percentage financial difficulties			not signif.			
Percentage unemployed			not signif.			
Percentage studying			not signif.			
Percentage on home duties			not signif.			
Percentage with low education			not signif.			
Percentage with high education			-0.01 *	-0.007 *	-0.005 *	
Percentage LA rented			not signif.			
Mean satisfaction with area			not signif.			
Disadvantage Index score			not signif.			
Sutton – additional effect					-0.44 *	
Killiney North – additional effect					0.46 *	
Clontarf East A – add. effect					0.79 *	
Variances:						
Variance of level 1 residuals	0.72	0.44	0.72	0.44	0.38	
Variance of level 2 int. residuals	0.21	0.07	0.05	0.06	0.11	
Model assessment:						
Deviance statistic	3392.06	2733.56	3334.54	2731.81	2639.89	
Degrees of freedom	3	21	16	16	26	
Pseudo R^2: level 1		0.39	0.00	0.39	0.47	
Pseudo R^2: level 2		0.67	0.76	0.71	0.48	

** Parameter estimates followed by an asterisk are statistically significant at the .05 level.*

Model 5 includes three covariances between the random slopes at level 2 and the random intercepts at level 2; these are not shown in the table above.

7.2.3 Computer Competence

Computer competence is conceptualised as a dichotomous variable, calculated by applying a cut-off point to the scale score for the original three items (e.g. I can deal with all of the difficulties I encounter when using computers). Missing values are coded 0, as they generally correspond to individuals who have never used a computer (630 cases out of 1,325). Scores range from 0 to 18 on the original scale, and the cut-off point used is a score of 9 or less out of 18 (which identifies 504 respondents out of 1,325 as 'competent', 38%).

This set of models is slightly different to the previous two, as it involves a dichotomous dependent variable that is coded 0 where computer literacy falls below a certain threshold, and 1 where it exceeds the threshold. As the dependent variable in the model is not a continuous, Normally-distributed variable, a different approach to model specification is required, which uses a logit link function and is similar to the logistic regression model.

It is important to remember that the coefficients reported in the table below are logit coefficients, not partial regression coefficients, which means that their interpretation is less straightforward than in the previous models. Nevertheless, the exponent of a logit coefficient gives the 'odds ratio', which has an intuitive interpretation. The odds ratio can vary between 0 and infinity, and an odds ratio of 1 indicates that there is no relationship between the explanatory variable in question and the dependent variable. Odds ratios less than 1 imply that as the variable in question increases, the odds that a given individual is computer literate *decrease*. For example, an odds ratio of 0.5 implies that for each unit increase on the explanatory variable, the odds of computer literacy decrease by half. Conversely, an odds ratio greater than 1 signifies that the odds of computer literacy, for example, *increase* as the explanatory variable increases. For example, an odds ratio of 10 would imply that for each unit increase on the explanatory variable, the odds of being computer literate increase tenfold.

Table 7.4 shows the results from our five models; the following paragraphs summarise the key findings of our final multilevel model:

Gender and age
Computer competence does not depend on gender, once we control for other individual attributes, but decreases dramatically with age. The odds that an individual aged 26-35 knows how to use a computer are half as large as the odds for people aged 25 or less. The differential between those aged over 55 and those aged under 26 involves a factor of almost 20. Thus, people aged under 26 are almost twenty times more likely to be computer competent than those aged over 55, even after controlling for income, education level, financial difficulties, social class, whether they are involved in home duties and their computer support network.

Income and financial difficulties
The difference between the highest and lowest income categories is associated with an odds ratio of 5.42, implying that high earners are more than five times more likely to be computer literate than low earners. Where a family is described as having difficulty making ends meet, the odds that family members are computer competent decline by half.

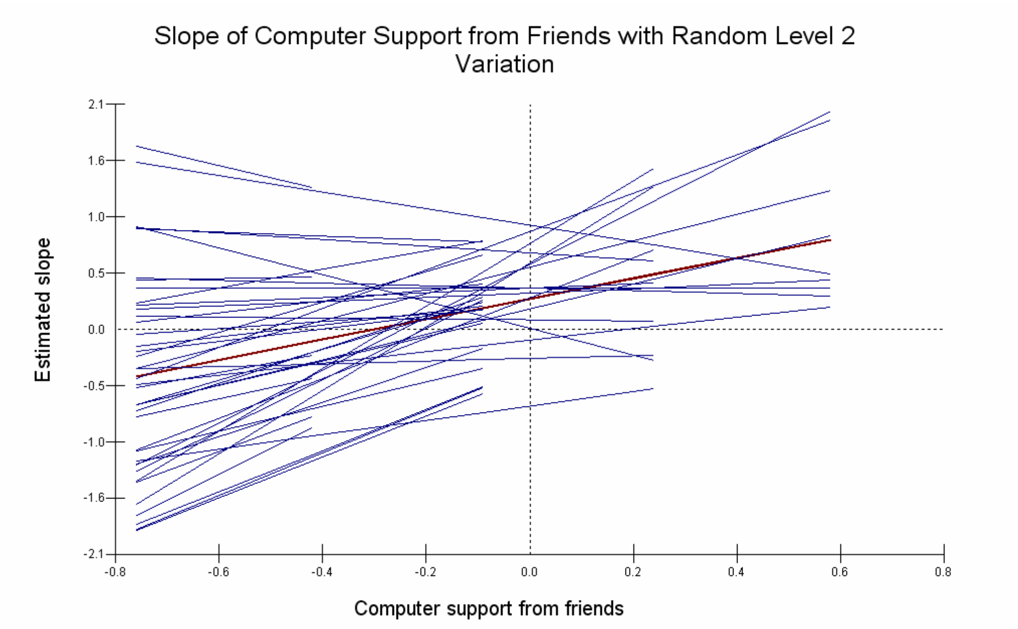
Economic status and social class
Being engaged full-time in home duties tends to obstruct the acquisition of computer competence, all else being equal, and individuals who fall within this category are just half as likely to be computer literate than other individuals. Furthermore, people from a disadvantaged social class background tend to have lower competence levels (odds ratio of 0.64), and those from the higher and lower professional social classes tend to have higher competence (2.18), compared to those classified as 'skilled manual' and 'other non-manual', after controlling for the other variables included in the model.

Educational attainments
After age, one of the largest effects is associated with educational attainments, and completing a third-level course is associated with a seven-fold increase in the odds of being computer competent, all else being equal (odds ratio of 7.03).

Computer support network
To the extent that friends and neighbours are able to offer help and assistance with computers or internet, computer competence increases (a unit increase on the computer support network scale is associated with an increase of more than 2.5 in the odds of being computer competent), although this effect varies according to the neighbourhood context. In other words, in certain areas, having supportive friends and neighbours does not have such a strong effect on computer competence, whilst in other areas, the effect is even stronger.

Neighbourhood effects
The influence of one individual-level variable – the support provided by neighbours and friends with computers and internet – varies significantly according to the neighbourhood context. This suggests that the way in which computer support networks influence computer competence is conditioned by the nature of the local area in which people live. Figure 7.5 below illustrates the differences in slopes and intercepts for this variable across the 40 neighbourhoods. We have included the mean slope (red line) for reference purposes, and the graph shows that the effect of computer support networks is extremely variable. Although the slope is positive in most areas, in a few cases – where computer competence is already above average – this is even negative. Clearly, where an individual has already acquired a high level of competence, their friends and neighbours are less likely to be at the same level and consequently less likely to be able to provide assistance with computers and internet. Nevertheless, in areas where computer competence tends to be lower on average, support networks are crucial to acquiring computer skills.

Figure 7.6: Computer Competence and Support Networks



One way of evaluating our final model is to generate a vector of predicted probabilities by taking the exponent of the vector of predicted values from the fixed part of the model. These can be used to generate a Classification Table, as follows (using 0.4 as the cut-off criterion):

Table 7.3 Classification Table for Computer Competence Based on Model 5 Results

Predicted computer competence * Actual computer competence Crosstabulation

			Actual computer competence		Total
			not competent	competent	
Predicted computer competence	not competent	Count	690	95	785
		% within Actual computer competence	84.0%	18.8%	59.2%
	competent	Count	131	409	540
		% within Actual computer competence	16.0%	81.2%	40.8%
Total		Count	821	504	1325
		% within Actual computer competence	100.0%	100.0%	100.0%

Thus, the final model enables us to correctly classify more than 8 out of 10 individuals in the sample as either computer competent or incompetent (we correctly classify 84% of individuals who are not competent in using computers and 81% of those who are actually competent).

Table 7.4 Models for Computer Competence (N=1325)

Parameter	Model 1	Model 2	Model 3	Model 4	Model 5	Model 5 - slope var.
Individual Level Effects:						
Intercept	-0.58*	0.20	-0.44	0.34	0.44	
Gender		not signif.				
Aged 26-35		-0.51		-0.67*	-0.67*	
Aged 36-45		-0.65*		-0.80*	-0.84*	
Aged 46-55		-1.36*		-1.47*	-1.50*	
Aged 56+		-2.51		-2.66*	-2.79*	
Low social class		-0.39		-0.40*	-0.44*	
High social class		0.79*		0.75*	0.78*	
Household income		1.69*		1.68*	1.69*	
Financial difficulties		-0.63		-0.81*	-0.70*	
Unemployed		not signif.				
Full-time student		not signif.				
Home duties		-0.75*		-0.64*	-0.68*	
Low education		not signif.				
High education		1.91*		1.93*	1.95*	
LA rented		not signif.				
Satisfaction with area		not signif.				
Computer support – family		not signif.				
Computer support – friends		0.64*		0.79*	0.97*	2.38 *
Neighbourhood Level Effects:						
Percentage aged 26-45			not signif.			
Percentage low social class			not signif.			
Percentage high social class			not signif.			
Mean income			not signif.			
Percentage financial difficulties			not signif.			
Percentage unemployed			not signif.			
Percentage studying			not signif.			
Percentage on home duties			not signif.			
Percentage with low education			not signif.			
Percentage with high education			0.026*	not signif.		
Percentage LA rented			not signif.			
Mean satisfaction with area			not signif.			
Disadvantage Index score			not signif.			
Variances:						
Variance of level 2 int. residuals	0.79*	.069*	0.44*	0.69*	0.49	
Model assessment:						
Degrees of freedom	3	21	16	16	26	
Pseudo R^2: level 2		0.13	0.44	0.13	0.38	

** Parameter estimates followed by an asterisk are statistically significant at the .05 level.*

Model 5 includes one covariances between the random slopes at level 2 and the random intercepts at level 2; this is not shown in the table above. All models are estimated using Second Order Penalised Quasilikelihood estimation with RIGLS. Comparison of the results with Markov Chain Monte Carlo estimation and bootstrapped samples shows that these estimates are highly robust.

7.3 Conclusions

A number of aspects of the research design utilised for this study are worth emphasising, as they enhance the value of this study in understanding the nature and determinants of the digital divide in the Dublin area. Firstly, the rigorous and labour-intensive nature of the sampling procedure makes it possible to generalise to the overall population with a high level of confidence. Rather than rely on quota sampling, which can often produce samples that are biased, we relied on a random two-stage sample as far as possible. Secondly, our relatively large sample size means that the estimates produced by our statistical models provide an accurate picture of the underlying determinants of the digital divide. With a sample of more than 1,300 individuals these models have high statistical power and can therefore detect relatively subtle influences on the dependent variables[21].

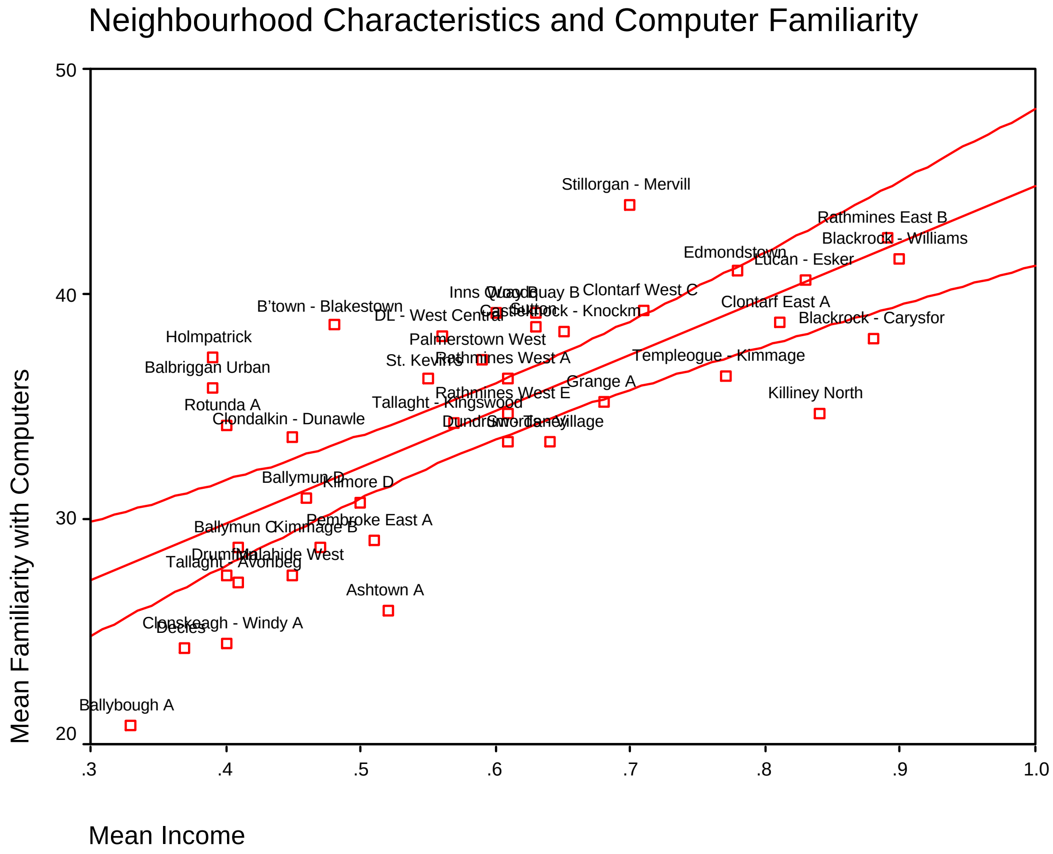
Thirdly, the use of sophisticated statistical techniques that control for the clustering of individuals within neighbourhoods ensure that our statistical tests are reliable as well as providing considerable insights into the ways in which the neighbourhood context influences familiarity with digital technology, computer confidence and competence. Finally, the development of new measurement instruments that use multiple items to generate sensitive and specific measures of key aspects of the digital divide increases the relevance of the results to policy-makers and to the research community.

