Gender in the Information Society: Strategies of Inclusion

WENDY FAULKNER AND MERETE LIE

This article reports from a European study on efforts to close a gendered digital divide through inclusion. The authors argue that inclusion is not just a mirror image of exclusion, and that to achieve inclusion, it is not sufficient to curb exclusion mechanisms but to enhance positive measures of inclusion. A variety of inclusion strategies have been studied, the authors concluding that 'one size does not fit all'. Therefore, to reach a wide audience, a combination of many different strategies is needed. More women users are not sufficient to increase women's influence on ICT development, however. Particular measures are needed to recruit more women into the ICT profession and to curb marginalization within the profession.

The research that we shall present is a joint European project that started from the premise that overall more women than men are excluded from the information society.[1] In literature and statistical overview, we found that there is a general increase in the number of women using Information Communication Technologies (ICTs), whereas there is not a corresponding increase in women working within the ICT professions (Sørensen and Stewart 2002). The shift from computing as a technical field to an emphasis on information and communication was followed by an optimistic cyberfeminist trend (Plant 1997). There was a belief that a demand for 'feminine skills' would replace masculine technical skills within ICT

Wendy Faulkner, Reader, Science Studies Unit, University of Edinburgh, 21 Buccleuch Place, Edinburgh EH8 9LN, Scotland. Email: w.faulkner@ed.ac.uk
Merete Lie, Professor, Department of Interdisciplinary Studies of Culture, Norwegian University of Science and Technology, N-7005 Trondheim, Norway. Email: merete.lie@hf.ntnu.no

Gender, Technology and Development 11 (2), 2007: 157–177
Sage Publications Los Angeles/London/New Delhi/Singapore
DOI: 10.1177/097185240701100202

use and professions. In spite of this optimism, it is clear that diffusion alone is not sufficient to close the gap all together, especially concerning the professional work of ICT (cf. Lagesen 2005; Lie 2003; Wajcman 2004).

Our literature review at the start of the project confirmed that there is still a gender gap in terms of ownership of ICT products, and to a lesser extent, in terms of access and use (Sørensen and Stewart 2002). It also confirmed that gender cuts across other dynamics in the digital divide—income, occupation and age generally being more significant than gender, with other factors (for example, ethnic minorities, lone parent families) also intervening. Though the trend is optimistic concerning ICT use, there is a persistent and sizable gender gap within the computer professions designing ICTs. In most western countries, the proportion of women entering computer science and engineering courses is static or in decline, even in cases of sustained inclusion efforts. Here the trend may actually be different in some parts of Asia (Lagesen 2005; Ng and Mitter 2005). Across Europe, however, the overall picture is a contradictory one: optimistic with respect to what we call women *and* ICT (that is, women as users) and pessimistic with respect to women *in* ICT (that is, women within the ICT professions).

A conscious choice in our research was to focus on processes of inclusion rather than exclusion. The main research effort consisted in case studies of different inclusion strategies, and our ambition was to cover a wide variety of possible ways to inclusion. The case studies included initiatives to reach those with no prior knowledge nor access to computers as well as initiatives towards women computer specialists.

We must stress that this is a European study, including empirical cases from five different countries: Ireland, Scotland, The Netherlands, Italy and Norway. Interesting differences that we may mention are more public efforts to advance equal opportunities in Norway than in the other countries and marked differences in gender relations in Southern and Northern Europe. The study has, however, not aimed at national comparisons but at studying a wide variety of inclusion efforts. Studies from other parts of the world would certainly expand our knowledge of gender and inclusion/exclusion in relation to ICT.[2]

The aim of this article is to draw together the main findings of the study. For those who are interested, the case studies will present more

varied and 'thicker descriptions' of the various inclusion strategies.[3] This article is structured around the main crosscutting themes resulting from the analyses of the case studies. A few individual case studies are described in outline to illustrate some key points.

We begin with an overview of the case studies we have conducted and continue with a discussion of the notion of digital inclusion related to gender. In the presentation of the results, we shall start with themes that are general to inclusion and move on to themes that are more gender specific. We shall introduce the following themes: *challenging gender binaries and essentialist understandings of gender*; and the importance of *informal learning strategies.* We shall show that in some instances, *women centered spaces* are still needed; keep a focus on *design* of ICT products; and finally, argue that *numbers matter*.

The Case Studies

The SIGIS project involved case studies of different types of inclusion strategies, backed up by a sizable crosscutting analysis (Faulkner 2004; Rommes et al. 2004; Sørensen 2004). We investigated 30 different public and private sector initiatives that included women in the design or use of ICT (Lie and Sørensen 2003; MacKeogh and Preston 2003); a further 18 'user studies' solicited end-user experiences of selected strategies (Oudshoorn et al. 2003). The inclusion strategies investigated differ on a number of counts.

First, they cover a wide range of inclusion goals and measures, in diverse social settings: school and university education in ICT; basic and vocational ICT training (for socially excluded groups and specific occupations); design of new ICT products for female audiences (mobile phones, web publications and computer games); measures to increase the recruitment of women into ICT occupations; and finally, support networks for professional women in ICT sectors, both virtual and in 'real life'.

Second, there are several important differences in terms of how these strategies were framed. Basically, they included initiatives both within the public sector and voluntary work, and the private, commercial sector. There were initiatives that had gender inclusion as an explicit objective, whereas other cases were chosen because we observed that they had this as the 'de facto' outcome. Some initiatives were aimed particularly at women, whereas others were 'for everybody', including women.

Third, our analysis suggests a further conceptual distinction based on different kinds of inclusion thinking or processes underlying the different strategies. A common strategy is that of increasing skills and overcoming computer reticence by different types of training courses. Another is by facilitating informal ICT learning. One strategy is to creating women-friendly spaces. A different one is aiming at redefining symbolic images of ICT that associate them to men and masculinities such as the image of the nerd or hacker. And finally, one strategy is to create virtuous circles by improving the relative numbers of women within ICT contexts.

All the case studies revealed some degree of success in inclusion of women, across the variety of dimensions listed above. Accordingly, gender inclusion in the information society can occur through a variety of strategies, including all of the dimensions listed here.

The overall research strategy is explorative in nature. The aim has been not only to identify successful inclusion but also to find out why and in which ways a strategy is successful. Qualitative methods were needed to look into these processes. The main methodological approach of the case studies has been interviews with key personnel of the initiatives. The interviews have in several cases been supplemented by observation, for example, of courses and teaching. In the studies of web pages, interviews with designers have been followed by content analysis of the actual web pages and their design. A sample of the cases has been followed up by interviews with the users.

A basic theoretical understanding within the SIGIS projects, emerging from feminist technology studies during the last decade, is that we need to study gender as well as technology as dynamic and rapidly changing notions and practices (Faulkner 2001; Wajcman 2000). In these practices, gender and technologies are co-produced, thus both may change during such a process.

Digital Exclusion and Inclusion

In discussions about the so-called digital divide, the problems have mainly been seen as produced through processes of exclusion, often related to entrenched patterns of social inequalities. These patterns have been thoroughly studied by social scientists for a long time. However, in the SIGIS project, we have been careful not to perceive inclusion as just a mirror-image of exclusion. While the development of inclusion strategies

should be informed about the nature of the exclusion processes that one tries to overcome, inclusion activities should not just be directed at curbing exclusion mechanisms. In addition, and this is very important, inclusion strategies need to have outspoken positive measures. To stop exclusion is not the same as achieving inclusion; in fact, too strong a focus on exclusion mechanisms may make inclusion seem impossible. Thus, our main interest has been inclusion as a social process in its own right.

There are several obvious areas in which the mechanisms of exclusion can be and need to be addressed through inclusion measures, in particular: resources, skills and knowledge, confidence and relevance. These points obtain for any digital inclusion strategies, gender or otherwise.

Both the statistical evidence on the digital divide, and all of the community-based ICT access and training initiatives we studied, confirm a simple message: some people (women and men) are digitally excluded because they are poor. Resource barriers to digital inclusion can only be overcome through the provision of free access to and training in ICT. But making ICT resources available is not enough to ensure digital inclusion. In addition to resources, people obviously need to acquire skills and knowledge in using ICTs if they are to participate in the information society at any level. Less obviously, the SIGIS training cases revealed that informal learning is a vital feature of how people acquire ICT competence even if they receive formal training, and that relevance and building confidence are key ingredients for success in ICT training.

Many non-ICT users are 'excluded' from the information society because they do not see that this technology as relevant to them. It is what the technology can do that makes ICT interesting to people—be it pursuing an existing hobby on the Internet, or communicating with distant family by email. Diverse strategies confirm the importance of finding ICT applications or content which are relevant to people's lives. Many ICT trainers who find the technology itself inherently interesting tend to teach ICT as 'merely skills'. A far more effective approach is to foreground the uses of ICT rather than the technology per se. Highlighting relevance can result in a process we have called 'self inclusion'. For instance, the website *Senza Maschera* ('without a mask') is set up by the medical faculty of Padua University to reach patients with the immune-defect disease commonly known as lupus. The majority affected are young women. Since this is a rare disease, the Internet has become a place where

important knowledge is exchanged and produced by those affected by it (Fortunati 2003a). The case reveals how new users are attracted to ICT use because of the content, and the effect is that the participants have become competent users of computers and the Internet.

Numerous SIGIS cases confirm the importance of bringing the technology to 'where people are at'. Effective tailoring of inclusion strategies means not only finding applications of ICT which are interesting to people, but also finding mechanisms for effectively reaching people in their existing social networks and practices.

We should, however, also keep in mind that many of the enthusiastic publications about closing the digital divide have a very simple and technology deterministic understanding in the sense that equal access to the Internet is the way to a better world. To avoid exclusion one must also consider other channels to information and access to public assistance, and one must accept that some people will remain non-users. To understand the processes of exclusion and inclusion, one should focus also on non-users who have made conscious choices to remain so (Wyatt et al. 2002).