There is a high degree of consistency in the results of our three sets of models, although naturally each dependent variable – familiarity, confidence and competence – also has its own specificities. Firstly, the key individual-level variables that influence these aspects of the digital divide are having a third-level education, belonging to an older age group, being in a low or high social class category, household income and having a strong informal support network of friends and neighbours who are able to provide help and advice in relation to computers and internet. Other variables, including financial difficulties, degree of satisfaction with one's neighbourhood of residence, being unemployed, engaged in home duties or a full-time student and the amount of support provided by other family members, also have an influence on the digital divide. It is striking that, once we control for these factors, gender has only a minor influence on familiarity with digital technologies. Thus, the digital divide is not exclusively attributable to differential access to material resources (as indexed by income, social class, financial difficulties, unemployment etc.), but is also a result of the individual's formal education, age, involvement in home duties and social networks.

We are also in a position to provide a more nuanced evaluation of our initial hypothesis regarding the geographical distribution of computer skills. As the considerable variance in familiarity, anxiety and competence between neighbourhoods shows, there is a considerable 'clustering' of these variables at neighbourhood level. Naturally, this does not mean that computer skills are confined to a small number of areas, but nevertheless indicates that they are far from being uniformly distributed. The scatterplots included in Appendix 3 illustrate this phenomenon, and show how average levels of familiarity, anxiety and competence follow the average income, educational attainments, social class composition and age profile of our neighbourhoods. For example, if we take the example of familiarity with digital technologies (Figure 7.6), not only are there marked disparities between our 40 neighbourhoods, but these differences can be predicted with a high level of accuracy by measuring average income levels.

[21] Kreft and de Leeuw (1998) provide a rule of thumb – the 30/30 rule – which suggests that researchers should strive for a sample of at least 30 groups and at least 30 individuals per group. This ensures high accuracy and power, at least in relation to the fixed parameters in the model. With an average of 30 individuals in 40 groups, we are in a strong position to draw valid inferences from our data.

Figure 7.7: Scatterplot of Mean Familiarity with Digital Technologies by Mean Income



Naturally, these differences are primarily the result of differences in the composition of the neighbourhoods in relation to social class, education levels and so on. However, our multilevel models show that these individual characteristics do not account for all of the observed differences between local areas. In fact, the percentage of local people with a third-level qualification has a statistically significant independent effect on computer anxiety and computer competence, even after controlling for individual educational attainments. Secondly, the significant variance of the intercepts at neighbourhood level shows that neighbourhood differentials remain, as far as familiarity, anxiety and competence are concerned. This is evident from the graphs presented in this chapter, where the regression lines for the different neighbourhoods often reveal quite sharp contrasts. Finally, the influence of individual-level characteristics itself varies according to the neighbourhood context; that is, the impact of having a third-level education, of being over 55 years of age and having a strong computer support network, for example, is not always equal. It is interesting to observe that the influence of support networks always depends on the nature of the local neighbourhood, suggesting that these informal channels for the transmission of skills may have a more important role in areas where computer skills are at a relatively low level. From a policy-making perspective this is an important finding, as it suggests that a programme of public interventions that boosts computer competence in these areas will have a particularly strong, indirect effect on neighbourhood differentials by injecting additional skills into existing social networks.

8 ICT and Second-Level Schools

Given the increasing importance of computer literacy, gaining familiarity with ICTs at primary and secondary school is clearly of fundamental importance. In Section 6.3, we demonstrated the importance of schools in building up computer knowledge amongst members of the younger age cohorts; over time, this will be the case for an increasing proportion of the population.

Government policy in this regard is outlined in *New Connections* and involves ensuring that all pupils and teachers at both primary and secondary levels have an opportunity to improve their skills in the acquisition and management of information and communication using ICTs. To this end, public policy focuses on:

- the provision of assistance to every school in building up its technology infrastructure
- the development of teacher skills
- the establishment of support services

Since 1997 significant progress has been made under the Schools IT2000 project in achieving these core objectives. Findings from recent surveys indicate progress in a number of key areas:

- There are at least 56,000 computers in Irish schools
- Every Irish school has an internet connection
- Cutting-edge pilot projects on technology in schools have been undertaken or are in progress

In the following two sections, we will outline the main findings from our survey of second-level schools in the four Dublin Local Authority areas. As the focus of this study is on the digital divide, we will be looking not only at absolute levels of ICT provision, but also at whether we can detect differences in the quantity and quality of ICT facilities and levels of instruction in different types of school and in different kinds of catchment areas. The main question that we will seek to address is whether schools reinforce the digital divide, whether they are largely neutral in this respect, or whether they make a positive contribution to narrowing this gap.

Before presenting our findings, some preliminary remarks should be made regarding the geographical distribution of second-level schools in Ireland, and in the Dublin region in particular.

Table 8.1 Location of Dublin Schools by Type and Area[22]

Type of School	20 per cent most affluent areas	All other areas
Secondary – Boys	68%	32%
Secondary – Girls	71%	29%
Secondary – Coeducational	63%	37%
Vocational	38%	62%
PLC	80%	20%
Community/Comprehensive	56%	44%
Total	**64%**	**36%**

There are currently 769 second-level schools in Ireland, 187 of which are located in the four Dublin Local Authority Areas. Over half (56%) of these are Secondary schools, 33 per cent Vocational Schools and the remaining 11 per cent are made up of Community and Comprehensive Schools. At national level, the location of second-level schools broadly

[22] The most affluent areas are defined here as being amongst the two most affluent deciles of District Electoral Divisions (DEDs) as measured by the *Index of Relative Affluence and Deprivation* (Haase, 1996).

follows the overall distribution of affluence and deprivation, as measured by the *Index of Relative Affluence and Deprivation* (Haase, 1996). However, a different picture emerges within Dublin: at the level of District Electoral Divisions (DEDs), social segregation in Dublin is much greater than in the rest of the country, implying that schools are likely to be more selective both with regard to their location as well as their student intake. In fact, there is a general tendency for second-level schools to be located in more affluent areas: roughly two-thirds of Dublin second-level schools are located in the 20 per cent most affluent areas. This tendency is most pronounced amongst Secondary Schools, compared to Community and Comprehensive Schools and particularly Vocational Schools. The latter are, by comparison, more strongly represented in the less affluent areas of Dublin. Post-Leaving Certificate Colleges, however, which form part of the vocational school sector, are also concentrated in the most affluent areas.

This selective geographical distribution may be further accentuated by selective intake, as students from more affluent backgrounds are more likely to attend Secondary Schools with a better reputation. It is therefore important to ask whether this overall differentiation also affects ICT teaching, contributing to the digital divide. This question is of particular importance, as ICTs are sometimes viewed as a means to ameliorate deeply-rooted forms of educational disadvantage, allowing students who might otherwise feel discouraged by ‘traditional’ subjects and teaching methods to develop alternative educational interests.

Of the 187 second-level schools in Dublin, 121 (65%) responded to our postal survey. Response rates were relatively uniform across the various types and locations of schools, and we may therefore feel confident that the resulting data is representative of the second-level sector in the Dublin region. To highlight the differences between different types of school, including their gender mix and catchment area, we have categorised these schools into the following groups: (i) secondary - boys (ii) secondary - girls (iii) secondary coeducational (iv) vocational (v) PLCs and (vi) community and comprehensive schools. It is important to note that a definitive picture of the relationship between schools and ICT literacy would require testing students’ computer proficiency. As this data is not universally available, we will confine our analysis to the facilitation of ICT learning and use indirect estimates of competence as a proxy for actual computer skills.

8.1 ICT Facilities in Dublin’s Second-Level Schools

Almost 60,000 students attend the 121 schools that participated in our school survey, and nearly 5,000 teachers are employed by these schools. Nearly half of these teachers (45%) were described by their Principal, Vice-principal or IT Co-ordinator as having received IT training. In total, therefore, there are approximately 12 students per teacher in second-level schools in Dublin, and roughly 26 students per teacher with IT training.

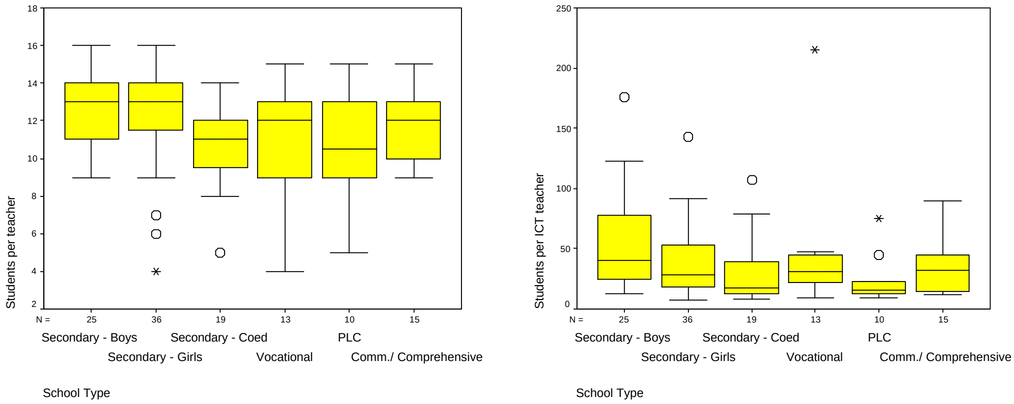
However, whilst general student/teacher ratios vary only slightly between schools, the ratio of students to IT teachers fluctuates much more greatly (Table 8.2, Figure 8.1b). Secondary girls, vocational and community and comprehensive schools all have broadly similar ratios of IT teachers, whilst coeducational secondary schools are slightly above the average and secondary boys schools are significantly below this (Table 8.2). As we will see in the following paragraphs, PLCs differ greatly from the rest of the second-level sector with regard to ICT access and teaching, as ICTs appear to play a much more central role in these schools.

Table 8.2 Students per Teacher / ICT Teacher

Type of School	Mean of Students/Teacher Ratios	Mean of Students/IT Teacher Ratios
Secondary – Boys	13	54
Secondary – Girls	12	39
Secondary – Coeducational	11	32
Vocational	11	44
PLC	11	24
Community/Comprehensive	12	35
Total	**12**	**40**
Total number of students per teacher / IT teacher	**12**	**26**

Differences in student/IT teacher ratios do not only differ by school type, but also – and particularly – within each of these categories. In overall terms, this ratio ranges from a low of 7 to a high of over 200 students per qualified IT teacher, indicating the existence of vast differences in the emphasis placed on teaching and using ICTs in Dublin schools.

Figure 8.1 Students per Teacher / ICT Teacher [23]



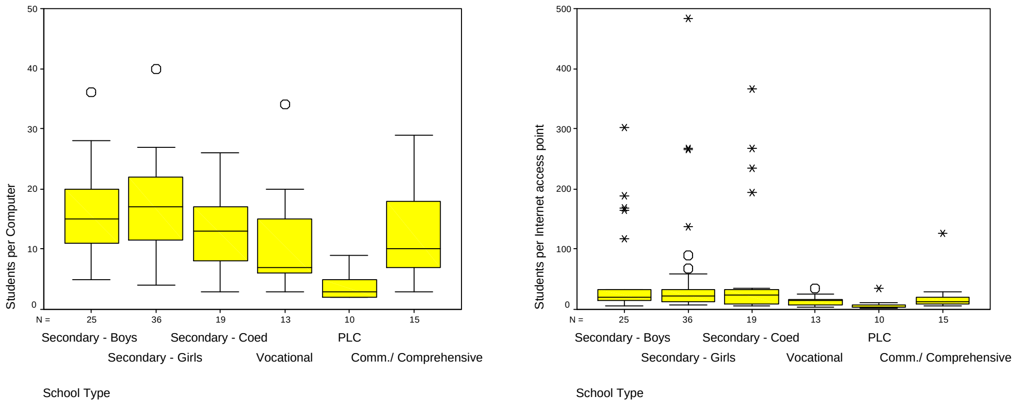
Although Figure 8.1 indicates the existence of significant differences in student to IT teacher ratios, the differences are even more pronounced in relation to ICT facilities. In all 121 schools included in our survey, students had access to 5,720 computers in total, and 4,381 of these were connected to the internet. This yields an overall average of about one computer for every 10 students and one internet connection for every 13 students in Dublin second-level schools. Conditions are most favourable in PLCs, however, where there are roughly 4 students per computer and 7 students per internet access point. Vocational schools come next (12 students per computer and 14 students per internet access point), followed by Community and Comprehensive schools (the corresponding ratios are 13 and 22 respectively). The situation in the Secondary Schools is similar as far as the ratio of students to computers is concerned, but the ratio of students to internet access points is much larger than in other schools (Table 8.3, Figure 8.2).