Challenging Gender Binaries and Essentialisms

In all of the inclusion strategies we studied, we found a profound tension between embracing gender stereotypes and binaries and challenging them—a tension which occurs not least because of the tendency for perceptions of gender difference to be exaggerated. On the one hand, there are examples that drawing on gender essentialisms and binaries (although simplifying) can serve to validate women's perceived interests and practices, and so may be effective in engaging otherwise excluded groups of women. On the other hand, such strategies may serve to marginalize women and making them invisible, especially in the longer run, by assigning them to special positions at the margins of ICT use and development.

Our case studies confirm that essentialist and binary understandings of femininity and masculinity are remarkably pervasive and tenacious. Several of the initiatives to make more girls/women interested in ICT start from an explicit or implicit assumption that their interests, motives and skills are different from those of boys/men—even understood as exactly the opposite. For instance, in a campaign to recruit more girls to

study computer science, it was emphasized that when working with computers, social and communicative skills were most needed (Lagesen 2003). This had the positive effect that girls felt they were welcome, and the number of applicants radically increased during the campaign. In the longer run, however, such strategies may lead to a marginalization of women within the ICT professions if women are expected to care for the social and communicative aspects of work, and thus accorded tasks that are not central to technical development.

In many cases, however, people's actual practices are far less gender differentiated than their accounts. An interesting case is the event called computer parties. Basically these are social events for young people with common interests. The one studied in Norway is a huge event with hundreds of people coming together in a large sports hall during the Easter holidays. A majority of the participants are young boys, but there is an increasing minority of girls (Nordli 2003). Computer parties were interesting to study as inclusion measures because they are open events which anyone can attend. In this context, girl participants are seen, and also see themselves, as 'just users' or 'chatterers', where the boys are described as 'programmers' and 'games players'. Yet they are all skilful and enthusiastic users, and most do all of these things. Thus gender affects the way technology use is apprehended and interpreted. This was also apparent in the way teachers talked about boys and girls' computing skills (Gansmo 2003), and in the self-presentation of computer science students (Corneliussen 2003).

As we shall demonstrate now, design strategies which start from plural understandings of gender are more likely to be inclusive than design strategies which start from essentialist, binary understandings of gender. Moreover, strategies which draw on gender binaries and essentialisms risk exacerbating gender inequality, if it is not challenged, by ghettoizing or stereotyping women. Ideally, any appeal to gender stereotypes should therefore be combined with efforts to move beyond or 'destabilize' those stereotypes which are particularly outdated, iniquitous or which palpably fail to acknowledge variety amongst 'real' people.

What we may term a combination of a traditional and more open approach in gender terms may be exemplified by the design of web magazines. These were virtual copies of traditional women's magazines. The designers started from the 'lowest common denominator' assumption

that 'women are computer reticent or incompetent and need user-friendly interfaces'. At the same time, they made concerted and creative efforts to help their customers gain ICT skills by creating interactive discussion sites and virtual communities which readers participate in and learn through. The web magazines we studied are women-centered in the sense that they build on the design and contents of traditional women's magazines. The magazines are an effective means to self-inclusion because they create the motivation and opportunity for readers to become more familiar with using the Internet. They are also women-friendly in the sense that the readers learn about ICTs in part through interacting with, and getting advice, support and encouragement from, other women readers. The enthusiasm with which these sites are used confirms that they are experienced as a virtual 'room of one's own'. By facilitating such informal learning about ICTs, this strategy actively undermines, and so renders redundant over time, the original assumption of computer reticence and incompetence amongst women.

Consequently, we shall first and foremost challenge the understanding that to reach women, one has to advertise ICT as 'soft' or 'non-techy', or design gadgets that look 'feminine' and function differently from 'masculine' ones. The first type of strategy we present is a strategy that aims at reaching 'everybody'.

Informal ICT Learning and 'Local Experts'

In all social settings and in all walks of life, informal processes are a recurrent and vital means by which most people learn about computers and extend their ICT skills. This was evident in the self-inclusion which resulted from the web-based magazines mentioned earlier. It also emerged in two cases of occupational ICT training of civil servants and teachers (Fortunati 2003b). These cases confirm that informal learning about ICTs routinely takes place alongside and supplements more formal kinds of learning. Yet, it is rare to find digital inclusion strategies which explicitly address informal learning. Our research stresses the importance of informal learning as part of 'domestication' processes in which ICTs become embedded in everyday life (Lie and Sørensen 1996). In this sense, informal learning is also 'social learning': interest and competence in ICTs evolve within complex interactions between education, work and leisure (MacKeogh and Preston 2004).

People tend to turn to 'local experts'. Most computer users (and increasing numbers of those who are not regular users) know somebody—a friend, colleague or family member—who knows something about computers. SIGIS cases demonstrate that these local ICT experts play two really crucial roles. They act as positive role models for building confidence, competence and enthusiasm about using computers. And they are a free and accessible source of practical advice about computers and ICT, to whom we can turn if there is anything we don't understand or can't do. People's life setting and social ties shape their particular networks of ICT experts. Most people under the age of 30 have learnt something about computers at school, and are more likely to have peers who know about and have computers than do middle- and retirement-aged people; the latter more usually acquire ICT skills through work or from a local expert in the family.