[23] Figure 8.1 comprises two sets of boxplots. A boxplot illustrates the distribution of observations, and the horizontal line in the centre of each boxplot indicates the median (i.e. the value above and below which 50% of cases are observed). The shaded area marks the central 50% of observations, whilst the 'whiskers' identify the range of the main body of data. Untypical observations are marked by the symbols 'o' and (when they are particularly extreme) 'x'. Boxplots provide a convenient way to compare the distribution of scores across different groups of schools.

Table 8.3 Students per Computer / Internet Connection

Type of School	Mean of Students/Computer Ratios	Mean of Students/Internet Access Ratios
Secondary – Boys	16	71
Secondary – Girls	17	54
Secondary – Coeducational	13	70
Vocational	12	14
PLC	4	7
Community/Comprehensive	13	22
Total (Mean of school level means)	**14**	**48**
Total number of students per computer / internet access point	**10**	**13**

Figure 8.2 Students per Computer / Internet Access Points



The establishment and maintenance of ICT facilities is obviously a major task for all schools, and the provision of technical support to teachers and pupils is equally costly in terms of time and resources. Approximately two-thirds of second-level schools in Dublin have appointed an IT Coordinator as a post of responsibility for this very reason: all of the PLCs and the vast majority (88%) of community and comprehensive schools have appointed an IT Coordinator (Table 8.4).

Table 8.4 Appointment of ICT Co-ordinators

Type of School	ICT coordinator appointed	No ICT coordinator appointed
Secondary – Boys	72%	28%
Secondary – Girls	62%	38%
Secondary – Coeducational	42%	58%
Vocational	62%	38%
PLC	100%	
Community/Comprehensive	88%	12%
Total	**68%**	**32%**

When asked about the adequacy of funding for IT facilities, only one third of respondents judge their funding allocation to be adequate, whilst nearly one quarter describe this as ‘completely inadequate’ (Table 8.5). Satisfaction with funding is slightly higher amongst vocational schools (69%) and community/comprehensive schools (50%) and is lowest amongst PLC schools (10%). The latter figure is highly interesting, given that PLCs are already much more favourably endowed in terms ICT facilities, but evidently they still feel that their facilities fall far short of what is needed.

Table 8.5 Adequacy of ICT Funding

Type of School	More than adequate	Adequate	Inadequate	Completely inadequate
Secondary – Boys		20%	60%	20%
Secondary – Girls	3%	30%	38%	30%
Secondary – Coeducational	5%	21%	53%	21%
Vocational		69%	23%	8%
PLC		10%	50%	40%
Community/Comprehensive		50%	38%	12%
Total	**2%**	**32%**	**44%**	**22%**

8.2 ICT Instruction in Dublin's Second-Level Schools

Having considered computer facilities in the previous section, we will now look at computer instruction in second-level schools. Computer instruction is provided in nearly all second-level schools in Dublin. Only a small number of coeducational secondary schools confined to infant classes do not provide computer instruction (Table 8.6).

Table 8.6 Computer Studies During School Day

Type of School	Computer Studies *within* normal school day	Computer Studies *outside* normal school day	No Computer studies
Secondary – Boys	100%		
Secondary – Girls	100%		
Secondary – Coeducational	95%		5%
Vocational	92%	8%	
PLC	89%		1%
Community/Comprehensive	100%		
Total	**98%**	**1%**	**2%**

The approximate proportion of students receiving IT instruction at junior and senior level is quite similar across the different school types, although huge variations again prevail between individual schools. In total, nearly 60 per cent of junior students receive some form of IT instruction, whilst this applies to nearly 70 per cent of senior students. A large number of schools indicated that, at second level, computer skills are taught primarily during transition year, and to a lesser extent in other years.

Table 8.7 Proportion of Students Receiving IT Instruction at Junior and Senior Level

Type of School	Junior Level	Senior Level
Secondary – Boys	66%	60%
Secondary – Girls	60%	75%
Secondary – Coeducational	65%	62%
Vocational	42%	66%
PLC	n/a	n/a
Community/Comprehensive	62%	68%
Total	**59%**	**68%**

Computer teaching is usually organised as a classroom activity. Exactly half of Dublin's schools allow pupils to access computers outside formal classroom instruction and one third allow students to access the internet in this way (Table 8.8). In community and comprehensive schools, the rate is even lower, with only one quarter of schools allowing access to computers outside class. In contrast, students in PLCs are given almost universal access.

Table 8.8 Student Access to Computers and Internet Outside Class

Type of School	Computer Access	No Computer Access	Internet Access	No Internet Access
Secondary – Boys	44%	56%	24%	76%
Secondary – Girls	51%	49%	32%	68%
Secondary – Coeducational	58%	42%	42%	58%
Vocational	39%	61%	15%	85%
PLC	100%		90%	10%
Community/Comprehensive	25%	75%	19%	81%
Total	**50%**	**50%**	**33%**	**67%**

Given that vocational and community and comprehensive schools have favourable ratios of teachers with IT qualifications to pupils and more computer and internet facilities, it is rather surprising to find that students in secondary schools nevertheless have more open access to computer facilities. Judging by the comments provided by respondents to the school survey, it is evident that the main obstacle in terms of access to ICT facilities is not their physical availability (most schools have a dedicated computer room, for example), but is related to the *running costs* of utilising the existing facilities, including internet access costs, maintenance, staff training and the difficulty of providing supervision. Thus, it would seem that more emphasis should be placed on the utilisation of existing resources, rather than focusing exclusively on increasing the amount of computer equipment present in schools.

When asked how receptive teachers in their schools are to computers, Principals, Vice-Principals and IT teachers replied that more than half of their fellow teachers are moderately receptive (56%); less than one third (31%) were described as being very receptive, whilst 13 per cent were judged to be not very receptive (Table 8.9).

Table 8.9 Receptiveness of Teaching Staff to using Computers

Type of School	Very receptive	Moderately receptive	Not very receptive
Secondary - Boys	28%	56%	16%
Secondary - Girls	22%	62%	16%
Secondary – Coeducational	32%	58%	10%
Vocational	23%	62%	15%
PLC	70%	30%	
Community/Comprehensive	38%	50%	12%
Total	**31%**	**56%**	**13%**

As we mentioned at the beginning of this section, the accurate evaluation of IT competency amongst pupils would require standardised test results, which are unfortunately not available for all schools. Nevertheless, we asked respondents whether their schools promoted any target qualifications and, if so, what percentage of students achieve the targets set by school. Respondents indicate that the European Computer Driving Licence (ECDL) is by far the most common target qualification, as about 60 per cent of all second-level schools promote this. FETAC is used in only 7 per cent of schools and no less than 20 other teaching/testing packages were mentioned, each of which is used in only a small number of schools.

The schools were asked to rate the computer skills of their students at Junior and Leaving Certificate level on a seven point scale, ranging from excellent to non-existent. As there were relatively few cases in the ‘excellent’ and ‘very poor’ categories, and none whatsoever in the ‘non-existent’ category, we have decided to recode the data using a four-point scale, from very good to poor.

Over half (56%) of all pupils were judged to have either good or very good computer skills at Junior Certificate Level, rising to 86 per cent at Leaving Certificate level (Tables 8.10 and 8.11). However, only 84 per cent of respondents answered this question, and actual competence levels could therefore be slightly lower than indicated.

Table 8.10 Student Competence at Junior Certificate Level

Type of School	Very good	Good	Moderate	Poor
Secondary - Boys	28%	32%	40%	
Secondary - Girls	18%	38%	35%	9%
Secondary – Coeducational	26%	37%	26%	11%
Vocational	9%	36%	55%	
Community/Comprehensive	20%	27%	40%	13%
Total	**21%**	**35%**	**38%**	**7%**

Table 8.11 Student Competence at Leaving Certificate Level

Type of School	Very good	Good	Moderate	Poor
Secondary - Boys	48%	36%	8%	8%
Secondary - Girls	64%	28%	8%	
Secondary – Coeducational	37%	53%	10%	
Vocational	42%	42%	17%	
Community/Comprehensive	62%	15%	23%	
Total	**52%**	**34%**	**11%**	**2%**

Our next considerations concern the amount and quality of computer instruction provided by second-level schools in Dublin. One quarter of schools view their current level of computer instruction as more than sufficient, exactly half as barely sufficient and one quarter as insufficient (Table 8.12). The only group that differs significantly in this respect are the PLCs which, as already pointed out at an earlier stage, place much greater emphasis on computer instruction. In fact, most PLCs feel that they have already achieved their desired level. There is a marginally higher level of dissatisfaction with the amount of instruction provided in secondary schools, in boys' schools in particular.

Table 8.12 Amount of Computer Instruction

Type of School	More than sufficient	Barely sufficient	Insufficient	Completely insufficient
Secondary – Boys	12%	36%	52%	
Secondary – Girls	16%	62%	19%	3%
Secondary – Coeducational	37%	42%	21%	
Vocational	8%	70%	23%	
PLCs	89%	11%		
Community/Comprehensive	33%	60%	7%	
Total	**25%**	**50%**	**23%**	**2%**

Table 8.13 Quality of Computer Instruction

Type of School	Excellent	Good	Moderate	Poor
Secondary – Boys	44%	28%	28%	
Secondary – Girls	40%	57%	3%	
Secondary – Coeducational	42%	31%	26%	
Vocational	31%	31%	31%	7%
PLCs	80%	20%		
Community/Comprehensive	37%	63%		
Total	**43%**	**42%**	**14%**	**1%**

Despite perceived shortcomings in the amount of computer teaching provided, most schools nevertheless express satisfaction with the quality of the instruction that they provide (Table 8.13). Only one school expressed serious concerns about the quality of computer instruction, and the PLCs once again stand out, as eighty per cent of these schools believe that their teaching is of excellent quality, twice the figure for second-level schools more generally.

The major obstacles to improving computer instruction in second-level schools in Dublin are the lack of funding (50%) and the difficulty in accommodating computer studies within an already overloaded curriculum (44%). Table 8.14 sets out the proportion of schools which include each of a number of potential obstacles amongst the three most important.

Table 8.14 Main Obstacles for Schools to Improve Computer Studies

	Mayor Obstacle
Resources	50%
Timetabling	44%
Technical Support	23%
Staff Training	20%
Space	14%
Curriculum	12%
Staff aptitude	9%
Teacher allocation	6%
Student aptitude	1%

Finally, we looked at the question of whether schools open their doors to the wider community by providing adult education classes or community access to IT facilities. Only one third of the second-level schools that we surveyed provide IT-related adult evening classes, and only 14 per cent allow local people to access computers and internet facilities at specific times.

Table 8.15 Schools and the Local Community

	Adult Evening Classes		Access to IT facilities For local people	
Type of School	**Yes**	**No**	**Yes**	**No**
Secondary – Boys	16%	84%	8%	92%
Secondary – Girls	14%	86%	11%	89%
Secondary – Coeducational	21%	79%	5%	95%
Vocational	69%	31%	31%	69%
PLCs	80%	20%	10%	90%
Community/Comprehensive	69%	31%	31%	69%
Total	**34%**	**66%**	**14%**	**86%**

Evening classes are confined mainly to PLCs (80%), vocational schools (69%) and community/comprehensive schools (69%). In contrast, less than one in five secondary schools provide any form of adult IT training. A similar pattern is observed in relation to community access to IT facilities, with one-third of PLCs, vocational schools and community/comprehensive schools providing access, compared with less than 10 per cent of secondary schools. It is clear from this that there is considerable scope for expanding the utilisation of IT facilities in second-level schools. Thus, consideration should be given to the prospect of linking public funding for IT equipment with the extent of its utilisation.

In conclusion, the following observations may be made in relation to second-level schools in Dublin and their role in relation to the digital divide.

- **Schools represent by far the most important vehicle for increasing levels of computer literacy amongst young people.**

- **Two-thirds of second-level schools in Dublin are located in the two most affluent deciles of District Electoral Divisions, whilst the remaining 80 per cent of DEDs contain only one third. Thus, the location of second-level schools in Dublin itself reflects a considerable bias towards more affluent areas.**

- **Secondary schools and PLCs have a particularly strong geographical bias towards more affluent areas. Vocational, community and comprehensive schools, in contrast, tend to serve the more disadvantaged areas.**

- **In terms of the availability of qualified IT teachers, computers and internet access points, there is no evidence that secondary schools are in a more favourable position.**

- **At the same time, secondary schools seem to achieve better results in relation to achieved computer skills compared to vocational, community and comprehensive schools. This, however, may be linked to differences in overall academic achievements.**

- **Overall, it would appear that, in addition to focusing on funding for equipment, more emphasis is needed on:**

  - **the rapid implementation of free broadband access for all second-level schools in Dublin**
  - **greater technical support for the maintenance of computer facilities**
  - **significantly greater access for students to computers and the internet outside formal classroom hours**
  - **the coordination, where appropriate, of teaching methods and content with the opportunities provided by ICTs**

- **It appears that existing IT facilities in second-level schools in Dublin are vastly underutilised with respect to the provision of IT-related evening classes and computer access for the local community, particularly as far as secondary schools are concerned. Thus, as well as providing increased funding for IT, it is important to seek ways of using the substantial infrastructure available within schools to address the digital divide within the adult population.**

9 A Review of Equalskills and CAIT

In the previous chapters of this report we provided a sophisticated conceptual approach to measuring the digital divide, a quantitative analysis of its extent, a statistical model explaining the determinants of ICT uptake and a consideration of the role of second-level schools in Dublin in relation to the acquisition of computer skills. In this chapter, we will complete our discussion by reviewing the two main community-based eInclusion initiatives that have been implemented thus far by the Irish Government and by outlining some key parameters for future similar initiatives.