SIGIS research demonstrates that it is vital to understand not only how exclusion mechanisms may be gendered, but also how inclusion mechanisms may be gendered. Ironically, this point is poignantly illustrated by the case of a community-based ICT access and training network in rural Scotland that failed to reach certain groups of men (Faulkner and Kleif 2005). It was an initiative aimed at 'everybody', which de facto included more women than men. Within this locality, among the middle-aged, more men are digitally excluded than women, in part because they tend to be concentrated in outdoor manual jobs. To compound this, the strategy itself, which was so effective in drawing in even computer-reticent women, did not work for these men. In a culture that remains strongly gender segregated, socially as well as at work, such community-based initiatives are marked as 'women-friendly' spaces. So these are not spaces where computer reticent men are likely to be willing to expose their ignorance. The case serves to remind us that 'gender in/exclusion' is not just a 'women's issue'. It also demonstrates that good intentions about reaching 'everybody' will not be effective unless they are backed up with a recognition of the specific ways in which diverse groups of women and men within the target constituency experience barriers to digital inclusion.

The policy significance of these observations for digital inclusion is enormous. Informal learning through networks of local experts, helping out and passing on their knowledge and enthusiasm to others who have

less expertise or confidence, is clearly very significant for ICT capability building for women and men. We need to understand better how people blend formal and informal learning, where they find local ICT experts, and how these inclusion processes are gendered in particular settings and for particular groups.

Women-centered Spaces

Do women need particular 'women only' inclusion measures? We have studied cases where the target group is 'everybody', including women, and also cases where there is a particular target group that may be women in general, unemployed women, lone mothers and young girls etc. We found that the women-only route is extremely effective to meet the needs of specific groups, because of the safe and supportive environment it creates. Specifically, it is beneficial to women whose self-esteem and confidence is low—as a result of being out of the labor market for some time, and in some cases, as a result of disadvantaged or vulnerable circumstances. We believe we need to stress this because it has rather 'fallen from fashion' in recent years. It does not follow that women-only training is either needed or effective for all women or for all types of training. However, the women-only training cases do highlight the general value, in terms of confidence building, of providing 'safe spaces', role models and networks of solidarity to encourage and support learning about ICT, and one-to-one support within training.

By contrast, relating to women in ICT, there has been a deliberate decision not to be women-only. A network organization has been created to enhance women's careers, but the organization—WITI—is also open to men. When one aim is to increase the visibility of women designers, one is careful not to ghettoize women or alienate potentially sympathetic men. The key justification is a recognition that what women who work within ICT need more than anything is to build networks, skills and confidence in order to overcome their felt isolation at work and to progress in their careers.

Another example of inviting women but not to the exclusion of men are the women's magazines mentioned earlier. Net-based magazines are open to everybody, although they are aiming at different target groups. Surfing through web magazines is an attractive first try for many users.

Case Study: A 'Women's Only' Training Center[4]

The Edinburgh Women's Training Course (EWTC) is a women-only IT-training program that aims to enable unemployed women living in disadvantaged circumstances to enter the labor market or go on to further or higher education. Launched in 1986 as the flagship project of the (then) Edinburgh Women's Training Center, EWTC was the first women-only vocational training project in Scotland. Its original objectives were to support and train disadvantaged women who wanted to (re)enter the labor market in computer technology. Since 1992, the content of the training has shifted from computing (programming and hardware) to IT applications, with graduates typically going into conventionally female jobs in administration rather than into conventionally male jobs in computing.

The trainees are selected on the basis that they are unemployed women who have low, unrecognized or no relevant qualifications, and who are disadvantaged in one or more of the following ways: lone parents, returners, over 40 years of age, disabled, from an ethnic minority or from neighborhoods with high unemployment. Twenty-four women are recruited each year. Training is (currently) provided three days per week over a full school year, with half a day devoted to personal development and communication skills and the rest to IT, including the European Computer Driving Licence (ECDL). The training plus travel and child care are all free.

The course is deemed a success in that the majority of its graduates find employment or go on to further or higher education. Since the women are disadvantaged in the job market and generally start the course with low self-belief, these are very real achievements. The success rests on several features of the EWTC strategy combined. First, the selection criteria ensure that the course reaches women who are unemployed and disadvantaged, but who also have sufficient aptitude and motivation to get something from it. Second, the course plus any travel and child care costs are paid for, without which the target group could not participate. Third, the course takes a full year, allowing time for trainees to achieve meaningful levels of competence. Fourth, the training staff empathize with the trainees and are directly involved in every aspect of the course, so they are both trusted by the trainees and in touch with employers and qualifications organizations. Fifth, the training is women-only so as to

provide a supportive and safe environment for trainees low in self-belief. Sixth, the training delivery is mixed pace and encourages the women to take pride in every achievement, however modest. Seventh, the curriculum includes communications, alongside IT, geared to personal development and employability. Finally, increasing confidence and self-esteem are considered crucial outcomes of the course alongside new skills and opportunities.

In sum, this inclusion strategy does seem to be very effective in using women-only training in IT skills as a route to the labor market or educational inclusion and personal development for particular groups of socially and economically excluded women. We found that the EWTC strategy enhances the inclusion of women in terms of entry into the labor market or education, greater ICT literacy in everyday life and greater confidence and self-esteem potentially enhancing personal empowerment and so inclusion. Building confidence and self-esteem are crucial objectives if socially disadvantaged women are to be more included—both in ICT and socially. They are the pivotal link between women-only training and any inclusion outcomes. The use of women-only training worked well for the target groups. However, it is the whole package of strategic measures which ensures success.

Designing for Women

Our case studies of the design of ICT products indicate that it is not always more effective to design for women specifically as opposed to designing 'for everybody', including women. For at least two decades, the computer industry and the ICT sector have been criticized for making products and systems that are 'made by men for men'. This complaint has been particularly strong in relation to computer games, with many feminists arguing that the industry should develop games for girls and women in order to meet the needs of this potential market. In two cases we studied, the designers chose to do this. Both started from assumptions of stereotypical differences between girls and boys, and trying to design an electronic toy for girls, the designers discovered that girls did not want the 'pink look' and 'round shapes' they had suggested.

Other games cases we studied indicate that the differences between girls/women and boys/men with respect to computer game playing are

overrated compared to those that exist amongst girls/women and amongst boys/men. Designers report that girls and women are much more into playing (existing) computer games than is usually assumed, even if they are critical of some 'boyish' aspects. But they do recognize that they need new designs in order to appeal to a wider cohort of girls and women. Their strategies are not about designing games specifically for girls and women, but about designing what we might call 'cross-gender' games, which seek to cater for a variety of tasks and interests within the same game.

In sum, design strategies targeted specifically at women tend to build on stereotypical gender differences. In some circumstances, this can be an effective means to self-inclusion in the information society. However, to the degree that these strategies assume all girls/women share the same interests and tastes, and do not move beyond the stereotypes, their success will always be limited—and, of course, their political impact will be gender conservative and not progressive. By contrast, 'for everybody' design strategies can work in attracting women if, rather than treating the market as homogeneous, they acknowledge the interests and tastes of heterogeneous groups of girls/women and boys/men. Once again, specifics matter. 'Women' is not a particularly useful design category, any more than is 'men'—a conclusion which is entirely in line with the emphasis on gender diversity or plurality.

Case Study: Designing a Girlish Toy[5]

During the 1990s, the research department of Philips Electronics in The Netherlands decided to make a product aimed specifically at girls. The toy never actually reached production, an indication that girls are generally not considered as a commercially interesting group when it comes to computer toys. Among designers of computer games, girls are perceived as not being particularly interested in electronic toys, and moreover, while girls might play games intended to appeal to boys, one would not expect the opposite to happen (Rommes et al. 2003).

Within the electronics games market, boys form the main customer group. Philips therefore decided that to reach girls it would have to make something that differed from what already existed. An inspiration was the commercially very successful Barbie game in which Barbie could be dressed up in different outfits. The concept was a computer game that

would reach the target group of little girls estimated to be in the age group 7–12 years. The product would be an electronic portable device with communication options, called the KidCom, and some prototypes were manufactured.

The authors of the case study highlight certain features of the device. The basic applications available in the KidCom were a message-sending application, an alarm clock, a calculator, a drawing book, a horoscope and an address book with a 'friendship calculator'. The KidCom could be personalized by storing information like a password or a tune on a 'key'-card that had to be inserted before the KidCom could be used. These messages, pictures and melodies could also be sent to other KidComs. Besides these applications, other applications would be available on so-called smart cards that had the same size and shape of credit cards. The project team planned to develop and sell smart cards with, for instance, information about famous pop stars, little games and self-tests.

How did the design group work to find what is attractive to girls? First, the composition of the work team was important. It should include women, because they had been girls themselves. Also, it was argued that women would have a natural feeling for what elements should be included in the design and how to market the product. Second, the design group should consist of professions other than technicians, as more than advanced technical features were considered important in this project. The third particular element was to study the target group. Marketing bureaus were hired, and the designers studied popular books on gender differences. They also adapted a user-centered methodology that included test groups. Thus girls were invited to come and try the product. Finally, the design group practiced brainstorm sessions on 'what girls like'.

The result was a very stereotypical presentation of girls. One may say that girls became depicted as everything that the boys are not. Boys were from the beginning a target group that the designers were familiar with, in the sense that boys liked the computer devices that designers were used to making. The design process was from the beginning based on the assumption that there were basic differences between boys and girls, and that the product could only be a success if they found out what was particular about girls. Thus, for instance, they jumped to the conclusion that girls wanted pink. The girls included in the user tests, however, actually preferred darker colors, and found the KidCom prototype too

childish. Still, in the end the designers decided on pinkish colors and round shapes because they thought that this was what the parents would look out for.