A myriad of IT initiatives currently receive support from central Government, County Development Boards, Local Authorities, Partnership Companies and educational institutions. It lies outside the scope of this study to provide an evaluation of all of these initiatives. Instead, the purpose of this study is to develop a more sophisticated approach to the measurement of ICT use and to provide a thorough benchmarking of the current extent of the digital divide in the Greater Dublin area. Our primary aim is thus to ensure that future evaluation studies are in a position to assess the effects of a given initiative, as well as providing detailed background information on the digital divide in order to assist policy-makers.

Based on our review of the international evidence, we argued in Chapter 3 that the equitable roll-out of new technology is necessary in order to prevent a growing digital divide, but that in itself, this is not sufficient in order to narrow the gap. In this context, we drew attention to the overwhelming importance of equality of access to new information technologies and the wider acquisition of computer skills via the targeted provision of computer centres and training programmes in disadvantaged areas.

Based on the statistical analysis presented in Chapter 7, we can now reinforce this point and elaborate on the theoretical discussion provided in Chapter 3. Our analysis, the first of its kind undertaken in Ireland, shows that the neighbourhood of residence matters and that the community in which one lives has an influence on the uptake of ICTs, over and above what might be expected on the basis of individual social, economic and cultural characteristics. Both the Government and the Information Society Commission are well aware of the important role that community-based initiatives have in realising the potential of the Information Society. The statistical analysis of neighbourhood effects presented in this study provides a strong additional rationale for community-based initiatives within the overall context of an eInclusion strategy. For this reason, we will focus our discussion in this section on the role of Government in supporting the most disadvantaged communities through the targeted provision of ICT access and training facilities.

To this end, we will provide a brief discussion of the recently-completed evaluations of two major community-based eInclusion initiatives, Equalskills and CAIT. Furthermore, as Government is currently considering how best to embark on a new eInclusion initiative aimed at disadvantaged communities, we will outline the key parameters which such an initiative should adhere to. In addition to the evaluation reports of the two Government initiatives, the discussion will draw on the experience of the Digital Community Project, which was initiated by the Dublin Institute of Technology in conjunction with partners from private industry and the Dublin Inner City Partnership. Details of this initiative are provided in Appendix 4.

Most interestingly, we will show how the benchmark criteria developed in this study can be used to make projections in relation to the likely impact of publicly-funded initiatives on the digital divide, within a specific time horizon. This represents a major development in the environment within which policy formulation takes place, one with considerable potential for the design and evaluation of future interventions.

9.1 Equalskills

The Equalskills Initiative was launched in September 2001 as a pilot project aimed at ensuring widespread computer literacy. The aims and objectives of this initiative were:

- to provide an enjoyable introduction to computers for participants, mainly late adopters of technology, and to help them to retain a basic understanding of computer use
- to involve the community by making community access available through support groups, training organisations and local industry
- to create an infrastructure for the delivery of basic IT training
- to raise awareness of ICTs amongst late developers

The Equalskills Pilot Initiative provided basic IT training free of charge to people residing in Counties Cork, Kerry, Limerick, Clare, Tipperary and Offaly. Training was also available on-line to people living outside the pilot area, although the training cards and supporting CD-ROM were not available outside the pilot area. The Equalskills pilot phase concluded in December 2002. ECDL, the main organisation supporting the initiative, has since decided to make the course material available through all of its centres, although no government funding has been provided for this initiative.

The ex-post evaluation (Warren et al., 2002) reports that approximately 74,000 individuals were reached by the initiative during the first 15 months of its operation, ahead of a target of 100,000 for its full duration. However, certification was comparatively low, at less than 10,000, compared to the original target of 23,000; the evaluation does not offer any explanation for this shortfall.

As a whole, Warren et al. provide a highly positive picture of the initiative, claiming that it *"very effectively meets the needs for which it was designed … and as such will contribute significantly to bridging the current digital divide in Irish society"* (p.4).

However, the only evidence provided for this conclusion comes from the high satisfaction ratings of participants and stakeholders. No analysis is provided of the extent of the digital divide, nor any measurement of the contribution of Equalskills to narrowing the existing divide.

The authors of the present study have doubts about what can realistically be achieved by a training programme in which participants interact with ICTs for no more than 6-8 hours on average. Whilst the programme seems to provide a very useful introduction to computers – and this is the principal aim of the initiative – the skills that can be acquired by people without prior computer experience within such a short time are certainly below the definition of computer competence adopted in this study. On its own, and without further training, it is perhaps misleading to claim that late adopters who only participate in Equalskills are no longer at risk of digital exclusion.

Equalskills, on its own, is unlikely to provide sufficient exposure to ICTs in order to provide a skills base that enables people to expand their ICT usage autonomously and to participate meaningfully in the Information Society. Government funding for a nationwide extension of the programme should only be considered, in our view, if this is complementary to, and not at the expense of, a more in-depth community-based training approach that specifically targets the most disadvantaged individuals and communities in Ireland.

9.2 Community Application of Information Technology (CAIT)

The CAIT Initiative was introduced in Spring 2000, following the publication of the Information Society Commission report *IT Access for All*, which sets out a series of recommendations to promote inclusion in the Information Society. One of the key recommendations is that community and voluntary sector organisations should be resourced to bring the benefits of the new technologies to their organisations and constituencies.

Against that backdrop, the CAIT Initiative provided funding to community and voluntary organisations to:

- encourage late adopters to engage with information and communication technologies in a beneficial way
- empower communities to harness the benefits of the new technologies
- employ information and communications technologies to overcome the particular socio-economic barriers that exist in certain communities

A total of €5m in funding was allocated to 71 projects throughout the country. These projects operated for an eighteen-month period between June 2001 and December 2002. The initiative was continued during 2003 (CAIT 2), although the available resources have now been exhausted and a decision is pending regarding how to proceed with a new community-based initiative to address the digital divide.

The CAIT initiative involved a different form of contact with ICTs compared to Equalskills. In addition to providing a basic introduction to computers, the internet and email, training focused on Microsoft Word/Excel, internet research, digital media, spreadsheet and database training as well as a number of other specialised training packages. Participants typically received 30-40 hours of training, a large proportion of which was spent on the basic introduction to computers and the internet. However, possibly the most important aspect of the CAIT initiative lies with its implicit recognition of the fact that the potential of ICTs in relation to social exclusion is not confined to issues of access and skills alone, but also embraces the issue of appropriate and progressive usage.

The final evaluation of CAIT 1 (Duggan and Dunne, 2003) provides a very balanced view of the initiative. It states that *"although access and skill issues were the predominant actions taken under the initiative, a substantial amount of good practice in relation to progressive usage was also developed"* (p.15). The evaluators conclude that *"[n]otwithstanding concerns about having spread its resources too thinly, all the evidence suggests that the organisations participating in CAIT experienced a significant degree of capacity building in relation to new technologies. In relation to the second objective, a much lower level impact was achieved. Case study data suggests that fewer than 15 per cent of projects sought to assimilate new technologies into their community development practices. This is not a weakness in CAIT per se, in that it reflects the aims of the projects themselves, but it does highlight the need to ensure that future Initiatives maintain a broad focus on combating e-exclusion".*

The position of the CAIT evaluators in relation to utilisation of ICTs is therefore quite similar to our stance on the measurement of ICT uptake: narrowing the digital divide is not an end in itself, but rather a means to an end. Duggan and Dunne make a number of recommendations which we believe to be of considerable interest, and are worth citing in full, as they are highly relevant to the formulation of future initiatives:

- Future CAIT or similar initiatives should combine wide-ranging objectives with a strategic approach to project selection in order to ensure an appropriate balance in relation to all objectives.

- Measures to support the role of the community sector in promoting equality in the Information Society should differentiate between the provision of training and other opportunities to clients, on the one hand, and enabling the community sector itself to be an effective user of ICTs.

- Future measures to support the community sector to promote digital inclusion should be accompanied by the provision of technical support, with particular emphasis on promoting awareness of hardware and software, infrastructural requirements and the benefits of networking between projects.

- Community sector organisations should be facilitated to identify the full costs associated with delivering Information Society interventions; the funding made available to them should be adequate to fund all of the required inputs.

- Future initiatives to promote eInclusion through community organisations should address the issue of sustainability either at project level or at local level, either by enhancing the level of support and the amount of resources provided or through parallel and complementary strategies.

The authors of this study fully support Duggan and Dunne's key recommendations in their evaluation of the CAIT 1 initiative. As the Irish Government is currently considering how a new community-based eInclusion initiative should be formulated, we will outline our key recommendations in this respect. Along the lines of CAIT 1 and 2, a new community-based eInclusion initiative should aim to:

- encourage late adopters to engage with information and communication technologies in a positive way
- empower communities to harness the benefits of the new technologies
- employ information and communications technologies to overcome the specific socio-economic barriers faced by specific communities

However, a new community-based initiative should also take note of some of the shortcomings that have been identified in previous initiatives, notably:

- a question mark regarding their long-term sustainability
- the need to provide a stronger overall structure to ensure a more strategic approach
- the need to pay significantly greater attention to the logistical and technological requirements of participating projects

Building on the experience of the Digital Community Project in Dublin's Inner City (for details see Appendix 4), we believe that there is considerable potential for a public-private partnership between existing local development structures (City and County Development Boards, Partnership Companies and Community Groups and Regional Technical Colleges) and major private sponsors at the regional level. This would contribute significantly to the long-term sustainability of a substantial community-based eInclusion initiative, as well as unlocking considerable technical and logistical support. Ireland has a large number of high-profile companies in the IT sector, with an interest in a sophisticated IT environment. Experience from the Digital Community Project indicates that private companies may be willing to contribute to such an initiative, particularly if the Government is willing to underwrite a well-structured public programme.

We further believe that the selection of projects should take place at the regional level (outside Dublin) and at the Local Authority level (within the Greater Dublin area), in order to facilitate a stronger strategic co-ordination of these interventions and a solid logistical and technical support structure. The Digital Community Project, which is the result of a collaborative initiative involving Dublin City Council, the Dublin Inner City Partnership, private companies and, notably, the Dublin Institute of Technology, provides a practical example of how such an overarching support structure can be developed.

Finally, we believe that the benchmarking criteria advanced in this report provide a solid framework for setting realistic and verifiable targets for such an initiative. At the time of this study in 2003, approximately 87 per cent of higher professionals were competent computer users, compared with only 16 per cent of people in the semi- and unskilled manual social classes. Based on a rough extrapolation towards a national initiative that would be roughly twice the size of CAIT 1, it is estimated that the level of computer literacy amongst the most disadvantaged classes could be increased by approximately 6 percentage points per annum. This would represent an excellent achievement in its own terms, would make a substantial contribution towards the development of an inclusive Information Society and would constitute demonstrable progress in relation to the aims of the Government's New Anti-Poverty Strategy.

10 Conclusions

In this chapter, we will draw together the evidence and conclusions presented in previous chapters, as well as providing some more general recommendations regarding the most effective ways of addressing the digital divide and moving towards an inclusive knowledge-based society.

Conceptualising the Digital Divide

Providing physical access to computer technology does not automatically lead to the inclusion of excluded groups. As the Information Society Commission points out in *IT Access for All,* the notion of 'access' also embraces awareness, usability, user friendliness, competence and the availability of technical support. As we showed in Chapter 6, the adoption of a broad, multi-faceted definition of digital inclusion leads to a more nuanced and accurate picture of the digital divide.

On this basis, we feel that greater care should be taken in future studies of the digital divide as far as measurement issues are concerned. For example, ownership of computers and home internet access mask considerable differences with regard to the way in which computers are used by different members of the same household. The extent to which people actually use computers is much more important than the mere presence of a computer, and this is why we need reliable quantitative measures of competence and confidence. We showed in Chapter 6 that, once we employ such measures, the observed variations in computer use greatly exceed those found in relation to computer ownership.

Greater care must also be given to the design of studies which provide benchmark or monitoring data, particularly in relation to sampling strategies, data collection and methods of analysis. Quota sampling, particularly where this is combined with Computer-Assisted Telephone Interviewing (CATI), appears to result in biased estimates of ICT uptake due to selective non-response. Furthermore, sampling strategies should be sensitive to the hierarchical structure of the digital divide, as both individual and neighbourhood attributes influence technology uptake. This is of particular relevance where policy responses to counter uneven uptake of new information technologies include initiatives targeted at specific communities.

The Extent of the Digital Divide

In overall terms, 40 per cent of households in the Greater Dublin Area possess a computer, and 31 per cent can access the internet from their home. As expected, the extent to which individuals have adopted new information and communication technologies is highly dependent upon their social, economic and cultural situation. Social class, income, age, economic status and education are all strongly associated with ICT uptake.

The largest disparities are found in relation to educational achievements, social class and age; being a homemaker or unemployed also has a negative effect on ICT uptake. Interestingly, after controlling for other attributes, gender has only a small effect on ICT uptake. It should, however, be noted that most homemakers are female and that the differentials observed in this respect may therefore add to the disparity between men and women in terms of ICT uptake.

With regards to the measurement of ICT uptake, the largest differentials are observed in relation to competence and confidence in the use of computers. In contrast, computer ownership and home internet access provide the smallest estimates of the digital divide, largely due to the fact that this measure conceals the considerable differences that exist *within* households.

Educational attainments appear to have the greatest predictive power in relation to the digital divide, and comparing individuals with a postgraduate qualification to those who did not progress beyond Primary School, we find that the former are:

- 4 times more likely to have a computer in their home
- 5 times more likely to be aware of computers
- 7 times more likely to use a computer regularly
- 12 times more likely to feel confident in relation to computers
- 20 times more likely to use more than two software packages regularly

These figures not only reveal a considerable social stratification in terms of computer ownership, but also show that the differentials are even larger in relation to computer use. We may therefore conclude that, although greater equity in physical access to computers is a necessary condition for narrowing the digital divide, greater emphasis should be placed on education and training in order to enable those from disadvantaged social and educational backgrounds to participate meaningfully in the Information Society.