The designers' anticipations of 'what girls like' appeared as very stereotypical. Moreover, their perceptions of what girls are like are modified according to what they think 'the market wants'. Although the designers in this case utilized participatory design methods and user tests that actually gave another result, the expectations of what girls are like were given greater weight.

This case highlights the prevalence of the I-methodology in ICT design. This means that the designers, usually young or middle-aged men from Europe, USA or Japan, make what they themselves find interesting or attractive. When imagining other user groups, they tend to lean on their own imaginings of the group (cf. Akrich 1992; Berg 1994). Inclusion for all, consequently, presupposes research designs that are more diversified, designing for heterogeneous groups of people and for people with varied interests.

An 'Image Problem'?

It has long been presumed that symbolic associations between technology and masculinity, in particular the a-social connotations of the 'nerdy' hacker image, are important barriers to women's inclusion in ICT. One of the more unexpected findings from the SIGIS research is that this particular 'image problem' is very much less evident than one might have expected, and easily overcome.

Strategies to encourage more women into ICT frequently address the 'image problem' explicitly, by seeking to change the image (if not the content) of computer science and engineering in order to make it more appealing to women. This is evident in the fairly innovative strategies of 'IT Beat' in the UK and the 'Squares and Circles' campaign at the Norwegian University of Science and Technology. In the first case, ICT was associated with fun, glamour and youth (Pitt 2003). The latter case is particularly interesting, since it included a very high profile advertising campaign that played directly to the nerd/hacker image and associated gender stereotypes, arguing that computing needs more social skills which (it asserted) women bring (Lagesen 2003). To our surprise, interviews with women who chose to go into computer science and engineering during

the period of this campaign revealed that they largely ignored the message. Although the wider initiative of which it was a part did result in a significant increase in the number of women going into computer science, the main contribution of the advertising campaign was to convey the message that 'women are welcome here'. It made women in computing visible, and provided positive images of them, demonstrating that it is no longer exceptional to be a woman in computing.

The Relative Numbers of Women

Our analysis of recruitment strategies revealed that the most important feature was that the various measures adopted together had a direct effect on the numbers of women taking computer science and engineering at the university level. The most significant of which, and also the most controversial, was the introduction of quotas to ensure additional women entrants every year (Lagesen 2005; Teigen 2003). One consequence of this was that people could see there was a sizable proportion of women students in the department. We conclude that some sort of critical mass needs to be reached—and be seen to have been reached—in a previously male-dominated technological field before entry becomes a 'gender authentic' rather than gender inauthentic option for girls and women (Lagesen 2005). A similar 'critical mass' phenomenon is probably occurring with respect to the uptake of ICT products like computer games and the spread of ICT use more generally. The more examples there are of computer enthusiastic and competent girls and women, the harder it is for people to view ICT as a technology for boys and men, where the odd girl or woman is merely the 'exception that proves the rule'. Numbers matter!

This observation has wider significance. It suggests that one of the more effective ways to extend gender inclusion in the information society is to make visible the growing numbers of girls and women as users and as experts. A large and visible group of computer-enthusiastic and computer-competent girls and women will challenge old stereotypes about gender and technology and will provide role models for each new generation.

Conclusions: One Size Does Not Fit All

The SIGIS case studies indicate that 'one size does not fit all' in the sense that the same measures may not be effective with different groups

or in different settings. So, there can never be a single 'cure all' strategy to improve gender inclusion in the information society—precisely because there is so much diversity and fluidity in both gender and ICTs. Multiple and diverse strategies are likely to be required for different technologies and uses, and for different social groups and settings.

Context matters, and this means that effective tailoring is necessary if inclusion efforts are to succeed in reaching their target groups. Effective tailoring of digital inclusion strategies requires an awareness of which groups are excluded from the information society, and how; what each group's needs and interests are; and what measures are likely to reach them.

The literature review conducted at the beginning of the SIGIS project identified a contradictory pattern across Europe—a closing gender gap in the use of ICTs (what we call women and ICT), but a persistent gender gap within computer specialisms and professions designing ICTs (women in ICT). An important policy question with which we started our research was to explore how strategies to improve the position of women and ICT might impact positively on the position of women in ICT. It remains difficult to clearly discern underlying trends and causalities, but SIGIS research does point to some encouraging signs. We found that the image which people have of computers is increasingly less a 'techy', 'for men only' image, as ICTs become more widely used and an everyday part of social and economic life. Designers are increasingly aware of the missing women in their markets, and increasingly reflexive about how they might attract girls and women to their products. Growing numbers of girls and women are doing things previously presumed to be the preserve of boys and men, as computer enthusiasts, game players and, in some places, in computer science courses. In addition, it seems likely that there will be crossovers between increasing use of ICTs by women and increasing numbers working in ICT. Within ICT work, the boundary between using and creating ICTs is now very blurred.