Finally, we showed that, for younger age cohorts, the single most important influence on ICT skills is probably their contact with digital technologies at school. The role of schools in enhancing familiarity and competence in the use of new technologies should not be neglected when developing a strategic approach to the development of an inclusive knowledge-based society.

Conclusions and Recommendations

A number of conclusions and recommendation regarding the digital divide in Ireland follow from the analysis presented in the previous chapters.

- The strong correlation between key social, economic and cultural attributes and ICT uptake clearly demonstrates that the digital divide is inseparable from broader forms of social inequality. Interventions which seek to provide access to and/or training in the use of ICTs are likely to be of limited impact unless they are embedded within a broader strategy for combating social exclusion.

- On the other hand, the existence of substantial age cohort effects suggests that, at least in principle, social inequalities do not constitute an insurmountable barrier to the wider use of digital technologies. The digital divide is thus different from other forms of social exclusion, and the provision of training programmes and computer centres in disadvantaged areas can be expected to have a direct effect on rates of computer and internet use within those areas.

- The development of the ICT infrastructure (notably the roll-out of broadband and affordable internet access charges), the regulatory environment, eGovernment and the improvement of internet content all have a bearing on the evolution of the Information Society in Ireland and on the potential social inequalities that accompany this process. Arguably, both central and local Government have an important role to play in supporting disadvantaged communities and ensuring that they are not excluded *a priori* from the emerging knowledge-based society.

- However, even if the ICT infrastructure develops evenly and equitably, this will not by itself ensure that all social groups have the possibility of participating in the Information Society. Physical access to computers and the internet are a necessary precondition for eInclusion, but, as this study shows, this is entirely compatible with the persistence of differentials in the way computers and internet are used.

- It is of the utmost importance that future studies on the digital divide adopt a broad, multifaceted approach to the digital divide, following the conceptual insights developed by the Information Society Commission. This study clearly demonstrates that home access to computers and internet are problematic measures of the digital divide and that greater emphasis needs to be placed on the way that computers are used and the competence and confidence of computer users.

- The present study is the first of its kind in Ireland to use appropriate statistical models to test whether the neighbourhood of residence has an independent and additional effect on a particular aspect of social exclusion, net of individual-level social, economic and cultural attributes. We can demonstrate the existence of significant neighbourhood effects, and this provides support for policy initiatives that are targeted at the most disadvantaged communities.

- The study also shows that informal networks of friends and acquaintances have a strong impact on the uptake of ICTs, and this suggests that the concentrated provision of computer training within specific geographical areas is likely to have a considerable knock-on effect within these areas by introducing additional skills and knowledge into existing networks. Every computer-literate individual in a disadvantaged area constitutes a valuable resource for the local community, as he or she can potentially help others to overcome their fears and difficulties in relation to the new digital technologies. Thus, the aim of 'training future trainers' has a much wider relevance than one might initially imagine.

- Our survey of second-level schools in Dublin identifies significant shortcomings in the resources available for computer instruction. Whilst most schools believe that they are under-resourced in relation to equipment and computer facilities (particularly affordable broadband access), even greater shortcomings are apparent as far as the utilisation of the existing equipment is concerned. The number of hours dedicated to computer instruction is strictly limited and there appears to be a considerable shortage of personnel to facilitate wider student access to existing facilities outside formal class hours.

- In a similar vein, it is clear that existing ICT facilities within local schools have the potential to benefit the wider community to a much greater extent than at present. Whilst a significant number of vocational, community and comprehensive schools – and PLCs in particular – provide night classes in computer operation, these are rarely found in Secondary schools.

- There are strong arguments in favour of the development of a new, publicly-funded and community-based eInclusion initiative along the lines of the successful CAIT 1+2 Initiatives. Based on the recent evaluation of CAIT 1, and following from the arguments presented in this report, we believe that such an initiative should be based on a public-private partnership involving existing local development structures (City and County Development Boards, Partnership Companies and Community Groups, and Regional Technical Colleges) and, ideally, major private sponsors at regional level.

- Finally*,* this study provides detailed benchmark data on the extent of the digital divide in the four Local Authority areas in Dublin. For the first time, this means that eInclusion initiatives can be evaluated in terms of their contribution to narrowing the digital divide. This necessarily alters the policy-making environment, making it possible to set clear targets for public interventions that tackle digital exclusion and facilitating an unambiguous evaluation of their achievements within a given timeframe.

Bibliography:

Birdsell, B. Muzio, D. , Krane, D. and Cottreau, A. (1998) 'Web Users are Looking more Like America'. *The Public Perspective*. 9(3):33

Dublin City Development Board (2002) *Dublin – A City of Possibilities.*

Dublin City Development Board (2002) *Universal Participation – The key to bridging the digital divide.*

DIT Centre for Social and Educational Research (2001) *Final Evaluation Report to the Dublin Inner-City School Computerisation (DISC) Project.*

Duggan, C. and Dunne, K. (2003) *Community Application of Information Technology: Final Evaluation of the CAIT Initiative.* WRC Social & Economic Consultants.

Dublin Chamber of Commerce (2001) *Dublin as a World Class e-City.*

Haase, T. (1996) *Index of Relative Affluence and Deprivation.*

Information Society Commission (2000) *IT Access for All.*

Information Society Commission (2001) *How the General Public is Adapting to the Information Society in Ireland.*

Information Society Commission (2002) *Building the Knowledge Society.*

Irish Government (2002) *New Connections – A strategy to realise the potential of the Information Society.*

Irish Government (2003) *New Connections – Progress Report.*

Hibernian Consulting (2002) *Improving Access to ICTs for Socially Excluded Communities in Clondalkin.* (Draft report).

Hoffman, D. L. and Novak, T. P. (1999) 'The Evolution of the Digital Divide: Examining the Relationship of Race to Internet Access and Usage over Time'. Paper presented at the conference Understanding the Digital Economy: Data, Tools and Research

Kaplan, D. (2002) *In-School versus Out-of-School ICT Learning: Preliminary Findings for the United States.* School of Education, University of Delaware.

Kreft, I. and de Leeuw, J. (1996) *Introducing Multilevel Modeling*. London: Sage.

MRBI (2002) ‘Consumer Demand for Broadband in Ireland – Survey Findings’. Paper delivered by Ian McShane, Managing Director, MRBI, at the ODTR National Conference, 2002.

Nie, N. and Erbring, L. (2000) *Internet and Society: A Preliminary Report*. Stanford Institute for the Quantitative Study of Society. February 17. Stanford University, CA

OECD (2000) *Information Technology Outlook*. Paris: OECD

O’Donnell, S., Trench, B. and Ennals, K. (1998) *Weak Connections – The Voluntary Sector in the Information Age.* DCU School of Communications.

O’Donnell, S., Mcquillan, H., and Malina, A. (2003) *eInclusion – Expanding the Information Society in Ireland.* Itech Research. (Draft Report).

Norris, P. (2001) Digital Divide. Civic Engagement, Information Poverty & the Internet Worldwide, New York: Cambridge University Press.

Pew Research Center (1998) The Internet News Audience Goes Ordinary.

Resnick, D. (1998) 'Politics on the Internet: The Normalization of Cyberspace', in *The Politics of Cyberspace*. Ed. Chris Toulouse and Timothy W. Luke. NY: Routledge.

Rogers, E. M. (1995) *Diffusion of Innovations*. 4th edition. New York: Free Press.

Walsh, E. O. (2000) *The Truth about the Digital Divide*. The Forrester Report. Forrester Research Inc.

Warren, P. *et al.* (2002) *Ex-Post Evaluation of the Equalskills Initiative.* Chinook Consulting.

Wilhelm, A. G. (2000) *Democracy in the Digital Age*. New York: Routledge

Appendix 1: Comparison of Population and Sample Characteristics

Table A2.1 Comparison of Population and Sample Characteristics

	1996 Census of Population	Sample Population	Dublin City	County Dublin	South Dublin	Fingal	Dun Laoghaire -Rathdown
Higher Professionals	7	8	5	11	8	7	19
Lower Professionals	24	17	16	18	18	12	24
Other non-manual	20	25	24	26	23	31	26
Skilled manual	18	21	22	20	18	27	16
Semi-skilled manual	12	24	28	20	29	18	12
Unskilled manual	6	5	5	5	5	5	4
n/a *	13						
Total	100	100	100	100	100	100	100
More than 4,000	n/a	5	5	4	10	7	31
3,000-4,000	n/a	23	29	18	21	6	13
2,000-3,000	n/a	30	30	30	17	17	23
1,000-2,000	n/a	17	16	19	33	41	14
500-1,000	n/a	12	10	14	15	23	17
Less than 500	n/a	13	11	16	4	6	2
Total	n/a	100	100	100	100	100	100
Male	**48.4**	**48.4**	46	50	51	50	50
Female	**51.6**	**51.6**	54	50	49	50	50
Total	**100.0**	**100**	100	100	100	100	100
Under 16		2	1	2	4	3	0
16-25	24	16	15	18	21	19	12
26-35	21	23	25	21	22	22	20
36-45	18	18	19	17	16	17	19
46-55	14	13	12	15	15	16	13
Over 55	23	27	28	27	22	23	36
Total	100	100	100	100	100	100	100
Student or pupil	13	8	6	9	11	10	6
Working for payment	46	51	50	52	54	49	52
Home duties	18	19	20	18	20	18	16
Unemployed	4	5	6	4	4	4	3
Unable to work	n/a	1	1	1	0	3	0
Retired	9	16	16	15	9	15	22
Total	90	100	100	100	100	100	100

	1996 Census of Population	Sample Population	Dublin City	County Dublin	South Dublin	Fingal	Dun Laoghaire -Rathdown
Postgraduate Qualification	25	6	5	6	*1*	*4*	*15*
Third Level - degree		13	11	15	*9*	*10*	*27*
Third Level - non-degree		13	14	12	*13*	*9*	*14*
Leaving Certificate	50	28	24	32	*29*	*40*	*27*
Junior/Inter Certificate		19	21	16	*23*	*19*	*6*
Primary education	25	22	26	19	*26*	*18*	*11*
Total	100	100	100	100	*100*	*100*	*100*

Note that where social class is not specified, the individuals concerned should not be re-distributed across the six social classes, as they are known to be concentrated at the low end of the social class spectrum, and this confirms the overall alignment of the sample with the study area population.

Appendix 2: Overview of Findings from the Household Survey

Table A3.1 Various Uptake Rates by Social and Demographic Characteristic

	Awareness of Computers	Computer User	Computer in Household	Use of more than 2 Applications	Confident in Computer Use		Awareness of the Internet	Internet User	Internet in Household	ISDN in Household	Broadband in Household
Higher Professionals	90	82	71	73	69		90	79	63	11	1
Lower Professionals	75	66	55	55	54		73	65	45	5	2
Other non-manual	66	58	45	42	38		60	53	35	6	4
Total	**53**	**47**	**40**	**34**	**32**		**50**	**43**	**31**	**5**	**2**
Skilled manual	40	34	33	19	17		38	31	22	3	1
Semi-skilled manual	31	28	26	14	14		28	22	17	4	2
Unskilled manual	23	18	15	14	6		18	14	9	3	0
More than 4,000	81	69	63	61	61		78	68	56		
3,000-4,000	63	49	41	38	34		62	47	34		
2,000-3,000	67	62	51	49	46		64	60	44		
Total	**53**	**47**	**40**	**34**	**32**		**50**	**43**	**31**		
1,000-2,000	51	45	39	29	27		46	39	24		
500-1,000	29	28	24	14	13		26	24	18		
Less than 500	34	31	19	18	8		29	29	13		
Male	58.4	50.2	41.7	38.4	37.4		56.0	46.9	33.5		
Total	**53.5**	**47.1**	**40.0**	**33.8**	**31.6**		**50.0**	**43.5**	**30.8**		
Female	48.9	44.2	38.5	29.6	26.1		44.3	40.3	28.2		
Under 16	81	85	60	40	42		65	52	35		
16-25	79	73	54	59	55		77	70	39		
26-35	68	58	41	46	41		66	56	33		
36-45	62	56	48	35	33		58	49	35		
Total	**53**	**47**	**40**	**34**	**31**		**50**	**43**	**31**		
46-55	49	44	44	28	27		45	43	40		
Over 55	19	15	22	9	9		16	13	17		
Student or pupil	91	84	56	65	55		86	73	41		
Working for payment	70	65	50	49	46		67	60	40		
Total	**54**	**47**	**40**	**34**	**32**		**50**	**44**	**31**		
Home duties	30	19	30	9	9		25	18	22		
Unemployed	39	31	23	24	19		36	29	13		
Unable to work	28	11	22	6	0		28	17	17		
Retired	16	13	17	5	7		12	12	14		

	Awareness of Computers	Computer User	Computer in Household	Use of more than 2 Applications	Confident in Computer Use	Awareness of the Internet	Internet User	Internet in Household
Postgraduate Qualification	97	93	80	85	79	97	94	68
Third Level - degree	90	82	65	73	67	88	81	56
Third Level - non-degree	79	76	58	60	60	77	73	47
Total	**53**	**47**	**40**	**34**	**32**	**50**	**43**	**31**
Leaving Certificate	59	46	33	31	25	55	42	27
Junior/Inter Certificate	34	32	33	14	14	29	26	18
Primary education	16	13	20	4	6	12	8	13

Table A3.2 Correlations at Individual and Neighbourhood Levels

	Awareness of Computers	Computer User	Computer in Household	Use of more than 2 Applications	Confident in Computer Use	Awareness of the Internet	Internet User	Internet in Household
Individual Level:								
Social Class	-.41	-.37	-.29	-.40	-.40	-.42	-.39	-.31
Household Income	.33	.25	.24	.31	.32	.33	.27	.27
Age Group	-.44	-.41	-.21	-.37	-.33	-.43	-.38	-.14
Education	.54	.51	.35	.54	.51	.56	.55	.36
Neighbourhood Level:								
Proportion in Higher and Lower Professional Classes	.75	.61	.48	.71	.75	.77	.65	.64
Proportion in Semi- and Unskilled Manual Classes	-.73	-.56	-.40	-.58	-.62	-.73	-.60	-.55
Proportion with Third Level Education	.79	.73	.50	.81	.82	.81	.79	.60
Proportion with Primary Education	-.68	-.57	-.40	-.59	-.62	-.69	-.60	-.49

Appendix 3: Neighbourhood Comparisons

This Appendix will shed light on the relationship between the three dependent variables used in the multilevel models presented in Chapter 7 – familiarity with digital technologies, computer anxiety and computer competence – and a representative set of neighbourhood characteristics. We will use scatterplots to illustrate the strong correlations that exist between these variables once they are aggregated to neighbourhood level.