What is clear is that there is a serious lack of 'joined up policy' in most countries with respect to gender and ICT, whereby government support to bring women into ICT sits alongside wider digital inclusion efforts which are 'gender blind'. In the UK, for example, there have been concerted government efforts to get more women into ICT, but gender is virtually absent from some discourses about the digital divide. By contrast, in Norway public policies are frequently scrutinized to assess whether they

help promote gender equality. This is supported by a general political acceptance, and a particular law, of equal opportunities between women and men, enforced by the so-called 'state feminism'. Accordingly, there is a strong awareness of gender as a potential dimension in the digital divide.

The SIGIS findings indicate that gender gaps in digital inclusion will not disappear without intervention, and that gender blindness in digital inclusion strategies may even exacerbate the exclusion of specific groups (of men or women). If governments are serious about gender inclusion in the information society, then thorough gender awareness must permeate all digital inclusion strategies, be they education-based, work-based or community-based.

In sum, SIGIS research confirms the following overarching conclusion concerning links between digital exclusion and inclusion: because digital exclusion is multi-dimensional, inclusion strategies generally require a 'heterogeneous' package of measures. Digital inclusion is not simply a mirror image of exclusion, and consequently inclusion cannot be reached just by curbing exclusion mechanisms. Neither is it sufficient just to make technology available. To achieve inclusion, conscious and positive measures are needed. These must be of various characters since people are diverse (suffice to mention age, class, urban-rural) and need to be addressed where they are at. Key processes are those based on self-inclusion and informal learning with the support of 'local experts'. The way to enhance self-inclusion is to address people with contents of relevance to their lives, and to make ICT more fun!

NOTES

1. This article summarises the main research findings from the project 'Strategies of Inclusion: Gender and the Information Society' (SIGIS). This European study explored initiatives to include women in Information and Communication Technologies (ICTs). Forty-eight case studies were undertaken of inclusion initiatives in the public and private sectors, and of the experiences of those involved. These have been collected in three volumes, and are available on the SIGIS website (www.sigis-ist.org). The partners in the project were Dublin City University (Ireland), Studio Metis (Italy), The University of Twente (The Netherlands), the Norwegian University of Science and Technology (Norway) and The University of Edinburgh (UK) which coordinated the project. This research was supported by the European Commission, 5th Framework, Information Society Technologies (IST) Programme (IST-2000-26329).

2. An interesting case is Vivian Lagesen's study of women computer science students in Malaysia and Norway (Lagesen 2005). See also Thorseth and Ess (eds) (2005): Technology in a multicultural and global society, with case studies from China and West Asia.
3. Lie and Sørensen (2003); MacKeogh and Preston (2003).
4. Case study, see Faulkner and Kleif (2003).
5. Case study, see Rommes et al. (2003).

REFERENCES

Akrich, Madeleine. (1992) 'The De-scription of Technical Objects,' in Bijker, Wiebe and Law, John (eds), *Shaping Technology/Building Society. Studies in Sociotechnical Change*, MIT Press, Cambridge, MA, pp. 205–24.

Berg, Anne-Jorunn. (1994) 'A Gendered Socio-technical Construction: The Smart House,' in Cockburn, C. and Fürst-Dilic, R. (eds), *Bringing Technology Home: Gender and Technology in a Changing Europe*, Open University Press, Buckingham, pp. 94–110.

Corneliussen, Hilde. (2003) 'Male Positioning Strategies in Relation to Computing,' in Lie, Merete (ed.), *He, She and IT Revisited: New Perspectives on Gender in the Information Society*, Gyldendal Akademisk, Oslo, pp. 103–34.

Faulkner, Wendy. (2001) 'The Technology Question in Feminism: A View from Feminist Technology Studies,' *Women's Studies International Forum* 24 (1): 79–95.

———. (2004) *Strategies of Inclusion: Gender and the Information Society*, Final Report, University of Edinburgh, Edinburgh.

Faulkner, Wendy and **Kleif, Tine.** (2003) 'Edinburgh Women's Training Course: An Old Idea Still Working,' in Lie, Merete and Sørensen, K.H. (eds), *Strategies of Inclusion: Gender in the Information Society, Vol. I: Experiences from Public Sector Initiatives*, Centre for Technology and Society, Norwegian University of Science and Technology, Trondheim, pp. 231–36.

———. (2005) 'One Size Does Not Fit All! Digital In/Exclusion in a Rural Community,' *Journal of Adult and Community Learning* 11 (1): 43–61.

Fortunati, Leopoldina. (2003a) 'The "wolverines" Discuss. The Lupus Users Case Study,' in Lie, Merete and Sørensen, K.H. (eds), Strategies of Inclusion: Gender in the Information Society, Vol. I: Experiences from Public Sector Initiatives, Norwegian University of Science and Technology, Trondheim, pp. 233–54.

———. (2003b) 'The New Cinderellas,' in Lie, Merete and Sørensen, K.H. (eds), Strategies of Inclusion: Gender in the Information Society, Vol. I: Experiences from Public Sector Initiatives, Norwegian University of Science and Technology, Trondheim, pp. 327–58.

Gansmo, Helen J. (2003) 'Limits of State Feminism: Chaotic Translations of the Girls and Computing Problem,' in Lie, Merete (ed.), *He, She and IT Revisited: New Perspectives on Gender in the Information Society*, Gyldendal Akademisk, Oslo, pp. 135–72.

Lagesen, Vivian A. (2003) 'Advertising Computer Science to Women (or Was It the Other Way Around?)' in Lie, Merete (ed.), *He, She and IT Revisited: New Perspectives on Gender in the Information Society*, Gyldendal Akademisk, Oslo, pp. 69–102.

Lagesen, Vivian A. (2005) *Extreme Make-over? The Making of Gender and Computer Science*, PhD Thesis, Norwegian University of Science and Technology, Trondheim.

Lie, Merete. (ed.) (2003) *He, She and IT Revisited: New Perspectives on Gender in the Information Society*, Gyldendal Akademisk, Oslo.

Lie, Merete and **Sørensen, K.H.** (eds) (1996) *Making Technology Our Own? Domesticating Technology into Everyday Life*, Scandinavian University Press, Oslo.

———. (eds) (2003) *Strategies of Inclusion: Gender in the Information Society, Vol. I: Experiences from Public Sector Initiatives*, Centre for Technology and Society, Norwegian University of Science and Technology, Trondheim.

MacKeogh, Carol and **Preston, Pascal.** (eds) (2003) *Strategies of Inclusion: Gender in the Information Society. Vol. II: Experiences from Private Sector Initiatives*, Centre for Technology and Society, Norwegian University of Science and Technology, Trondheim.

———. (2004) 'Web Magazines and Informal Learning Strategies,' in Rommes, Els, van Slooten, L., van Oost, E. and Oudshoorn, Nelly (eds), *Designing Inclusion: The Development of ICT Products to Include Women in the Information Society*, University of Twente, Enschede.

Ng, Cecilia and **Mitter, Swasti.** (eds) (2005) *Gender and the Digital Economy: Perspectives from the Developing World*, Sage Publications, New Delhi, Thousand Oaks and London.

Nordli, Hege. (2003) *The Net is Not Enough: Searching for the Female Hacker*, Dr.polit. Thesis, Norwegian University of Science and Technology, Trondheim.

Oudshoorn, Nelly, Rommes, Els and **van Slooten, I.** (eds) (2003) *Strategies of Inclusion: Gender in the Information Society, Vol. III: Surveys of Women's User Experience*, Centre for Technology and Society, Norwegian University of Science and Technology, Trondheim.

Pitt, L. (2003) 'IT Beat: Bringing Pop and Glam to IT,' in MacKeogh, Carol and Preston, Pascal (eds), *Strategies of Inclusion: Gender in the Information Society. Vol. II: Experiences from Private Sector Initiatives*, Centre for Technology and Society, Norwegian University of Science and Technology, Trondheim, pp. 219–40.

Plant, S. (1997) *Zeroes + Ones: Digital Women + the New Technoculture*, Fourth Estate, London.

Rommes, Els, Oudshoorn, Nelly and **Stienstra, M.** (2003) 'Kidcom Designer Case,' in MacKeogh, Carol and Preston, Pascal (eds), *Strategies of Inclusion: Gender in the Information Society. Vol. II: Experiences from Private Sector Initiatives*, Centre for Technology and Society, Norwegian University of Science and Technology, Trondheim, pp 189–218.

Rommes, Els, van Slooten, I., van Oost, E. and **Oudshoorn, Nelly.** (eds) (2004) *Designing Inclusion: The Development of ICT Products to Include Women in the Information Society*, University of Twente, Enschede.

Sørensen, K.H. (2004) *Gender and Inclusion Policies for the Information Society*, Centre for Technology and Society, Norwegian University of Science and Technology, Trondheim.

Sørensen, K.H. and **Stewart, J.** (eds) (2002) *Digital Divide and Inclusion Measures: A Review of Literature and Statistical Trends on Gender and ICT*, Centre for Technology and Society, Norwegian University of Science and Technology, Trondheim.

Teigen, Mari. (2003), *Kvotering og Kontrovers* (*Quotas and Controversy*), UniPax, Oslo.

Thorseth, May and **Ess, Charles.** (2005), *Technology in a Multicultural and Global Society*. Programme for Applied Ethics, Norwegian University of Science and Technology, Trondheim (and American University Press, forthcoming).

Wajcman, Judy. (2000) 'Reflections on Gender and Technology Studies. In What State is the Art?' *Social Studies of Science* 30 (3): 447–64.

———. (2004) *TechnoFeminism,* Polity Press, Cambridge.

Wyatt, Sally, Thomas, G. and **Terranova, T.** (2002) 'They Came, They Surfed, They Went Back to the Beach—Conceptualizing Use and Non-use of the Internet,' in Woolgar, S. (ed.), *Virtual Society?: Technology, Cyberbole, Reality*, Oxford University Press, Oxford.