As noted at the beginning of this report, the forty study neighbourhoods were selected randomly, and consequently range from the most affluent – including Killiney North, Blackrock-Williams and Blackrock-Carysford – to the most disadvantaged – including Decies, Drumfinn, Ballybough A and Tallaght-Avonbeg. When we aggregate all data to neighbourhood level, variations in familiarity with digital technologies, computer anxiety and computer competence can be predicted quite accurately on the basis of the social and economic composition of these local areas. The figures below illustrate this in graphical form: the straight line in these graphs indicates the regression line, which represents our ‘best guess’ based on the information provided by the explanatory variable; the curved lines demarcate a 95 per cent confidence interval around this line. In other words, all points that fall within the two curved lines are approximately in line with our predictions based on the single socio-economic variable included in the graph. Our sole aim in this Appendix is to illustrate the extent to which ICT uptake is geographically clustered in Dublin, and to show how this clustering relates to the composition of the areas in question.

When interpreting the graphs presented below, it is worth bearing in mind that the neighbourhoods sampled for this study typically comprise a small number of neighbouring streets. They are therefore not always representative of the areas associated with the names used to identify them in the graphs. Nevertheless, readers who are familiar with the extent and history of social segregation in Dublin will find few surprises in this Appendix.

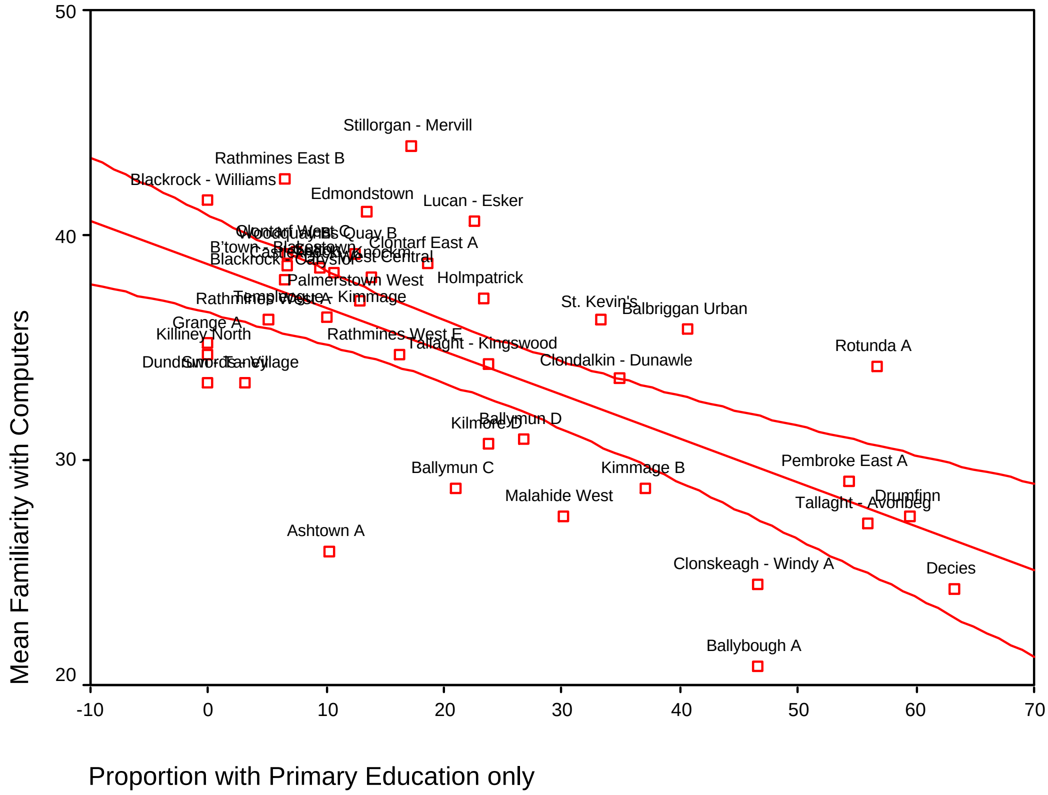
Regardless of the combination of outcome and explanatory variables that we select, essentially the same picture emerges:

- The composition of the neighbourhoods, in terms of their educational, social class, income and age profiles, is a strong predictor of familiarity with digital technologies, computer anxiety and competence.

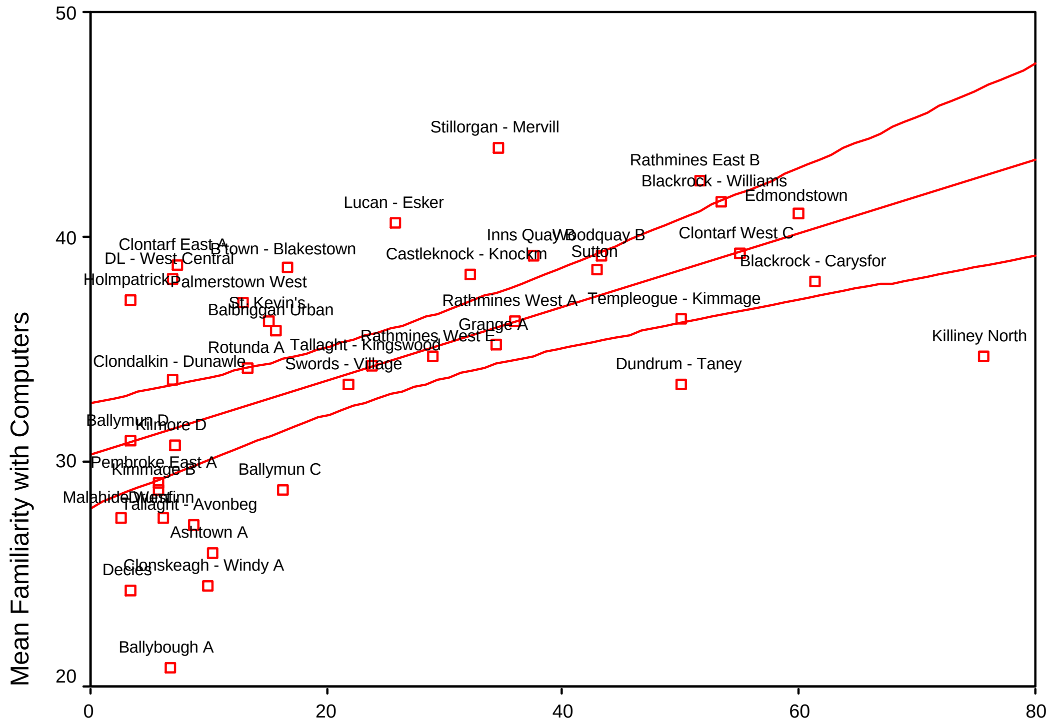
- Uptake of ICTs in certain neighbourhoods is regularly higher than what we might have expected on the basis of their socio-economic make-up, including Stillorgan – Merville, Edmondstown and Lucan-Esker.

- In other neighbourhoods, ICT uptake is systematically below what we might have expected given their socio-economic profile, including Ballybough A, Ashtown A, Malahide West and Ballymun C.

Neighbourhood Characteristics and Computer Familiarity

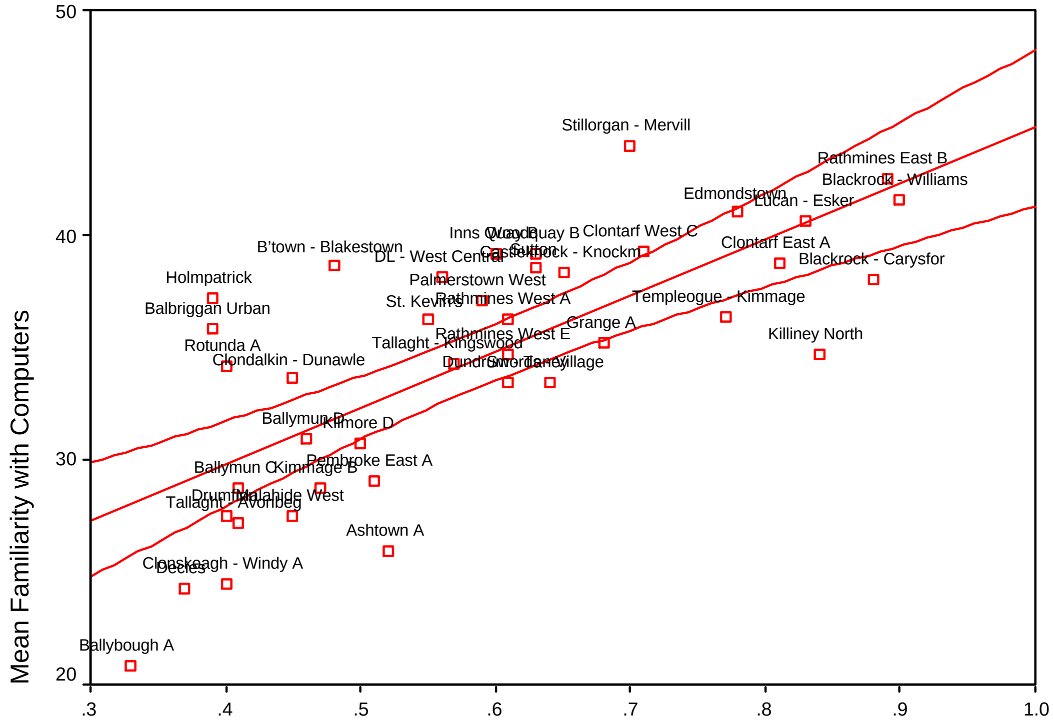


Neighbourhood Characteristics and Computer Familiarity



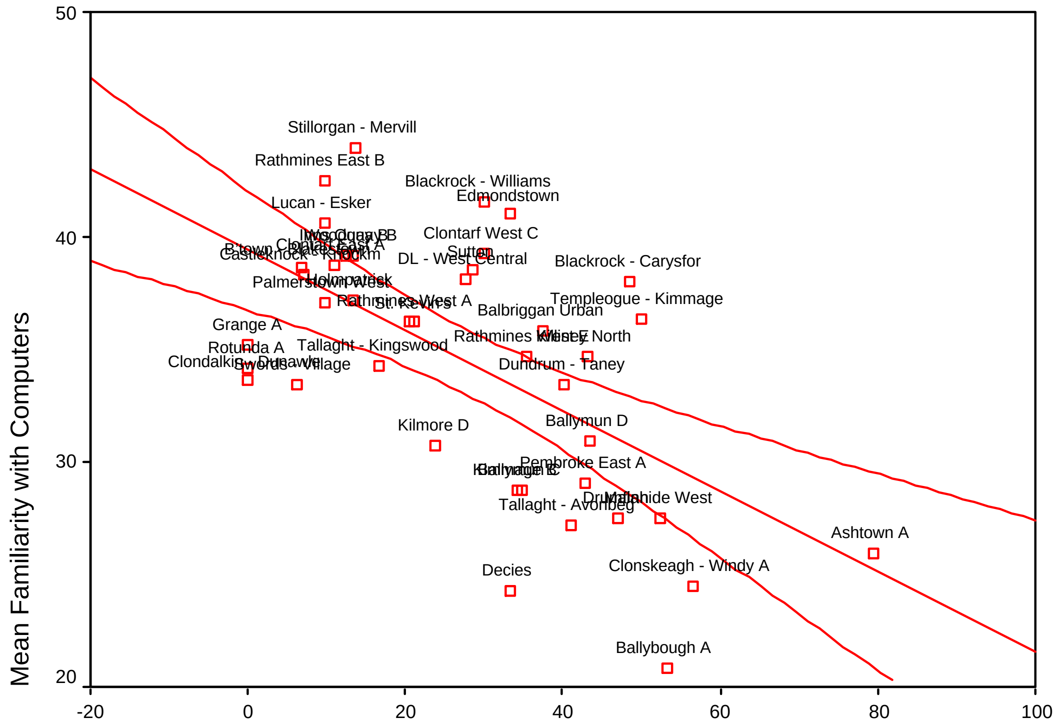
Proportion in Higher Class

Neighbourhood Characteristics and Computer Familiarity



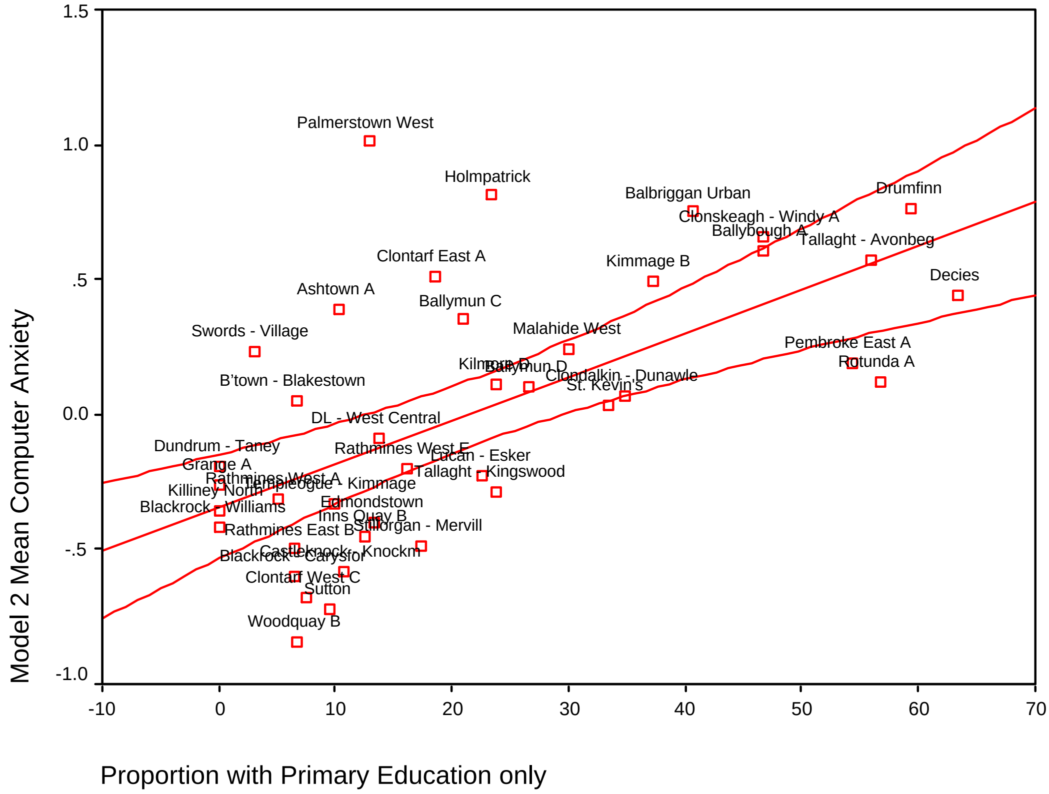
Mean Income

Neighbourhood Characteristics and Computer Familiarity

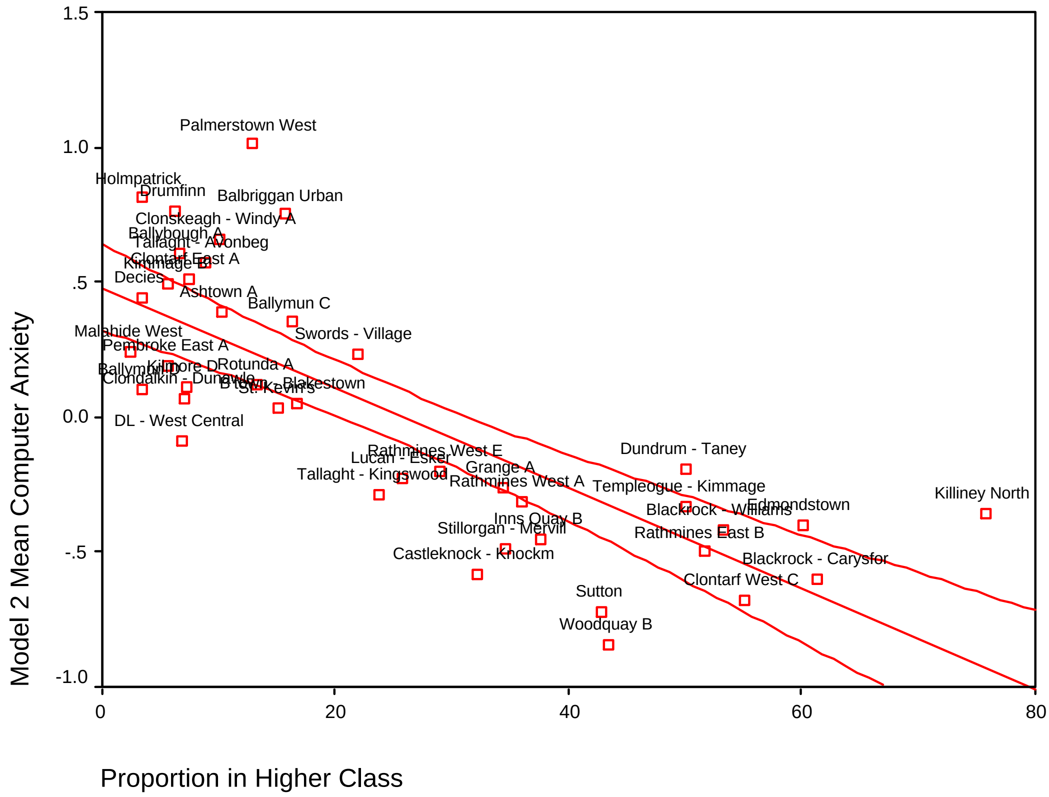


Proportion aged over 55

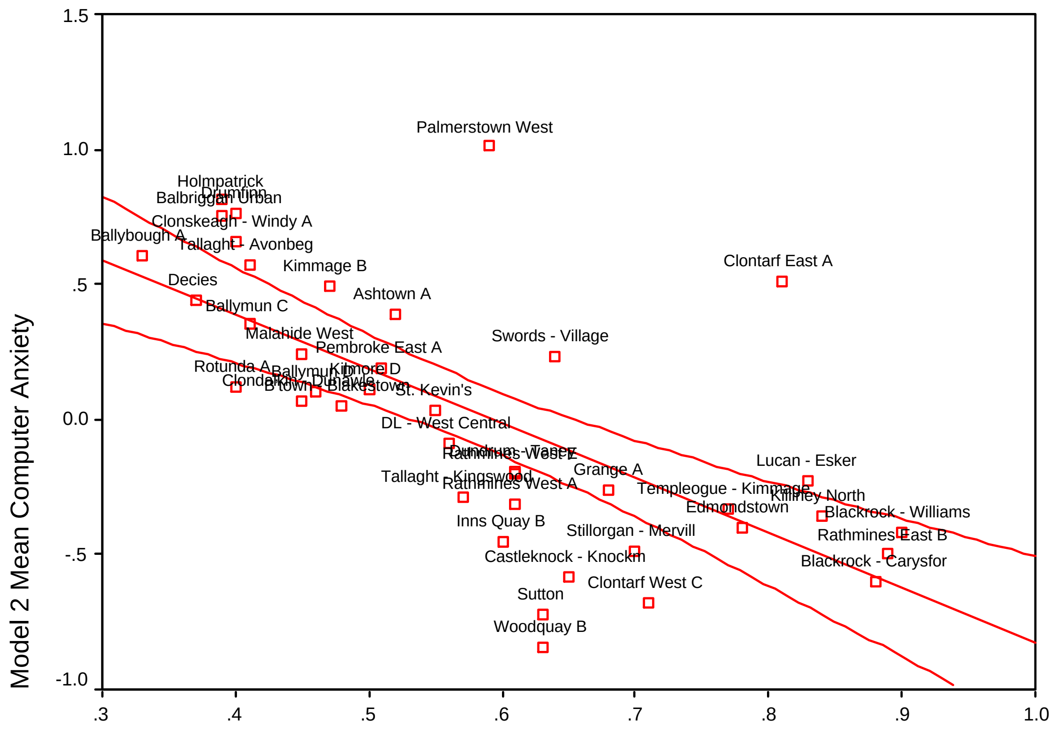
Neighbourhood Characteristics and Computer Anxiety



Neighbourhood Characteristics and Computer Anxiety

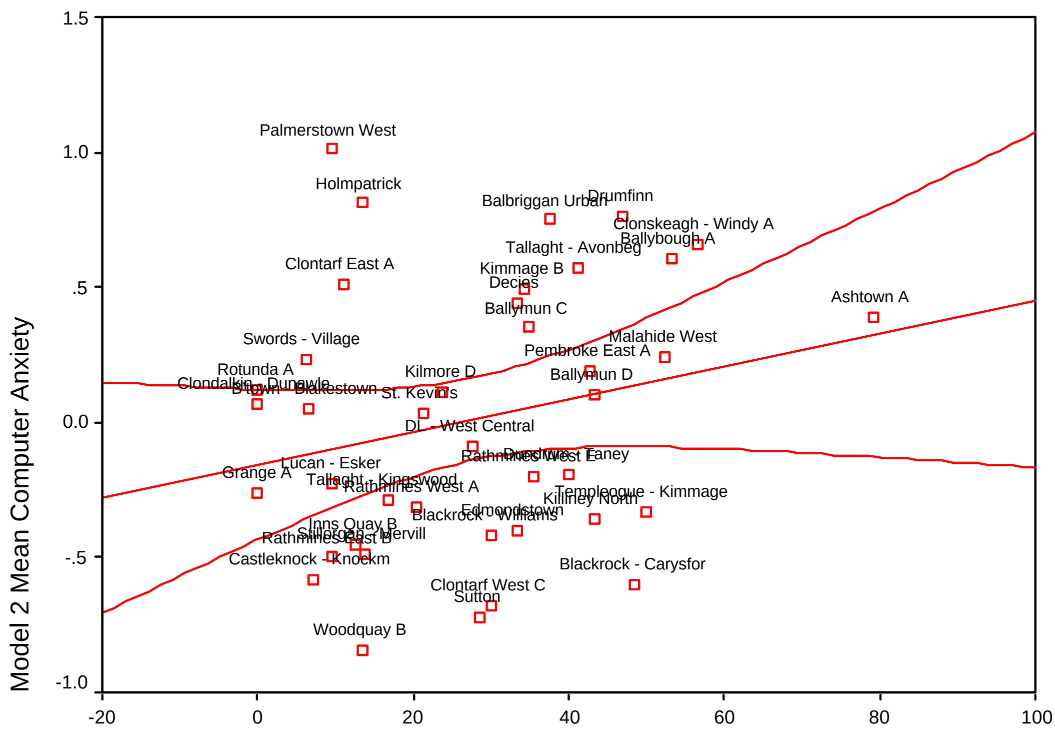


Neighbourhood Characteristics and Computer Anxiety



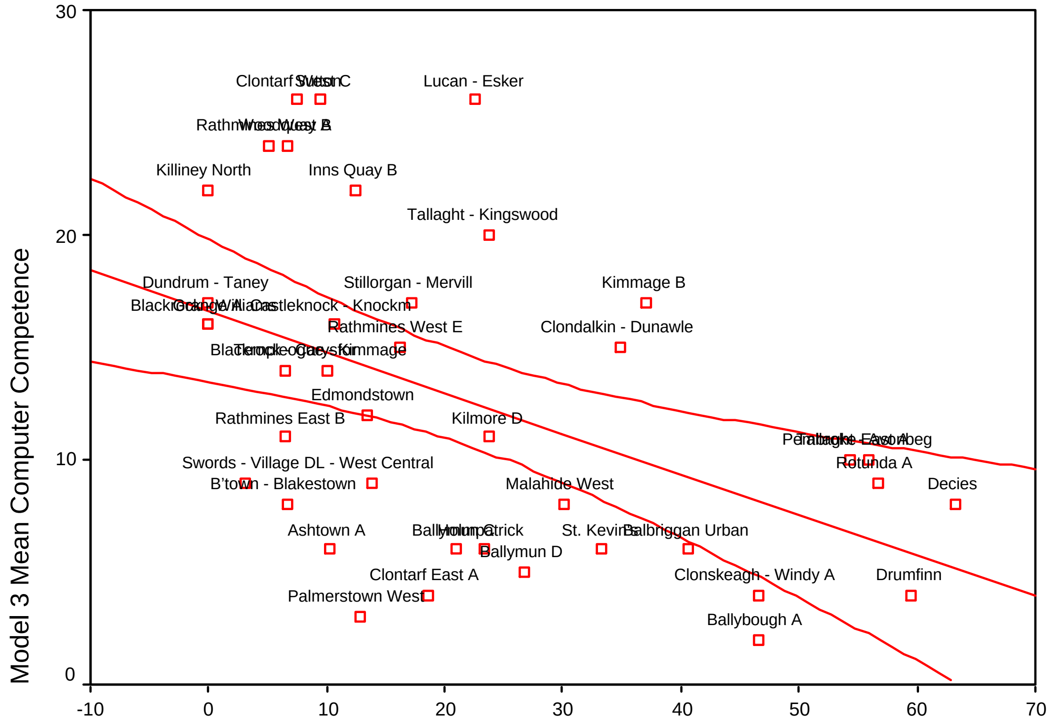
Mean Income

Neighbourhood Characteristics and Computer Anxiety



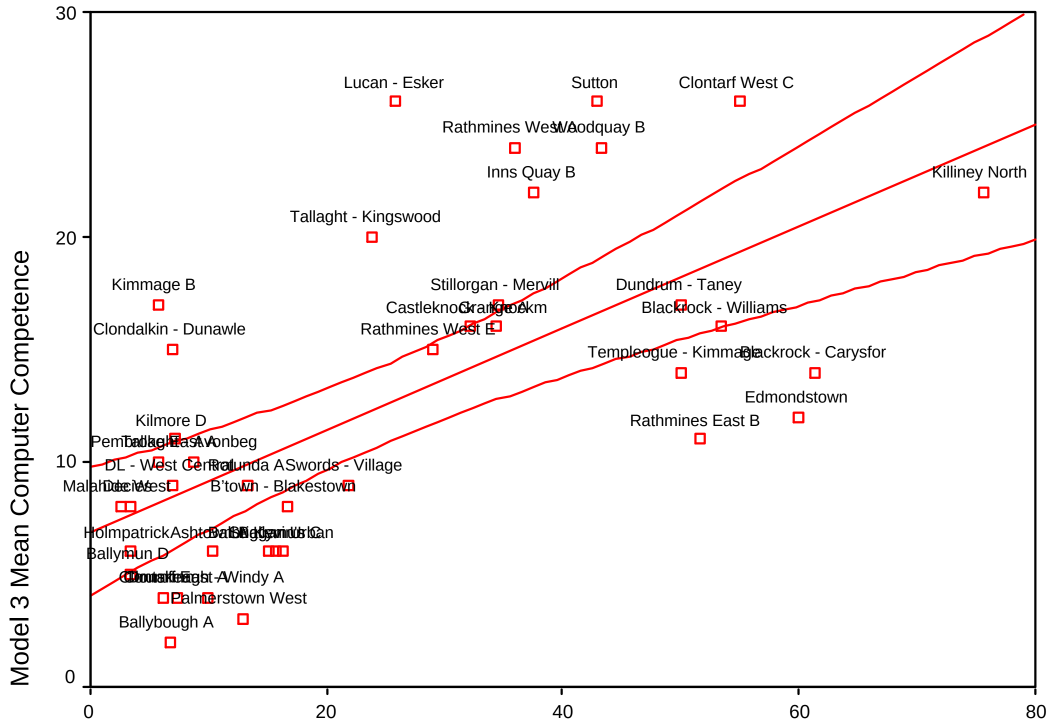
Proportion aged over 55

Neighbourhood Characteristics and Computer Competence



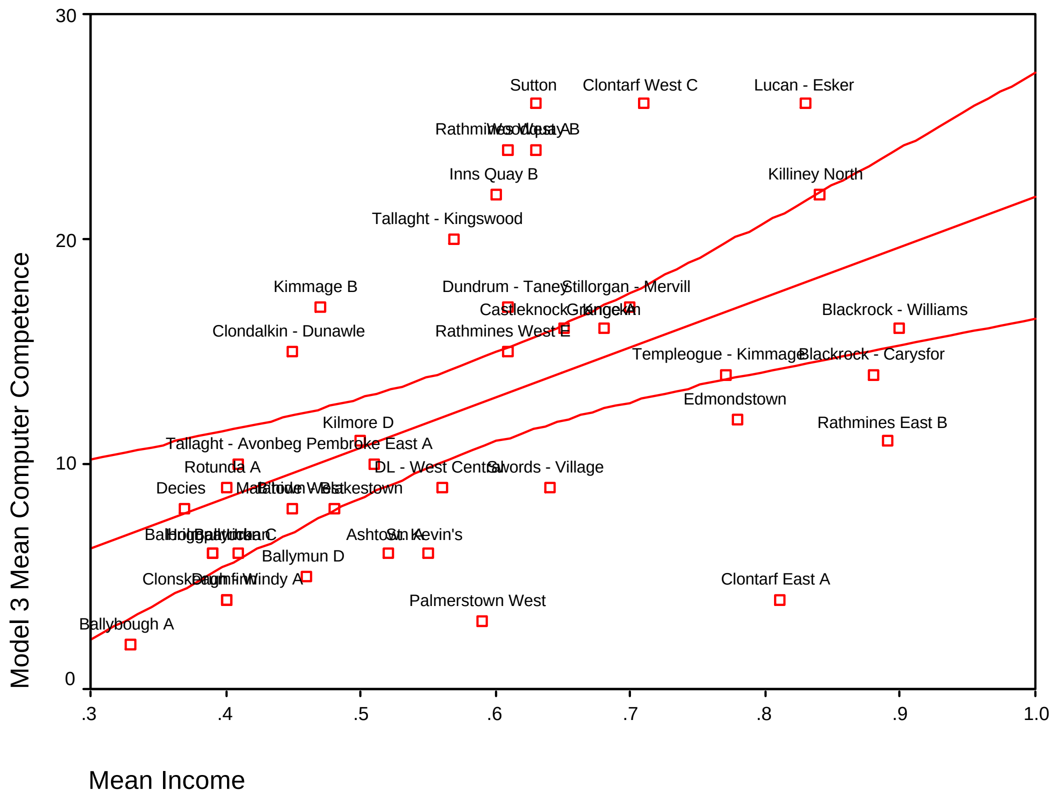
Proportion with Primary Education only

Neighbourhood Characteristics and Computer Competence

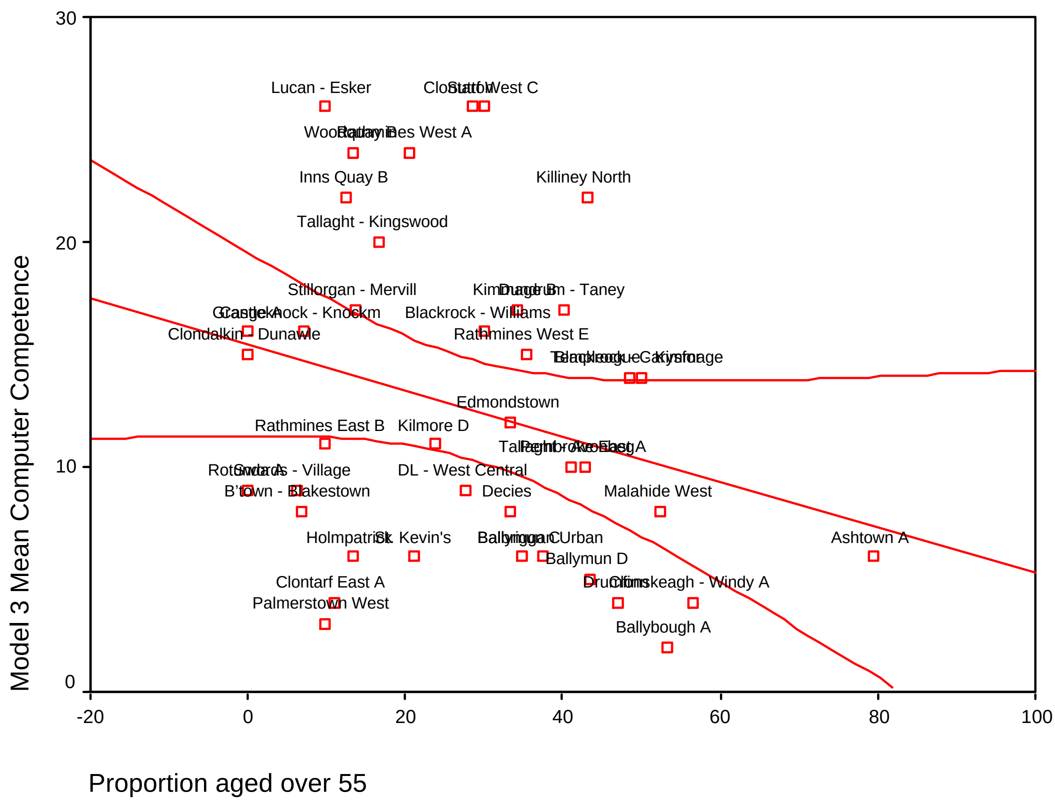


Proportion in Higher Class

Neighbourhood Characteristics and Computer Competence



Neighbourhood Characteristics and Computer Competence



Appendix 4: The Digital Community Project (Dublin)

Over the past two years, valuable experience has been gained from the Digital Community Project in Dublin, which we believe addresses some of the most problematic issues that were identified in the evaluation study of CAIT 1. The Digital Community Project is a spin-off of the Dublin Inner-City Schools Computerisation (DISC) Project, and represents a major IT initiative situated in the heart of some of Dublin's most disadvantaged communities. It is novel in a number of ways and provides some important indications for future Government-sponsored initiatives to address the digital divide.

The DISC project itself was established in 1998 with the aim of upgrading disadvantaged inner city primary and post-primary schools. The project is spearheaded by the Dublin Institute of Technology (DIT), Fujitsu Siemens (Phase 1), Hewlett Packard (Phase 2), the National Centre for Technology in Education of the Department of Education and the Dublin Inner City Partnership (DICP). The project is currently working with 40 inner-city schools, and embraces approximately 7,000 young people and 600 teachers. Since its establishment, DISC has assisted in the upgrading of 35 of these schools and has provided computer training for more than 500 teachers.

The Digital Community Project was a logical consequence of the experience gained as a result of the DISC project, that of bringing a major IT initiative directly into a disadvantaged community. The project is unique in that it brings together a partnership of the business, educational, government and community sectors in providing high-density inner-city flat complexes with state-of-the-art computer facilities and IT training. So far, eleven locations have been included in the initiative, all of which are based within disadvantaged housing complexes; it is intended to expand this initiative within the constraints imposed by the available resources.

The centres are equipped with a minimum of 10 PCs each, as well as a range of peripherals and appropriate software. Training programmes are under development, based on the specific needs of local people, including training for young people, the unemployed and people interested in improving their work skills. A novel element of the programme is the 'training of trainers', an approach that guarantees a significant number of jobs at the end of a process of high-level training, with the condition attached that, after completion, participants must themselves work in the centres for a certain period of time. The idea is thus to establish a pool of trainers within the community who can help the local centres to become self-sustaining. The project is closely embedded in a wider strategy to tackle the various forms of disadvantage experienced by the respective communities and many of the projects provide general literacy tuition back-to-back with computer training.

In terms of its institutional foundations, the Digital Community Project is a collaborative initiative between the Dublin Institute of Technology, Dublin Inner City Partnership, Dublin City Council, Eircom, Hewlett Packard, the Digital Hub and the National Centre for Technology in Education, as well as the various residents' groups based in the participating areas.

The Digital Community Project resembles some of the initiatives funded under CAIT, including:

- an understanding that the digital divide is an expression of the wider disadvantage experienced by specific communities;

- that imparting digital literacy is not an end in itself but has to serve the wider emancipation of disadvantaged communities;

- that this requires a strong emphasis on training as well as consideration of the uses to which newly-acquired skills are put;

- the initiatives are also similar in terms of the depth of their engagement, involving a typical training period of 30-40 hours.

However, the initiative is also novel in a number of respects:

- The Digital Community Project is based on a public-private partnership, involving not only the provision of funds, but also the active involvement of some high-profile local IT companies.

- One of the critical points in the CAIT 1 evaluation regards the lack of logistical backup and technical support, specifically during the early phases of newly-established projects. In many cases, projects were forced to make major funding decisions prior to the actual commencement of training, and therefore without the necessary preparation, resulting in a sub-optimal allocation of scarce resources.

- In contrast, all of the community-based centres supported under the Digital Community Project have the full support of an overall Director and Project Manager, as well as considerable support services provided by the Dublin Institute of Technology. The Digital Community Project is a major undertaking for the DIT and Hewlett Packard, which have both allocated considerable resources to the initiative.

The authors of this study believe that these innovations are of considerable importance, as they address some of the key issues involved in creating long-term sustainable community-based IT initiatives in Ireland's most disadvantaged communities.

Appendix 5: A New Community-based eInclusion Initiative

The authors of this study generally agree with the findings of the CAIT 1 evaluation and suggest that a new community-based initiative should be developed along the general lines of CAIT 1 and 2. However, as we showed in Section 9.3, we believe that important additional lessons can be learned from the Digital Community Project, and these are outlined in Appendix 5. In this Appendix, we will provide a rough indication of the size and scope of a potential new initiative and show how the projections outlined in Section 9.3 were calculated.

The Digital Community Project (Dublin) currently supports eleven projects, each of which has an average of roughly ten computers, implying that between them these projects provide approximately 100 training places. At an average of 30-40 contact hours – we believe this to be the minimum required in order to achieve a sustainable level of computer literacy – the initiative has the potential to train up to 100 people per week (although each course may obviously be spread out over a number of weeks). With a training period of 40 weeks per annum, the initiative can, in theory, introduce roughly 4,000 people to basic computing each year.

As all of the centres supported by the Digital Community Project are located within the most disadvantaged housing complexes in Dublin's Inner City, the initiative is highly targeted: almost all of its beneficiaries are at risk of social and digital exclusion. Projecting this initiative to Dublin City, to the other three Dublin Local Authority Areas and to the Regions outside Dublin, the following picture emerges:

Table 10.1 Projections for a community-based eInclusion Initiative

Area	Number of Projects	Estimated Number of Beneficiaries per annum
Dublin Inner City	10	4,000
Rest of Dublin City	10	4,000
Fingal	10	4,000
South Dublin	10	4,000
Dun Laoghaire-Rathdown	10	4,000
Greater Dublin Area (Sub-total)	**50**	**20,000**
Rest of Southern and Eastern Region	50	20,000
BMW Region	50	20,000
Total	**150**	**60,000**

An initiative of this size would have roughly twice the capacity of the CAIT 1 Initiative (71 projects and about 31,000 beneficiaries). It would have the capacity to reach approximately 60,000 disadvantaged people, enabling them to take their first steps towards participating in the developing knowledge-based society.

There are approximately 3 million adults in Ireland, and roughly 20 per cent (600,000) of these fall within the Semi-Skilled and Unskilled Manual social classes. If we project the results of our survey from Dublin to Ireland as a whole, our benchmark data indicate that only 14 per cent (84,000) of these people currently have the skills to use ICTs effectively. An initiative that reaches 60,000 well-targeted beneficiaries within one year would have a sizeable and measurable impact on the digital divide. Even allowing for lack of targeting, drop-out and unsuccessful outcomes at a rate of 40%, such an initiative would raise the percentage of people within these social class categories who are computer literate from 14 to 20 per cent within the space of one year. We believe that this is a feasible target, one that can be verified empirically, and one that would make a major contribution to the National Anti-Poverty Strategy.